MICRO-MOBILITY IN ANKARA:
CONSIDERATIONS FOR A POTENTIAL CITIZEN SCIENCE APPLICATION

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ABSTRACT

MICRO-MOBILITY IN ANKARA: CONSIDERATIONS FOR A POTENTIAL CITIZEN SCIENCE APPLICATION

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This research explores the potential of Citizen Science to enhance the design and planning of urban micro-mobility systems, focusing on cycling experiences in Ankara, Türkiye. By combining insights from a literature review, expert interviews, and generative focus groups with local cyclists, the study examines the interconnected influences of policy frameworks, cultural attitudes, physical infrastructure, and user behaviors within the city's micro-mobility ecosystem. The findings reveal significant challenges, including infrastructural inadequacies and a car-centric culture, alongside systemic barriers in policy implementation and governance. The research highlights the potential of Citizen Science to foster community participation, amplify user voices, and co-create actionable solutions. By integrating community insights into planning processes, Citizen Science emerges as a pathway to sustainable, inclusive, and user-centered micro-mobility systems, contributing to more livable cities. This study provides actionable recommendations and advances participatory methodologies to bridge the gap between citizens, planners, and policymakers.

Keywords: Citizen Science, Micro-mobility, bicycle, participatory design, urban systems.

ÖZ

ANKARA'DA MİKRO HAREKETLİLİK: OLASI BİR VATANDAŞ BİLİMİ UYGULAMASI İÇİN GEREKENLER

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Bu araştırmada, Ankara'daki bisiklet kullanım deneyimine odaklanarak, Vatandaş Biliminin kentsel mikro hareketlilik sistemlerinin tasarımının ve planlamasının geliştirilmesindeki potansiyelini incelemektedir. Bu çalışmada, literatür taraması, uzman görüşmeleri ve yerel bisikletçilerle yapılan üretken odak gruplarından elde edilen bulgular bir araya getirilerek, şehrin mikro hareketlilik ekosisteminde politika uygulamalarının, kültür temelli tavırların, fiziksel altyapının ve kullanıcı davranışlarının birbiriyle bağlantılı etkileri incelenmektedir. Araştırmadan elde edilen bulgular, altyapısal yetersizlikleri ve araba merkezcil kültürün yanı sıra politika uygulama ve yönetişimdeki sistemik engeller gibi önemli sorun alanları olduğunu göstermektedir. Çalışma, Vatandaş Biliminin toplumsal katılımı teşvik etme, kullanıcı görüşlerini duyurma ve uygulanabilir çözümleri ortaklaşa üretme potansiyelini vurgulamaktadır. Toplumun içgörülerinin planlama süreçlerine entegre edilmesiyle Vatandaş Bilimi, sürdürülebilir, kapsayıcı ve kullanıcı odaklı mikro hareketlilik sistemleri için bir yol sunarak daha yaşanabilir şehirlerin oluşumuna katkıda bulunmaktadır. Bu çalışma, vatandaşlar, plancılar ve politika geliştiriciler arasında köprü görevi görerek eyleme dönüştürülebilir öneriler sunmakta ve katılımcı yöntemlerinin gelişimine katkıda bulunmaktadır.

Anahtar Kelimeler: Vatandaş Bilimi, Mikro-hareketlilik, bisiklet, katılımcı tasarımı, kent sistemleri.

"Participation without redistribution of power is an empty and frustrating process for the powerless."

-Sherry Arnstein

"The freedom to make and remake our cities and ourselves is, I want to argue, one of the most precious yet most neglected of our human rights."

-David Harvey

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CHAPTER 1

INTRODUCTION

Urban micro-mobility, particularly cycling, has emerged as a crucial component of sustainable urban transportation systems. In cities such as Ankara, the capital of Türkiye, integrating bicycles into the broader transportation network presents distinct challenges and opportunities. This thesis seeks to explore the potential of Citizen Science, which is a research approach that involves public participation into the process at varying levels, as a tool to inform and enhance the design of micro-mobility systems in urban environments, with a specific focus on Ankara.

The selection of Ankara as the focus of this study is intentional. As the location of Middle East Technical University, where this research is being conducted, Ankara provides opportunities for direct engagement with local users and access to relevant study sites. Furthermore, Ankara's status as a capital city with existing bicycle masterplans and strategic initiatives offers a unique context for examining the intersection of Citizen Science and micro-mobility.

In this thesis, Citizen Science is not employed as a direct method of data collection; rather, it serves as the primary subject of exploration and analysis. The study draws upon principles of user experience design, following a process akin to product design. These proposals may encompass recommendations for the functions, features, and usage scenarios of a potential Citizen Science application. Although Ankara is the focal case study, the insights and recommendations generated by this thesis are intended to be broadly applicable, contributing to the design and implementation of Citizen Science initiatives in other urban settings. The overarching aim is to advance the standardization and development of effective Citizen Science approaches for enhancing micro-mobility systems.

1.1 Problem Definition

Despite the increasing recognition of bicycles as a vital mode of urban transportation, significant challenges remain in their integration into the existing transportation systems. In Ankara, issues such as inadequate infrastructure, cultural attitudes, and insufficient policy support hinder the widespread adoption of cycling. Traditional approaches to the design and implementation of these systems often overlook the valuable perspectives of the citizens who use them. Here, Citizen Science offers a promising solution by actively involving citizens in identifying problems, collecting data, and co-creating solutions, thereby addressing the gap in participatory design in micro-mobility initiatives.

1.2 Research Aim and Objectives

The primary aim of this research is to explore the potentials of Citizen Science for improving the micro-mobility experiences of citizens living in Ankara, with a particular emphasis on cycling.

The thesis will investigate the following three research questions to address this aim:

- How do citizens perceive the main opportunities for and barriers against adopting micro-mobility practices in Ankara?
- How do citizens perceive potential improvements and new directions for micro-mobility and its effects on social life in Ankara?
- How can Citizen Science be implemented to improve the micro-mobility experience in Ankara?

These questions aim to identify the needs, preferences, and desires of Ankara's citizens concerning micro-mobility, leading to the development of a Citizen Science approach that can effectively respond to these factors.

1.3 Significance of the Topic

This research is significant as it bridges the disciplines of social design, urban mobility, and citizen engagement. By focusing on the application of Citizen Science to micro-mobility, this study contributes to the development of more user-centered, sustainable, and equitable urban transportation systems. The insights gained from this research have the potential to influence policy-making, enhance the design and usability of micro-mobility systems, and increase public engagement in urban planning processes.

1.4 Structure of the Thesis

The thesis is structured as follows:

Chapter 1: *Introduction* - This chapter introduces the research context, problem definition, and outlines the research questions, aim, and objectives.

Chapter 2: *Literature Review* - This chapter reviews relevant literature on micro-mobility, Citizen Science, and the role of design in participatory processes.

Chapter 3: *Methodology* - This chapter details the research design, including expert interviews and generative focus groups.

Chapter 4: *Findings* - This chapter presents the findings from the expert interviews and focus groups.

Chapter 5: *Conclusion* - This chapter discusses the implications of the findings and offers recommendations for future research and practice.

1.5 Scope of the Thesis

This thesis focuses on leveraging Citizen Science to address the complex and systemic challenges of urban micro-mobility. While Citizen Science has proven effective in environmental and ecological contexts, this research aims to expand its

application to the socio-political challenges of micro-mobility. By introducing a novel approach to navigating these intricate systems, the study explores how Citizen Science can act as a transformative tool for enhancing the design, implementation, and sustainability of urban mobility solutions.

Citizen Science is uniquely positioned as a participatory alternative that offers a more comprehensive engagement model, connecting multiple stakeholders within a complex system. Given the multifaceted nature of micro-mobility, which includes various actors and interests, Citizen Science emerges as a significant approach to bridge these diverse stakeholders. The focus is on designing effective participatory mechanisms that ensure broad, inclusive communication and collaboration, ultimately enhancing urban mobility projects.

CHAPTER 2

LITERATURE REVIEW

2.1 Micro-mobility

Micro-mobility refers to vehicles, either personally owned or shared, that fit into a specific categorization, which may vary but are generally described as lightweight, low-speed, human-powered or electric, and personally driven. These vehicles (See Figure 2.1) are used as an alternative to motor vehicles and often complement public transportation systems (Abduljabbar et al., 2021; Campisi et al., 2020; McQueen et al., 2021; Oeschger et al., 2020; Olabi et al., 2023). Common examples include bicycles, e-bikes, and e-scooters, although other vehicles such as skateboards, hoverboards, and segways also fall under this category (Olabi et al., 2023).



Figure 2.1. Micro-mobility vehicles. a) Sportive 220 28" 21-V VB bicycle by Carraro; b) E-Flow 28” NEX-5V HD Di2 automatic electrical bicycle by Carraro; c) Skateboard by BluePrint d) Electric Skateboard by Razor; e) T7XL Adult scooter by OXELO; f) Electrical Scooter 3 by Xiomi; g) Ninebot S by Segway; h)

Self-balancing scooter or hoverboard; i) Segway i2; j) Electric Mobility Ultralite 480 Mobility Scooter.

Micro-mobility has recently gained traction across various disciplines. Particularly in the last decade, interest in micro-mobility research and projects has grown considerably, with a marked increase since 2019 (Abduljabbar et al., 2021; Campisi et al., 2020; Guo et al., 2022; Oeschger et al., 2020). The popularity of micro-mobility is attributed to its recognition as a flexible, cost-effective, sustainable, and accessible form of transportation (Abduljabbar et al., 2021; Campisi et al., 2020; Guo et al., 2022; McQueen et al., 2021; Oeschger et al., 2020; Olabi et al., 2023). This surge in attention has been fueled in part by increased research and projects conducted by private, non-governmental, and governmental organizations that endorse and contribute to the United Nations Sustainable Development Goals (Campisi et al., 2020; Olabi et al., 2023).

The benefits of micro-mobility are numerous, particularly in the context of sustainability and urban accessibility. Some of the key benefits highlighted in literature include:

- **Reduced reliance on private vehicles and increased accessibility:** Micro-mobility serves as a practical alternative to private vehicles for short distances, significantly reducing congestion and promoting more sustainable urban environments (Abduljabbar et al., 2021; Olabi et al., 2023). It can enhance access to public transportation systems, particularly for first- and last-mile journeys. Studies have shown how micro-mobility vehicles complement public transportation by bridging gaps for long walks to transit hubs, thereby encouraging more sustainable travel patterns (Oeschger et al., 2020). Moreover, micro-mobility vehicles are compact and require considerably less space for parking and operation compared to private vehicles, freeing up valuable urban space for other uses, such as pedestrian walkways, green spaces, or public amenities (Campisi et al., 2020; Oeschger et al., 2020).

- **Lower energy consumption and reduced emissions:** Micro-mobility vehicles consume significantly less energy compared to traditional motor vehicles, particularly as they utilize electric motors that are more energy-efficient and less polluting than combustion engines. This reduction in energy consumption leads to lower greenhouse gas emissions and improved air quality in urban areas, especially where access to clean energy is limited, micro-mobility further demonstrates its sustainability by reducing overall energy consumption associated with transportation (Abduljabbar et al., 2021; Olabi et al., 2023). It's noted in studies that even a modest shift from private vehicles to micro-mobility can reduce car dependency and foster environmental sustainability (Abduljabbar et al., 2021).
- **Health, economic, and social benefits:** Micro-mobility encourages physical activity, resulting in positive health outcomes for users (Abduljabbar et al., 2021; Olabi et al., 2023). By reducing car dependency, it also contributes to cleaner air and quieter urban environments, enhancing the overall well-being of citizens (Abduljabbar et al., 2021). Economically, micro-mobility provides affordable and convenient transportation options, supports local businesses, and creates new employment opportunities within the micro-mobility sector (Abduljabbar et al., 2021; McQueen et al., 2021). Additionally, micro-mobility has the potential to enhance transportation equity by offering accessible options to underserved communities. However, equitable access requires targeted policies and infrastructure development to ensure the benefits of micro-mobility reach all segments of society (Olabi et al., 2023).

These benefits align with several of the United Nations Sustainable Development Goals (SDGs), mainly;

- **SDG 3 (Good Health and Well-being):** By promoting physical activity and reducing greenhouse gas emissions, micro-mobility contributes to improved

health outcomes, less traffic congestion, and lower noise pollution, creating healthier and more livable urban environments.

- **SDG 8 (Decent Work and Economic Growth):** Micro-mobility have a potential to support local economies by creating new job opportunities within the micro-mobility sector and enhancing access to employment opportunities, particularly in areas that are poorly served by public transportation.
- **SDG 11 (Sustainable Cities and Communities):** Micro-mobility contributes to more sustainable urban environments by reducing traffic congestion, air pollution, and the demand for motor-vehicle parking spaces. Its compact nature also allows for more efficient use of urban space, thereby freeing up areas for non-vehicle usage, pedestrian pathways and green spaces.
- **SDG 12 (Responsible Consumption and Production):** Micro-mobility encourages a reduction in private vehicle reliance, leading to a smaller transportation footprint and more efficient resource utilization.
- **SDG 13 (Climate Action):** By reducing greenhouse gas emissions associated with transportation, micro-mobility contributes to climate action, particularly when it replaces short car trips.

It is evident that micro-mobility offers significant benefits and is worth the effort and consideration of implementation. However, despite these significant benefits, several challenges can hinder this transition. These challenges can be broadly divided into those that arise before implementation and those that manifest afterward.

The pre-implementation challenges can be;

- **Data Collection and Analysis:** It has been noted in research that the lack of standardized data collection methods and limited data sharing between micro-mobility operators and cities hinder effective evaluation and policymaking. It is highlighted that establishing standardized data collection protocols and promoting open data sharing can facilitate research and

evidence-based decision-making (McQueen et al., 2021; Olabi et al., 2023). The data can provide insights into usage patterns, safety incidents, environmental impacts, and the effectiveness of various policies and interventions.

- **Regulatory Hurdles:** Establishing clear and consistent regulations is crucial for managing micro-mobility effectively. It's seen that many cities struggle to regulate new micro-vehicles like e-scooters, leading to inconsistent rules and even bans in some cases. Developing regulations that prioritize safety, address parking issues, and ensure equitable access while being adaptable to the evolving nature of micro-mobility is recommended (McQueen et al., 2021; Oeschger et al., 2020).
- **Public Perception and Acceptance:** Negative public perceptions regarding safety, clutter, and rider behavior can impact micro-mobility adoption. Public perception is influenced by discrepancies between perceived and actual risks, acceptance of regulatory changes, political will, and social influences (Dill & McNeil, 2013; Canzler, 2020; Oeschger et al., 2020). Addressing these concerns through targeted campaigns can help bridge the gap between perception and behavior. Resistance to reallocating public space, such as reducing car lanes for cycle paths, also presents a challenge (Dill & McNeil, 2013; Oeschger et al., 2020). Transparent communication and public awareness campaigns highlighting the benefits of micro-mobility—including efficiency, cost savings, environmental impact, and health improvements—are crucial for fostering acceptance (Canzler, 2020; McQueen et al., 2021; Oeschger et al., 2020).

And the post-implementation challenges might include;

- **Safety Concerns:** Safety is a critical challenge for micro-mobility, particularly for the newly emerged shared systems such as e-scooter users who are vulnerable to accidents, especially in environments with heavy motor vehicle traffic (McQueen et al., 2021). A lack of helmet use and

irresponsible riding behaviors, such as speeding or ignoring traffic rules, further exacerbate these risks. Inadequate infrastructure, such as the absence of dedicated lanes, forces riders to share roads with vehicles, increasing collision risks. (McQueen et al., 2021; Oeschger et al., 2020).

- **Parking and Clutter Issues:** The rise of dockless systems, while offering convenience, can lead to cluttered sidewalks and parking issues, such as improperly parked micro-vehicles, also create hazards for pedestrians, particularly those with disabilities, and contribute to conflicts in shared spaces (McQueen et al., 2021). Solutions can include enforcing regulations on parking zones (See Figure 2.2), using geofencing technology to restrict parking in certain areas, and ensuring sufficient parking capacity near public transit hubs to prevent overcrowding (McQueen et al., 2021; Oeschger et al., 2020).



Figure 2.2. Bike parking lot in front of Sloterdijk train and bus station taken by the author.

- **Equity and Affordability:** Ensuring equitable access to micro-mobility is essential for it to be a truly sustainable and inclusive transportation solution. Financial barriers, such as price and payment systems, often deter potential

users, especially for shared systems. Recommendations include implementing equity programs, offering discounted fares for low-income communities, and exploring alternative payment methods. Addressing systemic issues and the potential for discrimination experienced by is also crucial for fostering inclusivity (McQueen et al., 2021; Olabi et al., 2023).

- **Integration with Public Transport:** Seamless integration between micro-mobility and public transportation is considered crucial for promoting modal shift and maximizing benefits. This requires coordinated planning, infrastructure development, and multimodal systems. Providing secure facilities, such as bike parking (See Figure 2.3) and scooter docks at public transit stations, and ensuring the reliability and quality of public transport services are essential for effective integration (Oeschger et al., 2020).



Figure 2.3. Underground bike parking in front of the main train and bus station in Amsterdam taken by the author.

- **Environmental Impact Concerns:** The sustainability benefits including the environmental benefits of micro-mobility depend heavily on implementation practices. Concerns have been raised about the lifecycle environmental impacts of micro-mobility vehicles, including production, maintenance, and end-of-life management. Specifically, the energy consumption associated with e-scooter collection, distribution, coupled with relatively short lifespans, can reduce overall environmental gains, leading to higher emissions than anticipated (Abduljabbar et al., 2021; McQueen et al., 2021; Oeschger et al., 2020; Olabi et al., 2023). Solutions include promoting longer product lifetimes, reducing the distance of collection and distribution and optimizing the process, improving battery charging processes, and exploring renewable energy sources for powering micro-mobility infrastructure.

To fully realize the potential of micro-mobility, a comprehensive approach is needed, focusing on addressing safety concerns, promoting equity and affordability, ensuring integration with public transport, reducing environmental impacts, and fostering positive public perception. Tackling these challenges can enable cities to develop a thriving micro-mobility ecosystem that supports a sustainable, equitable, and livable urban environment. Although micro-mobility is a relatively new concept, its established forms and vehicles offer a solid foundation for cities to build upon and adapt to their specific needs.

2.1.1 Bicycle as an Urban Micro-mobility Vehicle

Building upon the discussion of micro-mobility's growth and its numerous benefits, while the landscape of micro-mobility has expanded rapidly with the advent of e-bikes, e-scooters, and other emerging technologies, it is important to recognize that bicycles represent a foundational and well-established component of the micro-mobility ecosystem. Traditional bicycles continue to be the predominant mode of both shared and privately owned micro-mobility vehicles. This ongoing prominence is likely attributed to the extensive research, development, and policy frameworks

established for bicycles, positioning them as a mature and reliable option for a micro-mobility vehicle (McQueen et al., 2021; Pucher & Buehler, 2008; Rietveld & Daniel, 2004).

The extensive history of bicycles being a mode of transportation, almost having over a century to its counterparts has not only led to widespread adoption but also to the deep integration of bicycles into urban planning and public policy frameworks around the world (Buehler & Pucher, 2021; Campisi et al., 2020; Olabi et al., 2023; Pucher & Buehler, 2008; Rietveld & Daniel, 2004). There are many exemplary urban spaces have successfully integrated cycling as not only a common practice but a cultural staple in their urban mobility such as Amsterdam (See Figure 2.4) and Copenhagen (Buehler & Pucher, 2021; Pucher & Buehler, 2008). It can be seen that many cities over the world has adopted some level of dedicated cycling infrastructure, and there are well-established guidelines surrounding the development of facilities needed for bicycle usage. Whereas as one of the challenges mentioned, newer micro-mobility options, due to lack of guidance, often struggle with infrastructure inadequacies that pose challenges for safety, parking, and integration into existing transportation systems (Oeschger et al., 2020).

In addition to infrastructure, well-established policies and regulations have been developed to govern bicycle use. These include traffic laws, safety standards, and parking regulations that provide clarity for both users and policymakers. The predictability and stability offered by these regulatory frameworks have contributed to making bicycles a reliable and sustainable transportation option. On the other hand, as presented as a key challenge, newer micro-mobility options, such as e-scooters, many of which have become widespread the urban area so suddenly, are often subject to evolving regulations, as cities attempt to integrate these vehicles into urban environments without the benefit of established precedents (Abduljabbar et al., 2021; McQueen et al., 2021; Oeschger et al., 2020; Olabi et al., 2023).

Further, since compared to newer micro-mobility vehicles, bicycles have a more established industry ecosystem. Since it is a more established option, it has a larger

availability of retail-repair options along with availability of maintenance and parts, supporting the long-term viability of its use. On the other hand, newer micro-mobility options still face challenges related to the scalability of production, maintenance infrastructure, and the availability of spare parts and repair services (McQueen et al., 2021; Olabi et al., 2023). Also, the e-mobility alternatives are still being studied for the possibility of their sustainability regarding the life-cycle and energy consumption (Abduljabbar et al., 2021; McQueen et al., 2021; Oeschger et al., 2020; Olabi et al., 2023).



Figure 2.4. A street in Amsterdam taken by the author.

Ultimately, the lessons learned from the successful development and integration of bicycles can serve as a model for guiding the implementation of newer micro-mobility options. By examining the factors that have contributed to the effective integration of bicycles—including infrastructure development, regulatory frameworks, cultural acceptance, and industry stability—urban planners and

policymakers can develop more effective strategies for promoting a broader, more inclusive micro-mobility ecosystem. It is also important to recognize that the maturity of different micro-mobility options may shift over time as technology advances, regulatory frameworks adapt, and urban mobility evolves. While bicycles currently represent a benchmark of maturity within the micro-mobility domain, newer options such as e-scooters and e-bikes have the potential to gain prominence as they overcome their initial challenges and achieve greater integration into urban environments.

Nevertheless, bicycles are likely to remain a crucial component of sustainable urban mobility, providing a stable foundation upon which other micro-mobility solutions can build, which is a crucial criterion to consider when transitioning to a more sustainable mobility system. Within the scope of this thesis, basing the research on a stable option such as bicycles allowed for leveraging the extensive existing literature.

2.1.2 The Role of Social Policies in Micro-mobility

Expanding on the foundational role of bicycles in urban micro-mobility, there are numerous parameters required to establish and build effective micro-mobility systems, with a particular emphasis on research focused on bicycle usage. The most widely known and accepted among Urban Planning and Design for bicycle usage is CROW Principles from Design Manual for Bicycle Traffic (2016). The CROW principles provide foundational guidelines for urban planning and design for bicycle infrastructure, consisting of the following five principles:

- **Cohesion:** Ensures that cyclists can easily travel to any destination within the urban environment, supporting network connectivity.
- **Directness:** Focuses on efficient, energy-saving routes with minimal detours, making cycling competitive with motor vehicles in terms of travel time.

- **Safety:** Involves protecting cyclists from road dangers and reducing stress and exposure to pollution. Infrastructure should be planned to minimize speed and mass differences with other road users to enhance safety.
- **Comfort:** Providing a pleasant cycling experience requires attention to smooth surfaces, minimizing stops, and reducing exposure to noise and fumes.
- **Attractiveness:** Enhancing the appeal of cycling routes involves promoting green, open, and lively areas. Where such environments are not possible, urban planners can use enhancements such as lighting or street art to improve the experience.

While this guide has been an established guide for many bicycle masterplans, academic literature continues to explore how built environments, and urban plans and designs influence micro-mobility and bicycle usage (Campisi et al., 2020; Guo et al., 2022). It is well-documented in the literature that infrastructure and the tangible elements of the system, regardless of how well-intentioned or well-planned, are not enough to succeed without well-thought-out regulations and policies (Jensen, 2013; Peters & MacKenzie, 2019; Pucher & Buehler, 2008; Rietveld & Daniel, 2004). Even in the CROW Design Manual for Bicycle Traffic(2016), it is emphasized in the very beginning that cycle-friendly design can only flourish if a well-established policy process is the foundation of the design and planning exertions. In the manual this has been illustrated by introducing the policymaking cycle.

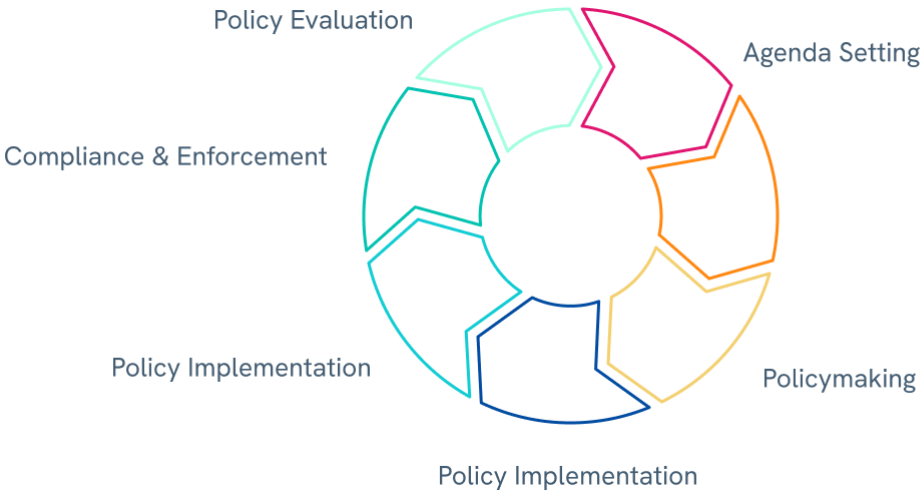


Figure 2.5. Policy process cycle adapted from CROW (2016) and Herweijer et al. (2021).

The policy process (See Figure 2.5) used by CROW (2016) follows the framework established by Hoogerwerf & Herweijer (2021), which consists of six stages, with particular emphasis on detailing the policy preparation stage across eight additional steps.

1. **Setting the Agenda:** The initial stage where problems requiring governmental intervention are identified and prioritized. Not every issue gains attention, but for an issue to enter the policy cycle, it must attract sufficient concern from policymakers, media, or interest groups. This stage is crucial for determining which issues need to be addressed through policy, in this case micro-mobility adoption and infrastructure development focusing on bicycle usage.

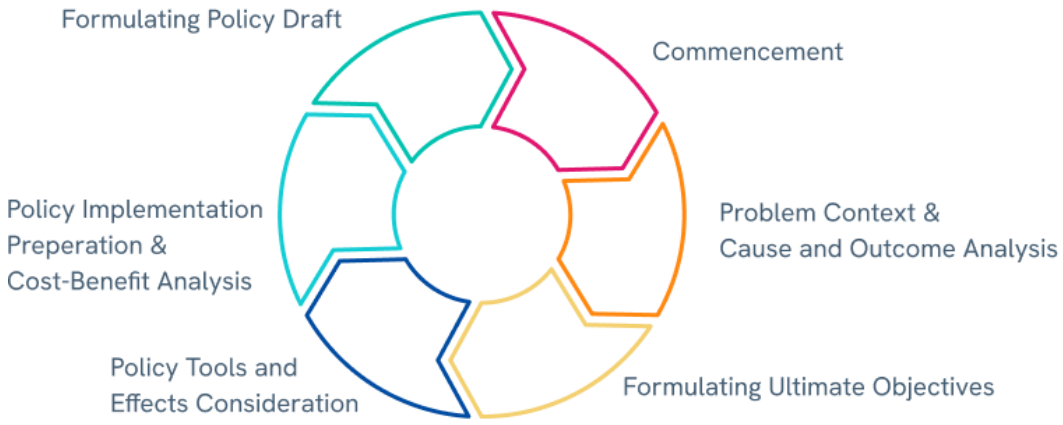


Figure 2.6. Policy preparation cycle adapted from CROW (2016) and Herweijer et al. (2021).

2. **Policy Preparation:** This phase involves a detailed analysis of the problem, its causes, and possible solutions. During this stage, goals are formulated, and different policy tools are evaluated. This is an essential process for understanding the specific requirements, such as public preferences and behavior, infrastructure needs, safety regulations, and integration with public transport in this thesis' case. The policy preparation phase is further broken down into eight detailed steps (See Figure 2.6):
    i. **Commencement:** This step marks the official start of policy development. It involves defining the problem's initial scope, identifying relevant stakeholders, and determining the authorities that will participate in the policy process. The goal is to initiate a structured and formal policy development path.
    ii. **Analyzing the Problem Situation:** In this step, a thorough analysis of the current state of the problem is conducted to understand its context, scale, and urgency. Data gathering is a critical activity, providing insights into the extent of the issues to be addressed.
    iii. **Analyzing Causes and Effects of the Problem:** This step delves into identifying the root causes and potential effects of the problem.

Understanding why the problem exists and what consequences might arise if left unaddressed is essential for framing effective solutions.

iv. **Formulating an Ultimate Goal:** Policymakers define the ultimate goal of the policy intervention. This involves setting long-term and short-term objectives that the policy aims to achieve, ensuring alignment with the ultimate goal, for this case is broader sustainability and urban mobility goals.

v. **Considering Policy Tools and Their Effects:** This step focuses on exploring different policy tools and approaches that could achieve the set goals. These tools may include regulatory measures, financial incentives, or infrastructural changes, and their potential impacts are carefully evaluated.

vi. **Preparing the Policy Implementation Plan:** A detailed plan is prepared for how the policy will be implemented, including timelines, required resources (such as personnel and budget), and coordination between different government agencies.

vii. **Weighing Costs and Benefits:** A cost-benefit analysis is conducted to determine the feasibility of the proposed policy. This analysis weighs the expected benefits against the financial, social, and environmental costs to ensure that the policy is viable and effective.

viii. **Formulating the Draft Policy Document:** The final step in policy preparation involves drafting a comprehensive policy document. This draft includes the problem analysis, goals, chosen policy tools, implementation strategies, and expected outcomes, providing a detailed roadmap for decision-makers to review.

3. **Policymaking:** In this stage, the proposed policy is debated, negotiated, and eventually adopted by decision-makers. This could involve legislative bodies or government agencies. For micro-mobility, this might mean creating laws and regulations that support the implementation of safe and accessible infrastructure, along with protecting the micro-mobility user in traffic.

4. **Policy Implementation:** After adoption, the policy is put into action. This stage involves allocating resources, ensuring coordination among government agencies, and operationalizing the solutions laid out in the policy. For micro-mobility, this means building bike lanes, installing parking facilities, and ensuring road safety measures are in place.
5. **Compliance and Enforcement:** Ensuring that policies are followed is critical for their success. This stage involves monitoring adherence and enforcing penalties or incentives for compliance. For micro-mobility, this could include measures such as enforcing speed limits in traffic or ensuring proper use and accessibility of bike lanes.
6. **Policy Evaluation:** Finally, this stage assesses the effectiveness of the policy. Questioning whether or not it did achieve its objectives and if there are unintended consequences. This evaluation can lead to further adjustments or even a complete overhaul some of the policy. For micro-mobility, evaluation may include assessing infrastructure use, safety outcomes, and user satisfaction.

Such systems like micro-mobility where behavioral acceptance or change for it to be successful call for a culture change with it (Abduljabbar et al., 2021; Jensen, 2013; Olabi et al., 2023; Peters & MacKenzie, 2019; Pucher & Buehler, 2008; Rietveld & Daniel, 2004). Which has proven to be successful with local, or central government endorsements, hence necessitates regulations and policies to be set for the culture change that is being sought (Rietveld & Daniel, 2004). Moreover, the failures and challenges are also well-documented in places and situations where these micro-mobility systems have failed due to planning and design processes not aligning with government and policies set in place (Peters & MacKenzie, 2019). Moreover, it has also been studied that correct policy efforts do result in establishing the said CROW principles (2016), thus the success of the micro-mobility system itself (Rietveld & Daniel, 2004). Even though there might be various frameworks and principles studied and set in the literature concerning this topic, every masterplan and policies set in place will be different and unique to the location, country, governing bodies,

and especially the culture and people in that area (Jensen, 2013; Olabi et al., 2023; Peters & MacKenzie, 2019; Pucher & Buehler, 2008; Rietveld & Daniel, 2004). This makes it even more crucial to know who the potential users of these systems will be.

Geller's (2006) *Four Types of Cyclists* typology, focusing on cycling for transportation, categorizes people into four groups based on their comfort level on different cycling environments and their interest in cycling, regardless of their current cycling behavior (Dill & McNeil, 2013);

- **Strong and Fearless:** These cyclists are comfortable riding in all roadway conditions, regardless of the presence or absence of bicycle-specific infrastructure. This group makes up less than 1% of the population. They may take a "strong part of their identity" from cycling.
- **Enthused and Confident:** Comfortable sharing the road with motor vehicles but prefer cycling on infrastructure specifically designed for bicycles, such as bike lanes. They appreciate efforts made to build cycling infrastructure. This group comprises about 7% of the population.
- **Interested but Concerned:** These individuals are interested in cycling but are afraid to ride on roads with motor vehicle traffic, especially on arterials. They will not cycle regularly unless they perceive their route as safe and comfortable. They make up the largest portion of the population, at around 60%.
- **No Way No How:** This group encompasses those who are unwilling to cycle for transportation, whether due to physical limitations, lack of interest, or other reasons. They are not interested in cycling and will not cycle regardless of roadway conditions. This group makes up approximately 33% of the population.

Geller (2006) developed this typology to better understand the market for bicycle transportation and guide planning decisions, particularly in Portland, Oregon, where it was first proposed. The typology aimed to address the need for infrastructure that caters to a wider range of potential cyclists, beyond those already comfortable riding

in mixed traffic conditions, which led Geller to focus on the *Interested but Concerned* group.

While Geller's typology has been instrumental in understanding cyclists' needs, subsequent research has been done around it. One research has discovered the typology proven to be most useful however can be paired with other cyclist types such as *non-cyclist, recreational* and *utilitarian cyclists*, to reveal potential users in the types (Dill & McNeil, 2013).

One research proposed alternative empirical segmentation methods to overcome certain limitations of the original model. These empirical methods aim to provide a more nuanced view of cyclist types and their infrastructure preferences, often incorporating a broader range of variables such as demographics and riding behaviors. Empirical segmentation identified three primary groups (Cabral & Kim, 2020);

- **Uncomfortable or Uninterested:** Cyclists in this group are comfortable only on completely segregated trails and may perceive even protected bike lanes as insufficient. They require the highest level of safety and separation from motorized traffic.
- **Cautious Majority:** This group is composed of cyclists who generally prefer separated facilities like protected bike lanes. However, some members of this group are comfortable riding on calmer residential streets. They represent the largest share of cyclists.
- **(Very) Comfortable Cyclists:** Although in this typology these cyclists are not "fearless," they are comfortable riding on a variety of cycling facilities, including dedicated lanes, calm streets, and protected bike lanes.

This empirical segmentation enables a more nuanced understanding of cyclist preferences, facilitating the development of infrastructure that effectively caters to the diverse comfort levels and safety requirements of various cyclist groups.

Understanding the potential user groups, irrespective of typology, is crucial for tailoring policies to their specific preferences and needs. This approach can help foster greater willingness to use micro-mobility systems and support broader behavioral change.

After framing out the need context around who the user can be, the local physical and cultural lay out there can be many policy approaches or tools to be utilized. Over the decades, several policy actions have been identified to encourage micro-mobility adoption, and it is still an important area of research given the new interest and the emergence of new vehicle types being introduced to traffic and urban transportation. Some of recommended approaches that governments can take are noted in literature as;

- **Implement Financial Incentives**: Subsidies and tax breaks can encourage individuals and businesses to adopt micro-mobility vehicles. For instance, fuel taxes could be restructured, and road pricing could be based on kilometers traveled or time spent on the road.
- **Integrate Micro-mobility with Public Transportation**: Providing safe and convenient parking facilities at public transport stations can facilitate seamless transfers. Governments may also offer integrated ticketing options, combining micro-mobility and public transport for more appealing multimodal travel options.
- **Develop Safe and Comprehensive Infrastructure**: Constructing dedicated bike lanes, protected intersections, and traffic-calming measures can enhance the safety and attractiveness of micro-mobility options.
- **Establish Clear Regulations for New Vehicles**: Governments must create regulations governing new micro-mobility vehicles such as e-scooters, including speed limits, designated riding areas, and safety requirements for shared services. These regulations must be clear and accessible to all road users.

- **Launch Public Awareness Campaigns**: Educational programs in schools and safety training courses can increase public knowledge of the benefits of micro-mobility and encourage its safe use.
- **Promote a Systems Approach to Sustainable Mobility**: Urban planning must be rethought to create holistic strategies that integrate land use, transportation, and environmental considerations. Micro-mobility should play a central role in disrupting short-distance car travel, contributing to the development of sustainable and smart cities.

These policy actions emphasize the need for a comprehensive approach, combining infrastructure development, financial incentives, public transportation integration, regulatory clarity, and public education. Successful urban transformation toward micro-mobility requires not only these practical measures but also a broader shift in societal attitudes and behaviors. Public awareness of the convenience, health, and sustainability benefits of micro-mobility is essential for driving this change.

An example of these policy actions being put into practice is the adoption of Sustainable Urban Mobility Plans (SUMPs) across Europe. The EU has been promoting SUMPs as a comprehensive approach to sustainable transport modes, such as public transport, walking, and cycling, aligning with its broader sustainability goals. While SUMPs are not mandatory, the EU provides financial support and incentives for cities to adopt these plans, lowering the barrier for entry through programs such as the European Structural and Investment Funds, Horizon 2020, and the Connecting Europe Facility. This financial backing not only supports infrastructure development but also encourages the integration of policies that promote sustainable mobility systems, including micro-mobility. In addition, by providing guidelines and best practices, the EU has facilitated knowledge sharing among cities, allowing for the effective implementation of SUMPs and the corresponding micro-mobility initiatives.

Thus, SUMPs (Sustainable Urban Mobility Plans) serve as a clear example of how a well-structured policy framework can drive the success of micro-mobility systems.

By providing financial resources, setting clear guidelines, and aligning policies with broader urban sustainability goals, such frameworks promote both the development of infrastructure and the cultural shifts necessary for micro-mobility to flourish. This approach has also attracted the attention of other countries, including Türkiye, which has implemented it as a framework for their own initiatives.

2.1.3 Bicycle as an Urban Micro-mobility Vehicle in Türkiye

The introduction of micro-mobility, specifically cycling, into Türkiye's transportation landscape dates back to 1885 during the Ottoman Empire, when bicycles were first brought into the country by foreign nationals. Within a decade, cycling gained popularity as a mode of transportation in Istanbul. The formalization of cycling as a legitimate means of transport is evidenced by the government's implementation of registration and documentation processes for bicycles and their owners by 1907. By 1913, the government had recognized bicycles as official commuting vehicles, instituting regulations such as mandatory registration and taxation. Moreover, safety regulations, including the requirement for lights to be used during nighttime, were enforced to enhance the safety of cyclists. From 1909 onwards, bicycles were integrated into various government bodies as official vehicles, further solidifying their status as a legitimate means of transportation (Süme & Özsoy, 2010).

The regulatory framework surrounding cycling continued to evolve, with significant developments occurring by 1925. During this period, the government introduced additional safety regulations, including the requirement for licenses, plates, and mechanical safety checks, such as brake inspections. By 1930, regulations had expanded to mandate that both recreational and commuting bicycles be equipped with plates, while cyclists themselves were required to hold licenses and obtain bike permits. These measures placed bicycles on par with motorized vehicles in terms of regulatory oversight, including the administration of cycling license tests by local municipalities (Atasoy, 2022).

However, the global rise in motorized vehicle usage during the mid-20th century prompted a shift in urban planning and transportation policies, with a growing emphasis on car-centric development. By the 1970s, urban planning discourse increasingly focused on socio-political issues arising from car-centric development, such as traffic congestion, land use challenges, and environmental concerns. This shift in focus included alternatives like cycling (Özalp & Öcalır, 2008). However, cycling as a mode of transport opposite to some of the other countries in the world in Türkiye was deprioritized. A pivotal moment in this decline occurred in 1983, when regulatory changes abolished the requirements for cycling licenses and permits, reducing the regulatory framework to a minimum age requirement of 11 years, alongside basic physical and mental health criteria. This regulatory shift significantly undermined the status of cycling as a legitimate mode of transport within the traffic system (Atasoy, 2022).

Prior to 1985, urban transportation policies in Türkiye largely overlooked and did not include recommendations or regulations for green transportation options, such as cycling and pedestrian infrastructure. Between 1995 and 2008, only 8 out of 40 policy developments addressed cycling regulations, reflecting a limited focus on integrating cycling into urban transportation planning (Özalp & Öcalır, 2008).

Although official statistics on the number of bicycle users in Türkiye are unavailable (Ardahan & Mert, 2014; Öncü, 2016), some sources estimate that approximately 5% of the population engages in cycling, a figure that has reportedly tripled in recent years (Özdimir, 2003). However, despite the incorporation of bicycle routes, some cities in Türkiye have experienced a decline in cycling rates, with no city surpassing a 3% cycling rate among its population (TC. Çevre ve Şehircilik Bakanlığı, 2021).

The period from 2010 onward marked a renewed focus on revising urban transportation plans and strategies, as mandated by Türkiye's transportation regulations, which required municipalities to undertake such revisions every five years. However, these revisions initially prioritized public transportation and road infrastructure improvements, with minimal attention given to cycling. It was not until

2015 that Türkiye established its first comprehensive standard practices and regulations pertaining to bicycle lanes and parking spaces. The "Regulation on the Design and Construction of Bicycle Lanes, Bicycle Stations, and Bicycle Parking Spaces on Urban Roads," issued by the Ministry of Environment and Urbanization, represented a significant legislative step towards formalizing cycling infrastructure in urban areas. This legislation mandated the inclusion of bike paths in urban planning revisions by municipalities and emphasized the integration of bike-share systems. Supported by financial incentives from the Ministry of Environment, Urbanization, and Climate Change for local government projects, this regulation facilitated the rapid development of bicycle infrastructure across the country (Atasoy, 2022).

Notably, in 2019, Konya became the first in Türkiye to develop a comprehensive bicycle master plan, drawing inspiration from the Netherlands. This plan aimed to create an extensive network of bicycle lanes covering the entire city, emphasizing sustainable and environmentally friendly transportation solutions (Atasoy, 2022).

Following the successful implementation in Konya and subsequent endorsements, the Ministry of Environment, Urbanization, and Climate Change launched the Türkiye Bicycle Road Network Master Plan as part of the broader "Turkey Inter-Settlement Bikeway Network Master Plan for Transportation and Tourism Purposes." The strategies developed at the national level, informed by international best practices, served as the foundation for future initiatives aimed at advancing cycling in Türkiye. The primary objective of this plan is to develop a comprehensive national bicycle network that seamlessly integrates local bicycle networks with urban transitions, facilitated through coordination with local governments where necessary.

The National Bicycle Master Plan sought to establish technical standards in alignment with international norms, guiding the development of a bicycle network that adhered to these standards. It also evaluated the types of infrastructure and design standards appropriate for both urban and peri-urban bicycle networks and

articulated a "National Bicycle Strategy." This strategy outlined the priorities, policies, principles, and actions required for the development and expansion of cycling infrastructure. As the first national directive of its kind, this strategy provided the foundational guide and regulatory framework for promoting cycling at all levels across Türkiye, offering a comprehensive administrative process to integrate cycling as a key component of the country's transportation system.

When looking at the broader context of Türkiye, Konya and Eskişehir stand out as urban areas where bicycles are prominent vehicles for transportation, each providing unique insights into the integration of cycling infrastructure and policy.

2.1.3.1 Case of Konya: 'The Bicycle City' of Turkey

Konya, Turkey's second-largest city, represents a complex and evolving case study in bicycle infrastructure implementation. Often celebrated as "Turkey's bicycle capital", Konya's journey reflects both its historical association with cycling and the ongoing challenges in fostering a robust cycling culture. The city's initial reputation as a "bicycle city" emerged as early as the 1950s, thanks to its flat terrain and favorable climate that supported early bicycle adoption (Süme & Özsoy, 2010). This led to widespread cycling, making Konya well-known as a bicycle-friendly city.

Konya also has a strong legacy in cycling sport, marked by the construction of Turkey's first velodrome in 1952 (Süme & Özsoy, 2010). This development fostered cycling clubs and nurtured cyclists, further solidifying Konya's identity as a hub for cycling. The city currently has over 500 kilometers of bike lanes, primarily developed under the Konya Transportation Master Plan of 2001 (Atasoy, 2022). This extensive infrastructure was designed to facilitate continuous and accessible cycling throughout the urban area. Additionally, since 2011, Konya has operated a bike-sharing system with numerous stations, offering accessible options for residents and visitors (Ağaoğlu et al., 2021). To improve convenience, cycling has been integrated

into the public transportation system, with allowing bicycles on certain trams and buses (Ağaoğlu et al., 2021).



Figure 2.7. Bike parking system from Konya Municipality.

Despite these efforts, Konya's cycling rate has declined compared to the 1950s, suggesting that infrastructure alone is insufficient to encourage widespread cycling adoption (Atasoy, 2022). The fragmentation of the cycling network, especially in residential areas, remains a significant barrier, particularly for those in the *Cautious Majority*, who value safety and continuity in cycling routes (Atasoy, 2022). There are also ongoing safety concerns at intersections, despite the implementation of cyclist-specific traffic lights at some locations.

In recent years, Konya has taken various initiatives to encourage cycling. Public awareness and educational campaigns have been launched, including cycling events, safety campaigns, and the distribution of bicycles to promote cycling awareness. Additionally, cycling is being promoted for tourism and recreational purposes, with organized cycling tours showcasing Konya's cultural and natural attractions. The city

is also exploring international best practices, such as those in Copenhagen, to enhance its cycling infrastructure and policies further (Atasoy, 2022).

2.1.3.2 Case of Eskişehir: Integrated mobility framework

Eskişehir presents an insightful case study on integrating cycling into its urban mobility framework. The city's journey reflects a progressive shift in urban planning toward sustainable transportation, with bicycles playing an increasingly important role. Initially, Eskişehir's urban mobility strategy, developed in collaboration with the METU Transportation Research Center, focused primarily on public transportation, with the implementation of a light rail system in the 1990s with the aim of achieving a dominant role in transportation by 2015 (Özalp, 2007; Ankaya & Aslan, 2020). This effort, though beneficial, relegated cycling to a less significant position within the city's mobility strategy.

However, with the revisions of the Eskişehir Transportation Master Plan in 2001 and 2003, the city began to adopt a broader vision of urban mobility, which included a dedicated bicycle lane plan and pedestrianization initiatives (Özalp, 2007; Ankaya & Aslan, 2020). In 2015, Eskişehir took a significant step by revising its Transport Master Plan into a Sustainable Urban Mobility Plan (SUMP), the first of its kind in Türkiye (Yerli, 2019). Under this framework, the city launched an ambitious bike lane project that aimed to construct over 8,000 kilometers of bike lanes by 2019. This plan represented a pivotal moment in recognizing cycling as an essential component of a balanced urban transport system.

The impact of Eskişehir's bike lane project has been notable, projecting that the new bike lanes would significantly increase the number of bike commuters by 2019 (Yerli, 2019). The economic value of preventing cycling fatalities was also highlighted, showcasing the broader benefits of investing in cycling infrastructure. However, research conducted with local cyclists revealed that inadequate cycling infrastructure and safety concerns were major barriers (Karaşahin et al., 2017). It's

seen that cyclists are concerned about the fragmented nature of the bike lane network and the lack of safe intersections, both of which discouraged broader adoption of cycling, particularly among those in the *Cautious Majority*.



Figure 2.8. Bike-share system Tripy from Tepebaşı Municipality.

Furthermore, the lack of detailed data on cycling usage and the overall impact of initiatives poses challenges for planning and later evaluating cycling systems fully. It is deemed urgently necessary for municipalities to collect and make these data publicly available with support from central government (Yerli, 2017). However, this is not an issue specific to Eskişehir and is experienced by all cities in Türkiye. Eskişehir also launched two bike-sharing systems in 2023; a traditional bicycle system (See Figure 2.8) operated by a private firm and an e-bike system (See Figure 2.9) established by the municipality. The e-bike system can arguably be used for data collection to an extent from what can be seen in the subscription conditions, which could inform future policy and development decisions (See Appendix A).



Figure 2.9. E-Bike sharing park station espedal from Eskişehir Municipality.

2.2 Citizen Science

The concept of Citizen Science has undergone significant evolution since its emergence in academic discourse. Public participation in scientific research has a long history, predating the term "Citizen Science." Throughout history, ordinary people have kept records of various events, such as harvest times, blooming seasons, and pest infestations, dating back centuries (Kobori et al., 2019). As early as the 17th century literature records collaborations with academia and non-expert people for research purposes in areas such as bird watching and recordings, and observation and collection of natural objects (Kobori et al., 2019). Before the professionalization of science in the late 19th century, much of scientific inquiry was carried out by individuals driven by curiosity and a passion for discovery rather than as a paid vocation (Bonney et al., 2009; Kobori et al., 2019). Prominent figures such as Isaac Newton, Thomas Jefferson, and Charles Darwin were all examples of people who made significant scientific contributions outside formal academia (Kobori et al.,

2019). These individuals, who would be considered citizen scientists today, pursued research out of personal interest, shaping early scientific disciplines without the constraints of institutional mandates or professional pressures. These early contributors to science, often called "gentlemen scientists" or "naturalists" in the upper classes, were largely amateurs who conducted experiments, collected data, and theorized about the world around them (Kobori et al., 2019).

As science began to evolve, the growing influence of academic institutions redefined the boundaries of scientific inquiry. The rise of academic institutions and the professionalization of science in the late 19th century began to draw a line between "amateurs" and "professionals," gradually positioning non-professionals in supportive roles, such as data collection, which remained crucial to scientific progress. This shift led toward the more modern definition of Citizen Science, expanding participation beyond just the privileged few. One of the earliest examples is the Christmas Birds Count by the Audubon Society in 1900, which encouraged the public to count and observe local bird species. The data collected through this effort continues to be utilized today (Bonney et al., 2009; Kobori et al., 2019).

There has always been a need for public engagement in research, especially for large-scale observation and tracking efforts. The idea of engaging the general public in contributing to scientific research is rooted in history even before modern systems and structures that now define how science is conducted. Although the term Citizen Science was not coined until the late 20th century, the historical contributions of amateur scientists laid the foundation for the formalization of public participation in science. This historical evolution highlights the enduring role of public involvement in science, which has led to varied attempts to formally define Citizen Science in contemporary discourse.

The definition of Citizen Science has been discussed since its emergence in academic discourse. Definitions vary based on methods used, levels of participation, range of participants, and the aims and goals of each research process. Citizen Science, as we currently know it, first appeared in a 1989 MIT Review article covering various

environmental research programs. From its first origin, Citizen Science has involved the generation of scientific data, volunteer contributions over large areas, and a relation to a politically relevant issue (Haklay et al., 2021). As the field continues to evolve, different organizations, researchers, and communities have provided their own definitions, reflecting the diversity of practices and goals. The table below has several key definitions of Citizen Science as articulated by various institutions selected from the article by Haklay et al. (2021) and expanded by the author.

Table 2.1 Citizen Science definitions selected from Haklay et al. (2021) and expanded by the author*

Oxford English Dictionary (2014)	Scientific work undertaken by members of the general public often in collaboration with or under the direction of professional scientists and scientific institutions.
National Geographic Encyclopedia	Citizen science is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through citizen science, people share and contribute to data monitoring and collection programs.
Australian Citizen Science Association	Citizen science involves public participation and collaboration in scientific research with the aim to increase scientific knowledge. It's a great way to harness community skills and passion to fuel the capacity of science to answer our questions about the world and how it works.
Australian Citizen Science Association (2024)*	Citizen science involves public participation and collaboration in scientific research with the aim to increase scientific knowledge.

European Citizen Science Association	Citizen Science – the participation of the general public in scientific processes... an open and inclusive approach, for example, by supporting and being part of the exploration, shaping, and development of the different aspects of the citizen science movement, its better understanding, and use for the benefit of decision-making.
European Citizen Science Association	Citizen science projects actively involve citizens in scientific endeavors that generate new knowledge or understanding.
European Citizen Science Association (2024)*	Citizen science, in general, means the participation of the public in science and research. It is an open and inclusive approach, with key characteristics including: (1) citizens are actively involved in research; and (2) there is a genuine science outcome, such as new scientific knowledge, conservation action or policy change.
EU-Citizen.Science (2024)*	Citizen science is any activity that involves the public in scientific research and thus has the potential to bring together science, policy makers, and society as a whole in an impactful way. Through citizen science, all people can participate in many stages of the scientific process, from the design of the research question, to data collection and volunteer mapping, data interpretation and analysis, and to publication and dissemination of results. Citizen science is also an approach of scientific work that may be used as a part of a broader scientific activity.
EU Commission (2021)	Citizen scientists, i.e. people who are not employed as scientists, can be involved in several stages of the scientific process, from collecting data to being part of the entire process from beginning to end.

EU (2016)	Inclusion of non-institutional participants, in other words the general public, in the scientific process.
EU (2017)	Citizen science – where citizens become providers and users of data. This will reinforce and give new meaning to the policy of open access to publications and data; this openness should enable citizens and citizen groups to participate in evidence-based policy and decision-making
EU (2019)	More and more Europeans hold higher education degrees. Enabled by digitalization and knowledge, citizens are today prosumers capable of shaping the innovation process and bypassing restrictive practices of established sectors and governments. This goes well beyond citizen science and covers the entire research and innovation process.
White Paper on Citizen Science (2015)*	Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.
European Commission (2024)*	While keeping a holistic view across the different possible types of citizen-generated and citizen-contributed content, this work should help to advance the understanding of peoples' intentional engagement in authentic scientific investigations (Citizen Science) and its possible interplays with European policy.

Group on Earth Observations Citizen Science Working Group	Citizen science encompasses a range of methodologies that encourage and support the contributions of the public to the advancement of scientific and engineering research and monitoring in ways that may include co-identifying research questions; co-designing/conducting investigations; co-designing/building/testing low-cost sensors; co-collecting and analysing data; co-developing data applications; and collaboratively solving complex problems.
Group on Earth Observations (2024)*	collaborative exchange with the scientific community, in which members of the public actively join the co-creation of new scientific knowledge.
United Nations Environmental Programme (UNEP) (2019)	Citizen science entails the engagement of volunteers in science and research. Volunteers are commonly involved in data collection but can also be involved in initiating questions, designing projects, disseminating results, and interpreting data.
UNESCO (2013)	The participation of a range of non-scientific stakeholders in the scientific process. At its most inclusive and most innovative, citizen science involves citizen volunteers as partners in the entire scientific process, including determining research themes, questions, methodologies, and means of disseminating results.
UNESCO (2021)*	Citizen science is scientific research that is carried out in whole or in part by non-scientists (citizens), often in collaboration with or under the guidance of professional scientists.

US Crowdsourcing and Citizen Science Act (15 USC 3724) (2024)*	The term citizen science means a form of open collaboration in which individuals or organizations participate in the scientific process in various ways, including (A) enabling the formulation of research questions; (B) creating and refining project design; (C) conducting scientific experiments; (D) collecting and analysing data; (E) interpreting the results of data; (E) interpreting the results of data; (F) developing technologies and applications; (G) making discoveries; and (H) solving problems.
Citizenscience.gov	In citizen science, the public participates voluntarily in the scientific process, addressing real-world problems in ways that may include formulating research questions, conducting scientific experiments, collecting and analysing data, interpreting results, making new discoveries, developing technologies and applications, and solving complex problems.
Citizenscience.gov (2024)*	Citizen science encourages members of the public to voluntarily participate in the scientific process. Whether by asking questions, making observations, conducting experiments, collecting data, or developing low-cost technologies and open-source code, members of the public can advance scientific knowledge and beneft society.

OSPP (2018)	Broadly defined, citizen science is 'scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions'. Citizen science is an already very diverse practice, encompassing various forms, depths, and aims of collaboration between academic and citizen researchers and a broad range of scientific disciplines. Civic participation in research can range from short-term data collection to intensive involvement in the research process, from technical contribution to genuine research, and from collaboration to co-creation of knowledge. Yet, there is still a need to define and establish citizen science as a genuine, open research approach.
G7 Science Academies (2019)	... Two categories of citizen science. The first one, which is predominant, is participatory research done by citizens who have not necessarily received training in scientific research. It was this activity that has been historically named 'citizen science'... A second and more recent category of citizen science involves scientifically trained individuals working in isolation, or in virtual communities, to develop projects outside established controlled environments (university, government, or industry research system).
UK Parliamentary Office of Science & Technology (POST) (2014)	Environmental citizen science – the involvement of volunteers in environmental monitoring.

UK Environmental Observation Framework (2012)	Citizen science, broadly defined as the involvement of volunteers in research.
OECD (2017)	At the heart of the scientific process, it can be more narrowly understood as people, who are not professional scientists, taking part in research, i.e. co-producing scientific knowledge. This involves collaborations between the public and researchers/institutes but also engages governments and funding agencies.
OECD (2022)*	Citizen science is an involvement of citizens in scientific research. By doing so researchers, citizens, and sometimes policy makers come together to tackle scientific and policy problems. Through citizen science, citizens can participate in many stages of the scientific process, from the design of the research question, to data collection and volunteer mapping, data interpretation and analysis, and to publication and dissemination of results.
OECD (2023)*	Citizen science is a form of scientific inquiry where members of the public engage in scientific investigations, often in collaboration with, or under the direction of, professional scientists and scientific institutions. It supports scientific research and applied sciences through a wide range of activities and across diverse topics.
Science Europe (2018)	The practice of citizens performing science and of scientists working together with citizens.
LERU (2016)	Citizen science, the active involvement of nonprofessional scientists in research... The boundaries of what can rightly be termed citizen science are debatable,

	but there is broad consensus that projects should involve voluntary and active public engagement with research.
Green Paper Citizen Science Strategy 2020 for Germany (2016)	Citizen science describes the process of generating knowledge through various participatory formats. Participation can range from the short-term collection of data to the intensive use of leisure time to delve deeper into a research topic together with scientists and/or other volunteers, to ask questions, and to get involved in some or all phases of the research process.
White Paper Citizen Science Strategy 2030 for Germany (2022)*	Citizen Science describes the engagement of people in scientific processes who are not tied to institutions in that field of science. Participation can range from the short-term collection of data to the intensive use of leisure time in order to delve deeper into a research topic with scientists and/or other volunteers.
METU (2023)*	In its most basic definition, the term "citizen science" refers to the contribution of non-scientists and nonprofessionals to scientific studies. The active participation of the public in scientific studies through "citizen science" is a new phase that can shape the future of science communication following the one-way and two-way science communication understandings.

Given the diversity of projects and perspectives, many definitions of Citizen Science have been proposed by academic, non-governmental, and governmental bodies (see Table 2.1). Despite their differences, most definitions of Citizen Science share common elements, such as public participation in scientific research and the collaboration between non-professionals and professional scientists. For example, many definitions emphasize the active involvement of citizens in data collection and analysis, highlighting their contribution to scientific knowledge. The distinctions

mainly arise in the level of participation, the scope of activities involved, and the intended outcomes—ranging from educational goals to influencing policy. For instance, while some projects aim solely at data collection by volunteers, others involve participants in co-designing research questions or interpreting results. This variability complicates efforts to create a single, universally accepted definition. The factors that contribute to this diversity in definitions are mainly as follows;

- **Diverse Disciplines**: The involvement of numerous fields with distinct goals and methods makes creating a universal definition of Citizen Science particularly challenging.
- **Varying Levels of Participation**: Public involvement can range from basic data collection to full participation in research design, data analysis, and dissemination. This variability complicates defining the scope of Citizen Science.
- **Terminology Issues**: The term "citizen" may be exclusionary for those without formal citizenship, prompting some organizations to use alternative terms like "community science" to foster inclusivity.
- **Multiplicity of Goals**: Different projects have diverse goals—from scientific discovery to fostering policy change and enhancing community education—which makes it challenging to encapsulate all efforts under one definition.

By understanding these varied definitions and factors that contribute to this diversification, we can appreciate the flexibility and broad appeal of Citizen Science in addressing societal challenges, allowing it to accommodate the wide range of activities, participants, and goals across various disciplines.

These definitions often aim to clarify the scope of their projects or contribute to making Citizen Science more accessible and functional. However, creating a rigid, universally applicable definition may limit future Citizen Science projects. Given the wide range of possible contributions—from simple data collection to active participation in research design—Citizen Science requires a broad definition to

ensure greater inclusivity and adaptability. This approach accommodates the diverse nature of projects across disciplines. Therefore, we will use a broad definition of Citizen Science: the collaboration or involvement of members of the general public to contribute to solving societal challenges alongside scientists, organizations, or academia. This involvement can take many forms, including but not limited to (Beck et al., 2024; Goi & Tan, 2021; Haklay et al., 2021; Preece, 2016; Robinson et al., 2021; Wiggins & Crowston, 2011):

- Identifying research questions,
- Collecting data,
- Gathering insights,
- Testing new products or systems,
- Participating in co-design and co-development.

With these varied definitions in mind, the different applications of Citizen Science across disciplines become more apparent, showcasing its flexibility and broad appeal.

2.2.1 Areas of Application

While Citizen Science can potentially be applied to any area however like its origination, has predominantly been utilized in natural science fields such as Ecology and Biology (Haklay et al., 2021; Manske, 2021). This is also evident when the academic literature is scanned and most platforms and projects that are subject to Citizen Science are dominantly about Ecology (Beck et al., 2024; Bonney et al., 2009; Jennett et al., 2016; Jennett & Cox, 2014; Newman et al., 2010; Preece, 2016a; Robinson et al., 2021; Silvertown, 2009; Skarlatidou et al., 2019; Sturm & Tscholl, 2019; Tinati et al., 2015; Wiggins & Crowston, 2011; Wright et al., 2015), Astronomy (Beck et al., 2024; Tinati et al., 2015; Wiggins & Crowston, 2011), and Medicine (Beck et al., 2024; Lewenstein, 2016; Tinati et al., 2015), all of which fall under the broad umbrella of natural sciences.

Even though Citizen Science is mainly utilized in the Natural Sciences, there are various definitions and categorizations that show that it is open to be used by other fields. One useful categorization that broadens the scope of Citizen Science might be the function definition by context (Haklay et al., 2021):

- Scientific: This is perhaps the most utilized context, where Citizen Science is applied in research for scientific, technical, or academic production, involving the discovery or identification of research problems or areas of study.
- Political: In this context, Citizen Science is employed to raise awareness among policymakers, legitimize funding efforts, and assist in strategy planning and positioning.
- Societal: Within this context, Citizen Science addresses community or social challenges, raises awareness, increases both individual and collective knowledge, and fosters networks among societal actors and communities in support of shared goals.

Some examples that are the most used applications are Zooniverse and Spotteron. Both platforms are facilitator applications for citizens and project teams to create and manage citizen science projects on.

Zooniverse (See Figure 2.10) was founded in 2009 and facilitates citizen science projects across a wide range of disciplines, including astronomy, ecology, and climate science. It connects researchers with volunteers who help analyze data, often through simple tasks like image classification, transcription, or data labeling.

Spotteron (See Figure 2.11), founded in 2014, is another customizable platform designed to support citizen science by providing ready-to-use digital infrastructures and tools that help researchers and organizations involve the public in collecting and analyzing data related to environmental monitoring and wildlife observation.

There are currently 346 projects recorded on the EU Citizen Science website, encompassing active, inactive, and completed initiatives. Despite the EU's emphasis

on citizen science as a means to inform policy, its primary focus remains on supporting scientific research, particularly in the fields of natural sciences, medicine, and science policy.

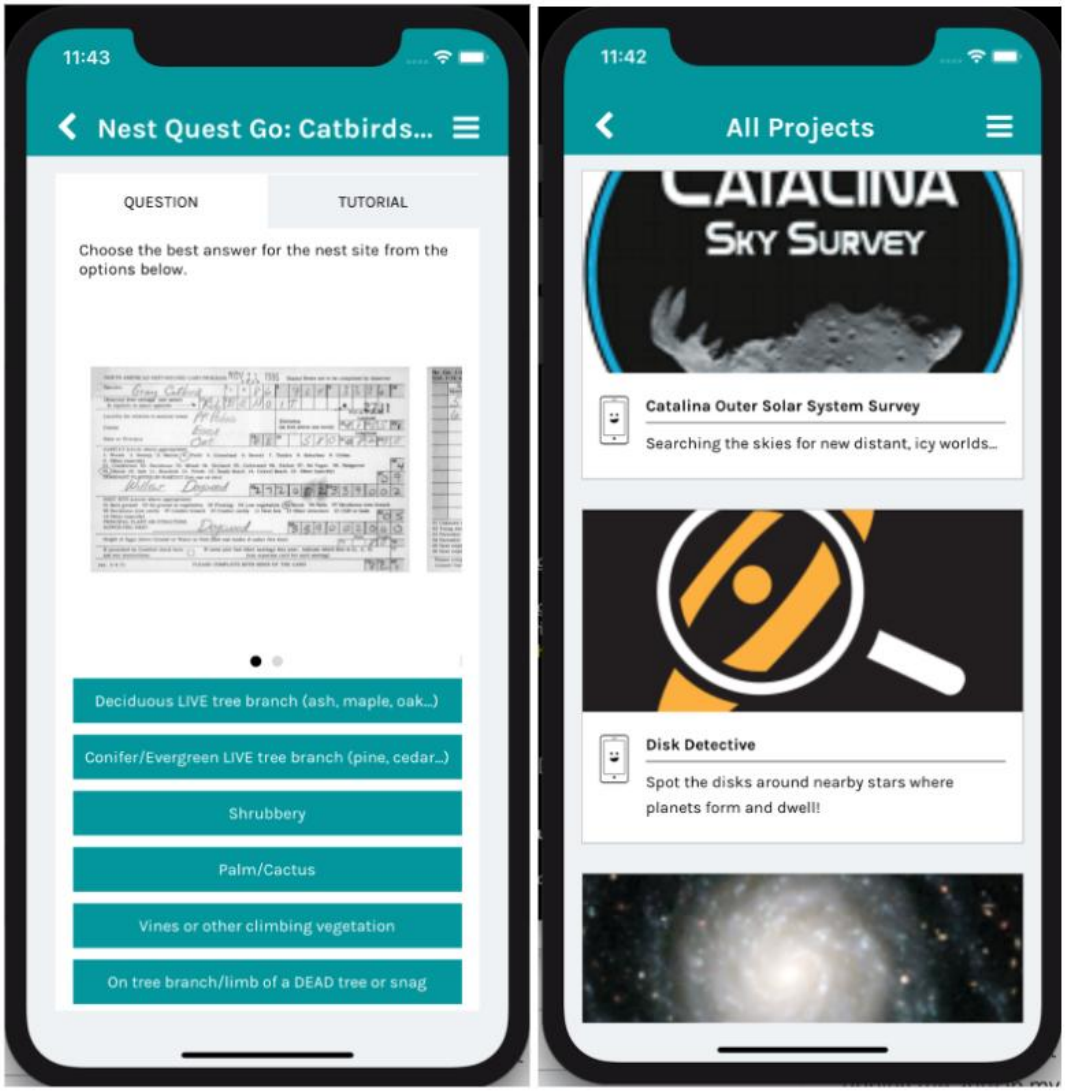


Figure 2.10. Some interfaces from Zooniverse mobile application taken from Zooniverse blog website.

In the context of this thesis, it is hypothesized that Citizen Science can branch out to more socio-political fields, such as micro-mobility. In this case its success of implementation is highly influenced by societal approaches, acceptance and the policies governing transportation and mobility. These socio-political fields have

traditionally been the domain of the Social Sciences and Planning disciplines. The scope of planning and the problems it ought to deal with have been realized to be complex, large-scale system problems interconnected with many other underlying issues.

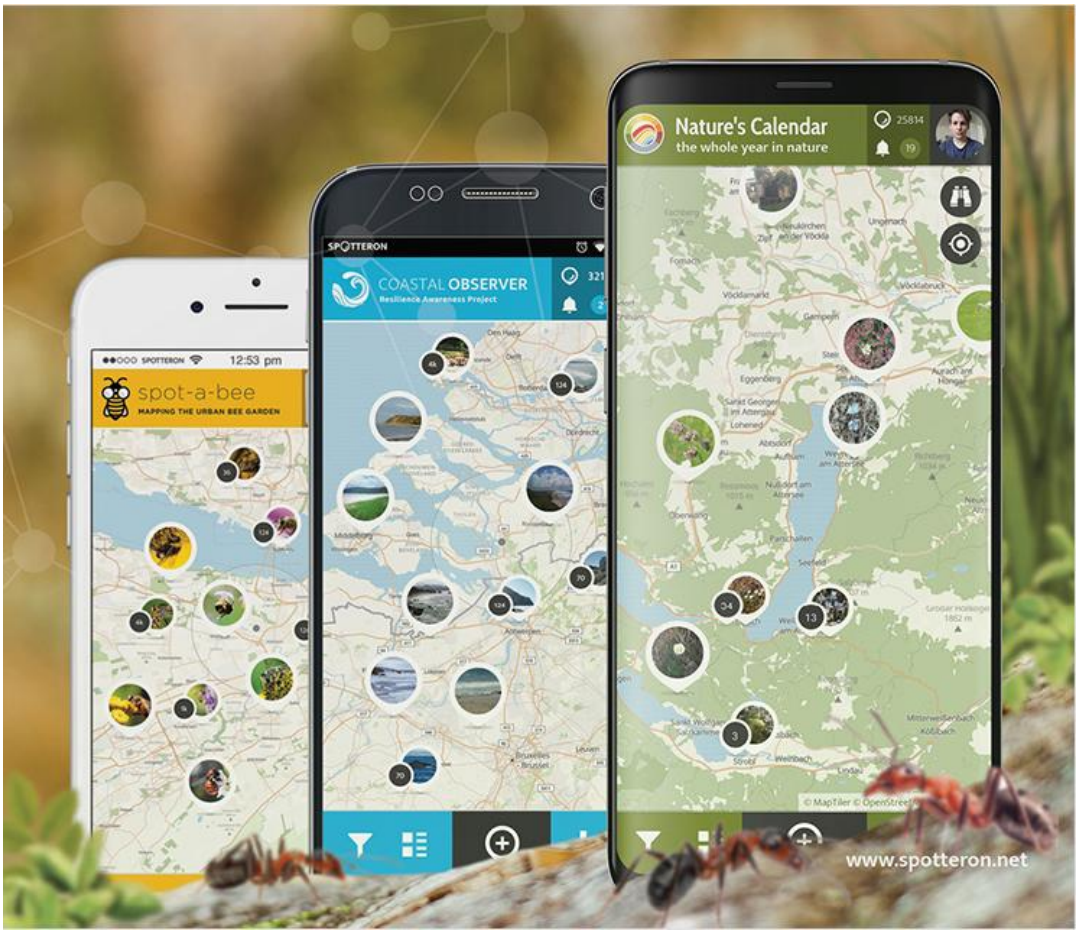


Figure 2.11. Some project's interfaces from Spotteron mobile application taken from Spotteron website.

One of the early attempts to define and frame these problems was the concept of *continuous critical problems* (Özbekhan, 1968). These were defined as systematic problems that are deeply connected to all aspects of the societal system, meaning that none of these problems can be fully resolved without affecting or interacting with the rest of the system. Later, defined and were more widely known as *wicked problems* (Rittel & Webber, 1973). *Wicked problems*, much *like continuous critical*

problems, were defined as problems that are large-scale societal problems that are connected to socio-political policies, no exact definition or formulation, no end-all solutions alongside no solution being correct-wrong only good-bad, no testing or prototyping in real-life conditions thus when implemented no trial-error opportunity, numerous ways of addressing and is one symptom of another higher problem, and being one-of-a-kind unique situation, with the responsibility fully lying on the solver of the problem (Rittel & Webber, 1973).

As the term *wicked problems* spread across disciplines, it became particularly relevant in the field of design (Buchanan, 1992; Christakis, 2014; Jones, 2014). Over time it has been used with terms as in complex or system problems (Christakis, 2014; Jones, 2014; Pira et al., 2024; Sangiorgi & Prendiville, 2017; Vink et al., 2021), and it has become a focal point in Service Design. These types of problems, due to their intricate and interconnected nature, require multidisciplinary approaches to address effectively.

The main point this thesis seeks to explore is how Citizen Science can be utilized to assist in the process of attempting to address these complex and systemic problems. Citizen Science has proven to be successful in its utilization in nature related systems, as demonstrated by its widespread application in environmental and ecological contexts. This research will challenge the idea that Citizen Science can also be effectively implemented in the socio-political realm, particularly in the context of micro-mobility, by attempting to bring a new approach to these complex systems.

2.2.2 Contributors and their Motivations

Contributors to a Citizen Science project can vary according to the project's design and aim, however, it is certain to have scientists, or to generalize it experts on the field or topic, the project is revolved around, any stakeholders necessary to realize the project; private, academic, non-governmental or governmental organizations,

and of course the citizens, people from the general public who are willing to contribute with their own free agency. Again, according to the project, the target group usually covers everyone in the local area who is concerned, affected by, or interested in the project's topic (Haklay et al., 2021; Robinson et al., 2021; Wiggins & Crowston, 2011). Yet, there have been studies that revealed that some characteristics are more common in the people contributing to Citizen Science projects; which is that they usually hold a higher education degree and tend to be from middle or upper socio-economic class, middle-aged (Preece, 2016a; Robinson et al., 2021; Wright et al., 2015). Even though some research reveals a correlation with gender, there is no substantial base as far as this review could reach (Preece, 2016a; Wright et al., 2015).

There are many studies done to guide and assist and provide experts in Citizen Science projects to be able to design their projects better with proper wording (Beck et al., 2024; Eitzel et al., 2017a, 2017b; Haklay et al., 2021; Jennett et al., n.d.; Land-Zandstra Anne and Agnello, 2021; Preece, 2016; Wiggins & Crowston, 2011).

2.2.3 Participation & Empowerment

Participation and empowerment are fundamental concepts in Citizen Science, reflecting the degree to which individuals and communities are engaged in and influenced by research and decision-making processes. Participation refers to the extent of involvement and engagement, while empowerment emphasizes the transfer of knowledge, skills, and decision-making power to participants. Understanding these concepts is crucial to evaluating the effectiveness and inclusivity of Citizen Science initiatives. This section examines the Ladder of Participation and the Ladder of Empowerment, two frameworks that provide insights into varying levels of engagement and empowerment within Citizen Science projects.

2.2.3.1 Ladder of Participation

The ladder of participation is a model developed by Sherry Arnstein in 1969 to describe the different levels of citizen involvement in decision-making processes. The ladder consists of eight levels, ranging from non-participation at the bottom to citizen control at the top. Arnstein in her paper focuses on disadvantaged communities and their participation in social programs, mainly in urban planning and development. However, the framework she laid is used for public policies and governance, social sciences, and any other context where community and citizen participation are relevant.

Arnstein's (1969) eight levels are Manipulation, Therapy, Informing, Consultation, Placation, Partnership, Delegated Power, and Citizen Control. Manipulation and Therapy fall in the non-participation category. Manipulation is the lowest level of participation where citizens are used as a means to an end and have no actual decision-making power, and therapy is when citizens are seen as passive recipients of help and are not involved in decision-making. The real purpose of therapy is not to enable people to participate in the planning and execution of programs but to enable powerholders to "educate" or "cure" the participants. The third and fourth levels are Informing when people are provided with information about decisions that have already been made but are not involved in the decision-making process; and Consultation when citizens are asked for their opinions and feedback on a decision; however, the decision-makers are not obligated to act on this input. These levels are referred to as levels of "Tokenism" by Arnstein since there is an appearance of citizen participation without providing any real power or influence. People are allowed to hear and to have a voice; however, there is no insurance of their views being taken into account. The fifth level Placation is explained as a higher level of tokenism where some selected citizens are given enough input to pacify them; allowing them to have places among decision-makers to advise and influence, however, the feasibility or rationality of the advice is judged, and decided by the decision-makers. In the last three levels, citizens hold a degree of power and

influence in decision-making. In the sixth level, Partnership, citizens are seen as equal partners in the decision-making process, and their input is taken seriously, responsibilities and authorities are shared through negotiations, and joint policies, committees, and solutions can be structured. The highest levels of participation are the seventh and eighth levels, Delegated Power, and Citizen Control where citizens hold the majority of decision-making influence. Delegated Power is when citizens are given the power to make decisions but within pre-defined limits set by authorities. They are empowered to make independent decisions on specific issues; however, do not have full control over the whole decision-making process. Thus, their actions can be rejected if seen fit by decision-makers. In the eighth and top level of participation, Citizen Control, citizens have full decision-making power, including resources and the entire process. Therefore, there is a shift toward citizens rather than traditional decision-makers and powerholders and their processes and systems.

Arnstein (1969) states that such levels of power as Partnership, Delegated Power, and Citizen Control, throughout history have been taken by citizens rather than been given. The ladder of participation suggests that a higher level of participation leads to greater empowerment and better outcomes, forming decisions for the communities' best interests.

According to the frame Arnstein (1969) sets in her Ladder of Participation, Citizen Science, in the most basic definition, falls into the level of Consultation, since it involves collecting and learning the citizens' perspective with research and data collection. However, the degree of influence they have and what is done with the information and input of the citizens are all up to the scientists or decision-makers on the receiving end (See Fig 2.1).

Nonetheless, depending on the degree of power and involvement in the decision-making process, the level of any Citizen Science project may very well go further up the level of Placation, Partnership, or Citizen Control. The most likely level-up would be Placation, with the involvement of a selective group of citizens being more

involved in the process with the decision-makers, such as field visits, and qualitative research participation, like interviews or focus groups, among the broader collection of data. Again, this level assists the decision-makers like at the Consultation level; however, there is no real control over what the output of their contribution is.

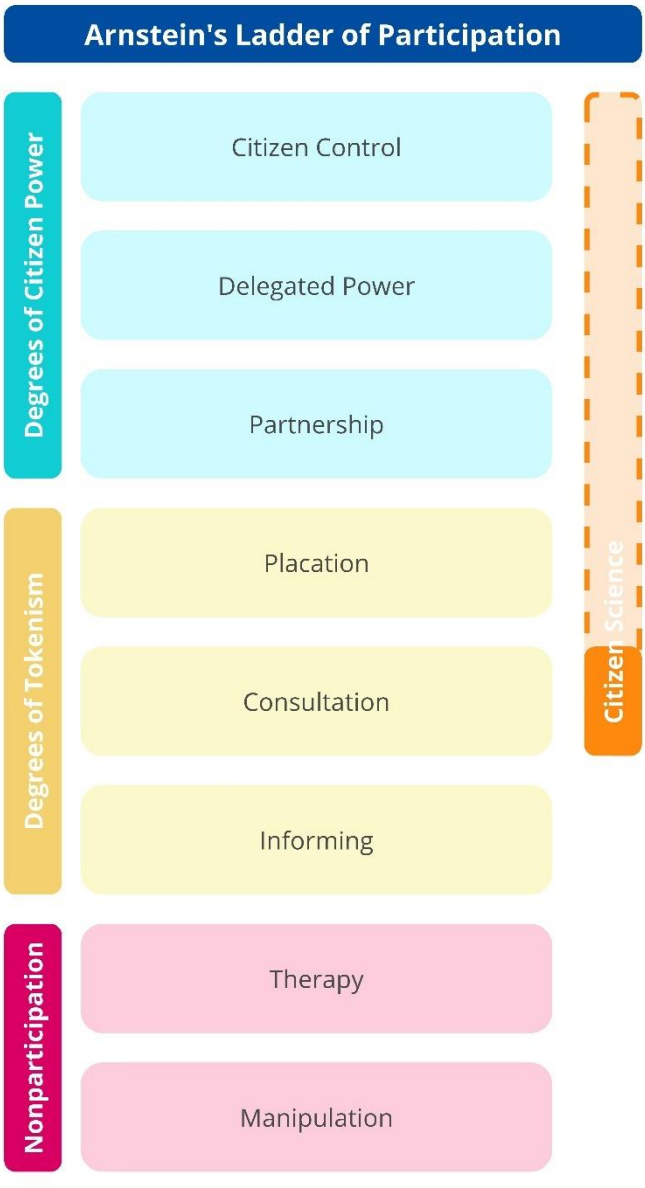


Figure 2.12. Citizen Science positioned in Arnstein's Ladder of Participation. Adapted from "A ladder of citizen participation," by Arnstein (1969)

The higher level of participation, thus citizens' influence and involvement in the process, would be Partnership, where citizens would directly work with decision-makers. This level would include citizens being active in decision-making and policy developments, sharing the responsibilities and thus power. This also allows them to be more involved in the design and outcomes of the process of Citizen Science working along with the scientists.

On the other side, Citizen Control would be the highest level of involvement in the ladder, thus also for Citizen Science. On this level, citizens would hold all power over decision-making, resources, and policies; scientists would only act as facilitators and advisors in the process. Ultimately, the citizens would decide on the agenda, method, and outcome with the support of the scientists, whereas the opposite of any other level.

2.2.3.2 Ladder of Empowerment

Almost three decades later, Arnstein's (1969) Ladder of Participation also influenced Elizabeth Rocha's (1997) Ladder of Empowerment, consisting of five levels. The difference between Arnstein's Ladder and Rocha's Ladder is that Arnstein's represents an effort towards some type of participation; however, the intent and outcomes behind the efforts might have varied; on the other hand, Rocha's is based on the belief in good faith and intentions of the organizers or facilitators with varying types of methods and goals.

The five levels of empowerment go towards individual to community empowerment and are Atomistic Individual Empowerment, Embedded Individual Empowerment, Mediated Empowerment, Socio-Political Empowerment, and Political Empowerment. The first level, Atomistic Individual Empowerment is the level focused most on individuals, their personal development, and growth. This might be through new knowledge, skills, or a better understanding and navigation of social, economic, and political environments. The second level of empowerment,

Embedded Individual Empowerment, is where individuals are more integrated into their local communities and form a sense of belonging and identity in the social context through networking, relationships, and community activities. Individuals acquire a type of power from collective action and shared resources. The third level Mediated Empowerment is a more professionalized model, where empowerment is through a process that is mediated by experts or professionals. Individuals gain access to information, resources, and intermediaries, such as community organizations, social networks, or public institutions, for individual or community decision-making. The fourth level Socio-Political Empowerment is when the individuals who form the community are the first priority, then comes the community and the environment they live in and can develop and flourish. Empowerment is derived from socio-political focuses and shared struggles, engaging in advocacy, activism, and policy-making processes to create systemic change. Individuals are empowered through collective action and political mobilization. The last and most community-based level Political Empowerment is achieved from actions towards the benefit of the community, and empowerment is accomplished in the process of institutional change with political actions. The network of individuals who form the community gains formal political power, such as participating in political decision-making processes. This level is also characterized by a sense of community ownership and collective responsibility for achieving social and political change.

In Rocha's (1997) ladder of empowerment, Citizen Science would likely fall under the level of Mediated Empowerment, as it involves providing individuals and communities with tools and resources to gather and analyze data and allow them to participate in decision-making (See Fig. 2.2.). Citizen Science empowers citizens by providing them the opportunity to contribute to decision-making and the development of policies with their input.

Citizen Science can also facilitate communication and collaboration between citizens and decision-makers, fostering an open and transparent decision-making process. Citizens can also better understand and get informed on complex social issues affecting them and their environment, allowing them to adopt and adapt to the

solution processes. Providing citizens with platforms to share their insights and contributing to the processes and projects that are relevant to their lives and communities gives them a sense of agency and control over their environment and areas of potential improvement. This experience and their comprehension of the process and issues can also lead to feeling a sense of ownership, along with becoming active participants in their community and contributors to the development of solutions. Once again with the design of the Citizen Science project, the empowerment level can climb up the ladder to Socio-Political and Political Empowerment according to the aims and outcomes.

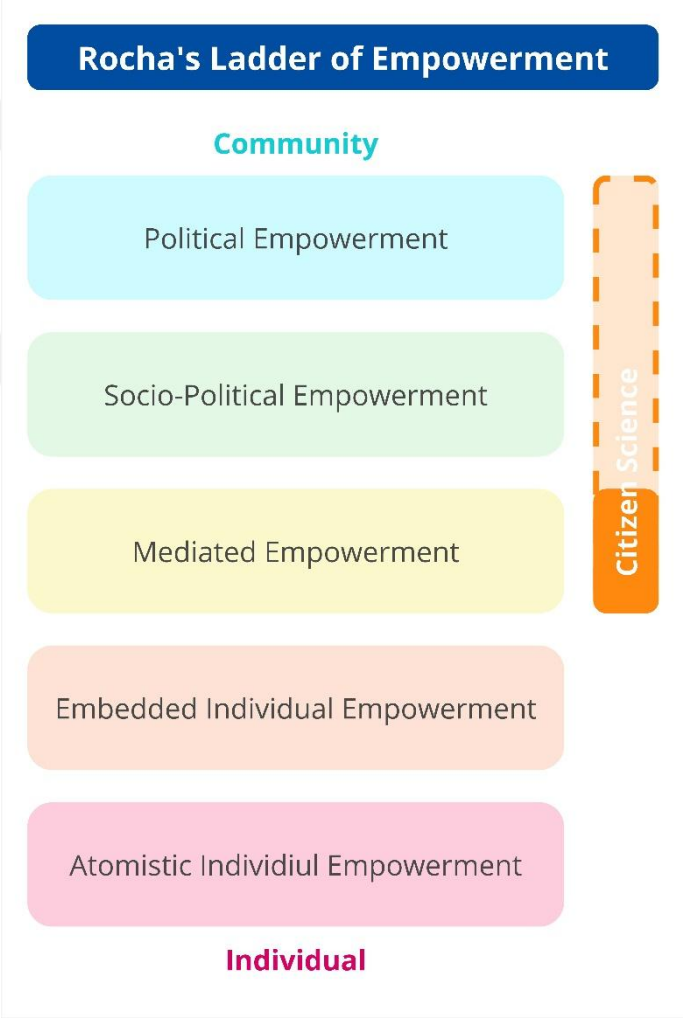


Figure 2.13. Citizen Science positioned in Rocha's Ladder of Empowerment. Adapted from "A ladder of empowerment," by Rocha (1997)

2.2.4 Differentiating Citizen Science from Other Participatory Methods

Citizen Science is part of a broader set of participatory research methods that engage the public in scientific research and knowledge production. The following section explores several participatory approaches, their characteristics, and how they relate and compare to Citizen Science.

Participatory Action Research (PAR) is a research approach that prioritizes social change and empowerment alongside knowledge production. PAR's primary goal is to bring about social change alongside knowledge production, which directly influences the research process by involving participants actively in decision-making and implementation (Albert et al., 2021). It is rooted in community organizing that emphasizes collaboration, empowerment, and addressing community-defined issues. It involves participants as co-researchers throughout the research process—from designing the study to disseminating findings. However, practical and ethical limitations, such as participants' willingness or capacity to engage at every stage, and the need for expert guidance, can hinder full participant involvement. Ethical concerns also arise when research blurs the line between activism and scientific inquiry, as some view PAR primarily as a tool for social change rather than a research methodology. Despite these challenges, PAR offers a model that seeks to mobilize collective action and inform tangible change (Albert et al., 2021).

Citizen Science projects concerned with social sciences can also be seen as building on the field of PAR, merging scientific methods with community organizing. In Citizen Science, professional scientists usually define the research process, with participants contributing in predefined ways. In contrast, PAR is community-driven, where participants actively define research priorities, shape the research process, and make decisions. Action-oriented Citizen Science projects encourage participant intervention in local issues, using scientific research as a tool to support civic agendas (Wiggins & Crowston, 2011). These initiatives share much of the ethos of PAR by centering the expertise of those directly affected by the issues and striving for long-term engagement with community concerns (Albert et al., 2021; Wiggins &

Crowston, 2011). While many Citizen Science projects incorporate elements of PAR, particularly those emphasizing community-driven research and social impact, the distinction between Citizen Science and PAR often lies in the degree of control and decision-making power held by participants.

Co-design, co-creation, and co-production are collaborative approaches that involve multiple stakeholders, including users, community members, and citizens, in the development and implementation of interventions or solutions. Each approach shares the common goal of fostering inclusion and collaboration, yet they differ slightly in their focus and application.

Co-design and co-creation are often used interchangeably (Albert et al., 2021; Hidalgo et al., 2021; Sanders & Stappers, 2008). However, even if not coined co-design emerged in the late 20th century, was rooted in participatory and user-centered design practices in Scandinavia and Northern Europe in the 1970s and 1980s, in the design field. Later on, was built upon by many researchers in the field. Co-design is a term used for various design processes to be carried out in collaboration of designers and non-designers (Sanders & Stappers, 2008). Co-creation however as a term was coined in the business and marketing field, in reference to creating value for a business, arguing that the value is created from the interactions between businesses and consumers, both contributing knowledge and expertise (Prahalad & Ramaswamy, 2004). After co-creation has been used in the design field too under the umbrella of co-design (Sanders & Stappers, 2008). Both terms used in the design field, emphasizes shared creativity and equal partnership in various design phases, ensuring that the outcomes reflect the diverse perspectives of all involved. Co-design is particularly useful in addressing complex problems that require innovative solutions tailored to the specific needs of a user group. These approaches originated in the design sphere but have increasingly been extended to political, social, cultural, and scientific domains, reflecting the growing emphasis on public participation in collective decision-making processes (Hidalgo et al., 2021).

Co-production is closely related to co-creation but places a greater emphasis on the involvement of practitioners and potential research users at every stage of the research process. It aims for a deeper and more transformative impact by bridging the gap between academic research and practical application. Co-production ensures that the knowledge generated is directly applicable to community needs, fostering a renewal of democratic practices by involving users, community members, and citizens in decision-making processes that affect their lives. In policymaking and governance, co-production is seen as a way to engage citizens more deeply and to create outcomes that are both relevant and impactful.

These collaborative and participatory approaches are particularly relevant in the context of Citizen Science, where they serve as core principles for many projects. Any of these methods can be applied to Citizen Science projects in relation to the depth of involvement varying widely depending on the project's goals and context.

Community-based participatory research (CBPR) is a term often used in public health and environmental justice context. CBPR emphasizes partnerships between researchers, community members, and organizations to address community-identified health priorities and improve health outcomes. It shares similar principles with Citizen Science, however CBPR emphasizes using local knowledge for direct interventions to improve outcomes. In contrast, Citizen Science covers a broader range of research topics and may include different levels of public engagement with differing outcome goals (Eitzel et al., 2017a).

When looked at the grand academic literature surrounding Citizen Science, we can see it most usually being used interchangeably alongside Crowdsourcing or mislabeled as it. Crowdsourcing involves an open call for collecting data from a large, undefined number of people, often with no clear set of goals, research questions, or aims. Along with the possibility of them both sharing commonalities—peer production, open data, and open participation—and both are participatory methods used in various fields, Citizen Science, according to the project and research design, does not have to be open, by the means of being free to review, use, or alter

by the general public or any organization. Moreover, Crowdsourcing is usually a process of an open call for collecting data from a large, undefined number of people with no clear set of goals, research questions, or aims, whereas Citizen Science is not only a means of data collection but is a project that is designed and planned around specific objectives and/or research questions (Beck et al., 2024; Bonney et al., 2009; Preece, 2016a; Robinson et al., 2021; Wiggins & Crowston, 2011).

While all participatory methods share the common goal of involving the users, citizens, or the public to their processes, it is important to highlight Citizen Science's focus to knowledge production as co-researchers to make scientific discoveries or verify or explore different research hypothesis or questions. Contributions are commonly from the participants who have a level of interest and motivation due from it to these projects, not from1 being recruited or invited to contribute from research teams. Rooting from this relation there is a different level of relationship between the researchers and the volunteers contributing to these projects, connecting them and fostering a feeling of ownership and investment to the goal and topic.

2.2.5 The Role of Design in Citizen Science

When broken down step by step, there are various levels to a citizen science project. It can range from a tool used to bridge the gap between organizations and citizens to a comprehensive process that facilitates and involves citizens in every step of the way. The outcomes of these projects also vary—from simple solutions that address specific community issues to transformative changes that influence entire systems.

The role of design and designers is to understand and communicate where we might fit in a Citizen Science process and why we might have a crucial role as facilitators to enable this discussion for a more collaborative future building.

To understand the role of design in citizen science, it is essential to explore Robert Young's (2008) content-based model of design, also known as the "world-view model." This model was developed to help designers grasp the complexity of design

activities and recognize the broader impact they can have, shifting beyond a narrow focus on product configuration and detail.

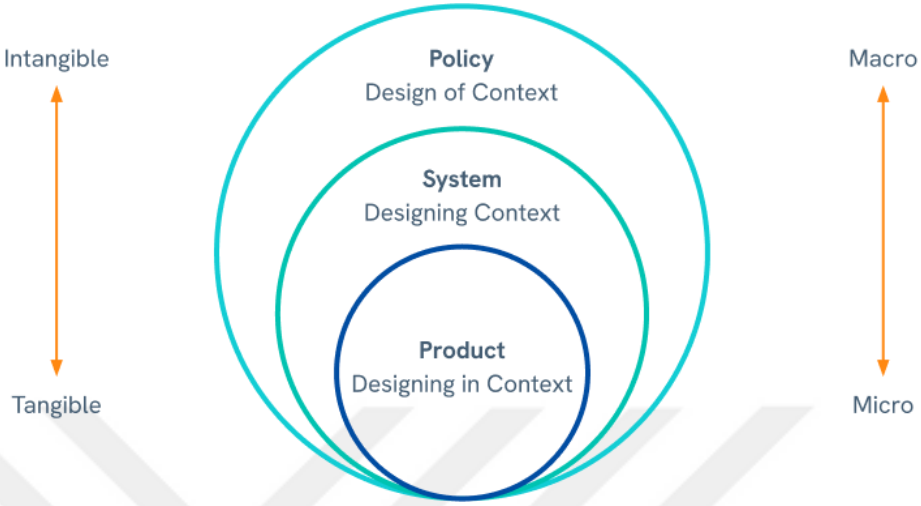


Figure 2.14. Young’s design model.

Young's model (See Figure 2.14)presents three levels of design complexity, moving from micro to macro concerns, and from tangible to intangible outcomes:

- **D1 - Products: Design in Context:** This level represents the traditional focus of design—creating artifacts, components, and products within a given context. It deals with addressing specific, well-defined problems with targeted solutions.
- **D2 - System: Designing Context:** At this level, design expands its scope to systems and services, considering interrelationships and interactions within a larger framework. It shifts from designing within a context to designing the context itself, embracing the complexity of interconnected elements.
- **D3 - Policy: Design of Context:** The third level involves the design of policies and ideologies that shape the broader context within which systems and products operate. It addresses social, economic, environmental, technical, and political concerns, focusing on creating meaning and purpose.

Young's model advocates that impactful designs often originate at the D3 level, where designers influence policy and strategy. This level of influence is especially

relevant in citizen science projects, where understanding and shaping the context—such as policy frameworks and community engagement strategies—can lead to more meaningful and sustainable initiatives. However, Young also acknowledges that designers are often constrained to the D1 level by clients and users, limiting their sphere of influence.

In the scope of citizen science, applying Young's design model can allow designers to address challenges at multiple levels of complexity. At the D1 level, designers can improve the tools and interfaces that citizen scientists use, making participation easier and more intuitive. At the D2 level, designers can contribute to creating systems that enhance collaboration between scientists, volunteers, and communities, facilitating efficient data collection, communication, and feedback mechanisms.

However, it is at the D3 level where the true potential of design in citizen science can be realized. By influencing the policies and ideologies that underpin citizen science initiatives, designers can help shape an environment that encourages inclusivity, accessibility, and long-term engagement. This means considering how scientific projects can address broader societal issues, ensuring that they are not only scientifically valuable but also socially meaningful and equitable.

Young's model aligns closely with and have provided foundation for the principles of complex system problems approach usually seen in Service Design, emphasizing that effective design should move beyond addressing isolated product-level issues to tackling the systemic and policy-level factors that shape the overall context. This shift from designing within a context to designing the context itself is crucial in citizen science, where projects often involve diverse participants, complex data, and varying motivations. By embracing this broader perspective, designers can contribute to creating citizen science projects that are impactful on both a community and societal level.

The literature on Citizen Science projects highlights various topics, primarily focusing on how citizens can contribute more easily and ensure their efforts lead to meaningful insights. Improving the contributors' experience throughout the project's

process is key to fostering sustained participation, which in turn supports the project's success and optimal outcomes. The effectiveness of Citizen Science projects, particularly those conducted online, depends heavily on how well their platforms and interfaces are designed to engage and retain participants (Jennett et al., 2016; Jennett & Cox, 2014; Preece, 2016b; Sprinks et al., 2017; Tinati et al., 2015). These concerns correlate with the user experience (UX) or user-centered design (UCD) in the design field. This is also evident in the research done on Citizen Science considering these issues.

In improving citizens' experiences while contributing to citizen science projects, the design of task flows plays a fundamental role. A well-structured task flow that is intuitive and user-friendly ensures that contributors can easily understand what is expected of them, reducing confusion and lowering the barrier to participation (Sprinks et al., 2017). By breaking down complex activities into simple, manageable tasks and providing clear instructions, citizen scientists are more likely to remain engaged and motivated. This task flow design is especially important because it supports contributors at each step, providing them with the guidance they need without overwhelming them. It has been revealed that the task flow significantly influences participant experience and the scientific results they produce. Interfaces offering greater autonomy and variety are generally preferred by participants, however, should be adjusted according to the project’s goals (Sprinks et al., 2017).

Motivation is another key factor for ensuring the continuity of citizen participation. The literature indicates that intrinsic motivations, such as the desire to learn, contribute to scientific discovery, or be part of a community, are significant drivers of participation. Therefore, designing platforms that highlight the value of contributors’ work, provide timely feedback, and create a sense of accomplishment can enhance their motivation. Feedback mechanisms are particularly important, as they create a loop where contributors see the impact of their contributions, encouraging them to remain active.

CHAPTER 3

METHODOLOGY

Building on insights from the literature review, this thesis' research methodology is designed to investigate the current micro-mobility efforts and processes in Ankara, Türkiye, and explore the potential of Citizen Science to enhance them. The primary goal is to understand both the needs of experts in developing effective micro-mobility projects and the experiences and perceptions of citizens who use these systems. Given that micro-mobility is deeply influenced by social behavior and local culture, it is crucial to investigate how these factors shape such initiatives in an urban environment.

To achieve these objectives, this research utilizes a multi-method approach that integrates expert insights and user experiences. The methodology combines semi-structured interviews with key stakeholders—such as urban planners, transportation engineers, and mobility experts—with a generative focus group process that includes user journey diaries and focus group discussions with cyclists in Ankara. This approach aims to assess the current state of the cycling experience in Ankara, explore users' involvement, and identify new opportunities for shaping these systems. Through this comprehensive approach, the study seeks to uncover how Citizen Science can be integrated into the planning and design of micro-mobility systems to make them more responsive to user needs and more effective in their implementation.

This study received ethical approval from the Human Research Ethics Committee (İnsan Araştırmaları Etik Kurulu - İAEK) at Middle East Technical University (METU), under the Industrial Design Master's program of the Graduate School of Natural and Applied Sciences. Ethical approval (See Appendix B), with reference number 0166-ODTUİAEK-2023, was granted in April, 2023. This approval ensures

that all research procedures involving participants were conducted according to ethical guidelines, safeguarding participants' rights, privacy, and safety throughout the study.

3.1 Reflection of Ankara Bicycle Context

This section presents the first stage of the study, which focuses on understanding the bicycle context in Ankara. This stage involved two parts: document analysis, which involved a review of gray literature, and expert interviews, which were designed and conducted based on insights gained from the document review.

3.1.1 Document Analysis

To map and understand the current state of micro-mobility and biking in Ankara, as well as the urban planning and mobility projects that have been completed or are underway, a comprehensive review of grey literature—including reports, policy documents, and urban plans—was conducted. This review focused on bicycle usage, master plans, and related policies in Ankara. Grey literature, typically produced by organizations directly involved in these activities, provides timely and practical insights, though it may vary in quality as it is not usually subject to peer review.

From the grey literature reviewed, four key projects were selected for their analysis and coverage of Ankara (See Fig 3.1.). wo of these projects addressed Türkiye as a whole, with in-depth examinations of selected major cities (TC. Çevre ve Şehircilik Bakanlığı, 2021; WRI TÜRKİYE Sürdürülebilir Şehirler, 2022), while the other two focused directly on Ankara (ANKARA BÜYÜKŞEHİR BELEDİYESİ EGO GENEL MÜDÜRLÜĞÜ, 2020; ARUP, 2021).

These documents served as a foundation for identifying and reaching out to experts for the interview stage of this research. The following summaries provide an overview of the key micro-mobility projects that will be discussed during the expert

interviews. These descriptions include the objectives, scope, challenges, and outcomes of each project, offering a clear understanding of the context in which these initiatives were developed. The information presented here is based on expert explanations provided during the interviews, corroborated by available project documentation.



Figure 3.1. Timeline of Micro-mobility Projects that covering Ankara, Türkiye.

3.1.1.1 Global Future Cities Programme - Ankara Project

The primary aim was to develop a sustainable urban mobility strategy, with a strong focus on integrating cycling into the city's broader transportation network. The project sought to establish a comprehensive and inclusive transport system that addresses gender equality and social inclusion (GESI), empowering disadvantaged groups while minimizing environmental impacts (ARUP, 2021).

The project involved the creation of a Bicycle Master Plan, engagement with key stakeholders, and the development of a communication strategy to promote cycling

as a viable mode of transport. Additionally, the project sought to develop a digital tool for urban mobility planning and to implement a pilot project.

The project encountered several challenges, including limited existing data, internal political dynamics, and organizational issues. Public engagement efforts were also hindered by the COVID-19 pandemic. Furthermore, due to necessary adjustments to the initial project scope, the planned digital tool was ultimately canceled. Furthermore, Ankara's car-centric culture posed a significant barrier to encouraging cycling.

The project resulted in a strategic framework and a master plan for cycling infrastructure, which included detailed guidelines and policies aimed at promoting cycling in Ankara. It also led to the implementation of the Batıkent Cycleway as a pilot project and established a foundation for future urban mobility initiatives.

3.1.1.2 Türkiye Bicycle Road Network Master Plan

The project aimed to create a national network of bicycle routes across Türkiye, focusing on promoting cycling as a sustainable form of transportation. The plan was designed to integrate cycling into urban transport systems, contributing to the country's overall sustainability goals (TC. Çevre ve Şehircilik Bakanlığı, 2021).

The project involved extensive research and planning to identify optimal routes for the national cycling network and develop supportive infrastructure, with specific strategies tailored for urban areas like Ankara. This process included stakeholder consultations and data analysis to ensure effective integration of the network into various urban environments.

One of the main challenges was addressing the diverse needs of different regions in Türkiye, each with its own unique urban and environmental characteristics. The regional diversity and the need for adaptable infrastructure solutions across different urban environments posed significant challenges. Additionally, integrating new

cycling infrastructure into existing urban settings, particularly in densely populated or heavily trafficked areas, required careful planning and innovative solutions.

The project provided a roadmap for developing cycling infrastructure nationwide. It emphasized the importance of national-level planning and coordination, and its recommendations have been used as guidelines by local governments to implement bicycle-friendly policies and infrastructure projects. The plan also provided detailed recommendations for infrastructure development, policy changes, and the establishment of supportive systems such as bike-sharing programs.

3.1.1.3 Türkiye Urban Bicycle Transportation Strategy Plan 2030

The project aimed to establish a long-term strategy for integrating cycling into urban transportation networks across Türkiye. The strategy set goals for significantly increasing the share of bicycle trips in urban areas by 2030, promoting cycling as a key component of sustainable urban mobility, and ensuring seamless integration with other urban transport systems (WRI TÜRKİYE Sürdürülebilir Şehirler, 2022).

The project involved comprehensive research, stakeholder engagement, and the development of policy recommendations to support cycling infrastructure. The strategy also included public awareness campaigns and educational programs aimed at shifting cultural perceptions and encouraging the widespread adoption of cycling.

The project provided a detailed vision for the future of cycling in Türkiye. The strategy outlined specific goals and action plans for increasing bicycle trips and ensuring the sustainability of these initiatives. It offered a comprehensive plan for increasing bicycle usage, improving infrastructure, and establishing the necessary policy frameworks to support these goals. The project also highlighted the need for coordinated efforts across multiple stakeholders and continuous monitoring to achieve long-term success.

The project provided a roadmap for developing cycling infrastructure nationwide. It emphasized the importance of national-level planning and coordination, and its

recommendations have been used as guidelines by local governments to implement bicycle-friendly policies and infrastructure projects. The plan also provided detailed recommendations for infrastructure development, policy changes, and the establishment of supportive systems such as bike-sharing programs.

3.1.2 Expert Interviews

To gain in-depth insights into the planning and design processes of micro-mobility systems in urban environments, and to identify what kind of information or data could be effectively gathered via Citizen Science, semi-structured interviews with four experts in the field were conducted. The interview questions were designed to gather anticipated insights that were crucial in informing the features and functions of a potential Citizen Science platform aimed at enhancing micro-mobility in Ankara. The interview questions were designed to gather anticipated insights that will be crucial in informing the features and functions of a potential Citizen Science platform aimed at enhancing micro-mobility in Ankara. By understanding the current processes and challenges in project development, as well as exploring how users are, or could be, involved, the study aims to identify key areas where Citizen Science could be integrated to support more effective and responsive planning. This approach is intended to ensure that the platform addresses practical needs, improves user involvement, and ultimately contributes to more successful micro-mobility initiatives.

The interview questions addressed the following key areas (See Appendix C):

- Professional Roles: The experts' responsibilities and involvement in bicycle-related projects in Ankara and Türkiye.
- Planning and Design Processes: Exploration of how bicycle infrastructure is planned, including decision-making criteria for the location and scope of bike lanes.

- Project Development and Challenges: Discussion of ongoing projects, the challenges faced, collaboration with partners, and how these projects align with national and local master plans.
- User and Citizen Engagement: Examination of the involvement of users in the project development process, including methods for collecting user data, engaging with citizens during and after implementation, and exploring the potential for applications to gather user feedback and enhance project outcomes.

By gaining insight from these professionals, the study aimed to understand the details and steps of developing micro-mobility systems within the Ankara context and to explore the interactions between users and the experts who develop these systems.

Table 3.1 Experts that were interviewed.

Expert	Gender	Education	Background	Company Scope
Expert 1	Female	Undergraduate	Urban Planner	Global firm offering engineering, architecture, and design consulting services
Expert 2	Female	Post-graduate	City and Regional Planner	Global research organization focused on sustainability and environmental conservation
Expert 3	Female	Post-graduate	Urban Planner	Global firm offering engineering, architecture, and design consulting services
Expert 4	Male	Post-graduate	Landscape Architect	Turkey-based consultancy specializing in architecture, interior, and urban design

From fifty experts who have worked on these projects ranging from different professions, fourteen experts who were City and Regional Planners, Urban Planners and Designers, Transportation Planners and Engineers, and Landscape Architects

were chosen to reach out to, and four experts (See Table 3.1) have agreed to participate in the interviews. Three out of four experts held degrees in City and Regional Planning with two of them being at a doctoral level, and one of the experts had a Landscape Architecture background, with their master's degree focusing more on Urban Design. Their roles in the projects ranged from Urban Designers/Planners to Sustainable Urban Development and Urban Mobility Experts.

The interviews for this research were carried out in the spring of 2023. The interviews were set up to last a maximum of one hour and were conducted either online or face-to-face, depending on the experts' availability. The interviews were voice recorded, then transcribed and analyzed as part of the research.

3.1.2.1 Data Analysis — Coding and Analysis of Expert Interviews

Following the expert interviews, the data analysis process was designed to systematically examine the information provided, focusing on the various micro-mobility projects in Ankara, Türkiye, to extract meaningful insights aligned with the research objectives. This process involved the transcription of voice recordings into text, which were then systematically coded to uncover insights and findings. The analysis involved both deductive and inductive coding methodologies, which allowed for the identification of key themes and factual findings related to the projects discussed. This section presents detailed descriptions of the projects, followed by a thematic analysis of the data by codes.

The thematic analysis was conducted to systematically identify, analyze, and report patterns within the data gathered from expert interviews concerning micro-mobility projects in Türkiye and Ankara. This method provided a structured approach to interpret complex qualitative data, leading to the identification of key themes. The analysis was guided by both deductive and inductive coding processes, which were visually represented through a detailed code tree.

To guide the analysis, specific information requirements were established based on existing literature and theoretical frameworks, allowing for the application of deductive codes that structured the data. These codes focused on:

- Project Context: Identifying key aspects such as stakeholders, project types, phases, and methodologies employed.
- Challenges and Recommendations: Discovering challenges encountered in Ankara and revealing recommended potential solutions.
- Engagement and Objectives: Understanding project strategies and goals for engaging with organizations and users, including how projects are scoped, planned, and implemented.

These deductive codes provided a foundational framework for understanding the general processes involved and were essential in structuring the initial analysis.

Subsequently, inductive coding was employed to explore the data more openly. The inductive coding process allowed for the emergence of new codes directly from the data, reflecting specific insights unique to the context of Türkiye and Ankara. As interviews were analyzed, additional codes were identified and added in the analysis. This process was critical in capturing nuanced aspects of the projects that were not fully anticipated in the initial deductive framework.

After all the transcriptions were coded, the initial deductive and inductive open codes were organized into thematic code trees (See Appendix D) (See Figure 3.2). The initial deductive codes acted as major themes, and through coding, specific subcategories were identified, allowing for a deeper exploration of the data.

The inductive coding, in particular, led to the emergence of the "Project Implementation & Contextual Insights" theme. This theme involves how micro-mobility projects were executed, including the practical challenges faced during implementation, the adaptations made in response to specific urban contexts and situations, and the insights gained from these experiences. It also highlights the dynamic interactions between project strategies and the local environment, offering

a richer understanding of the factors influencing the success and sustainability of these initiatives. Identifying these relationships between current methods, touchpoints, and the goals of data collection provided valuable insights. This process also informed the revision of the generative focus group. Additionally, it guided the selection of deductive codes for the analysis of focus group data.

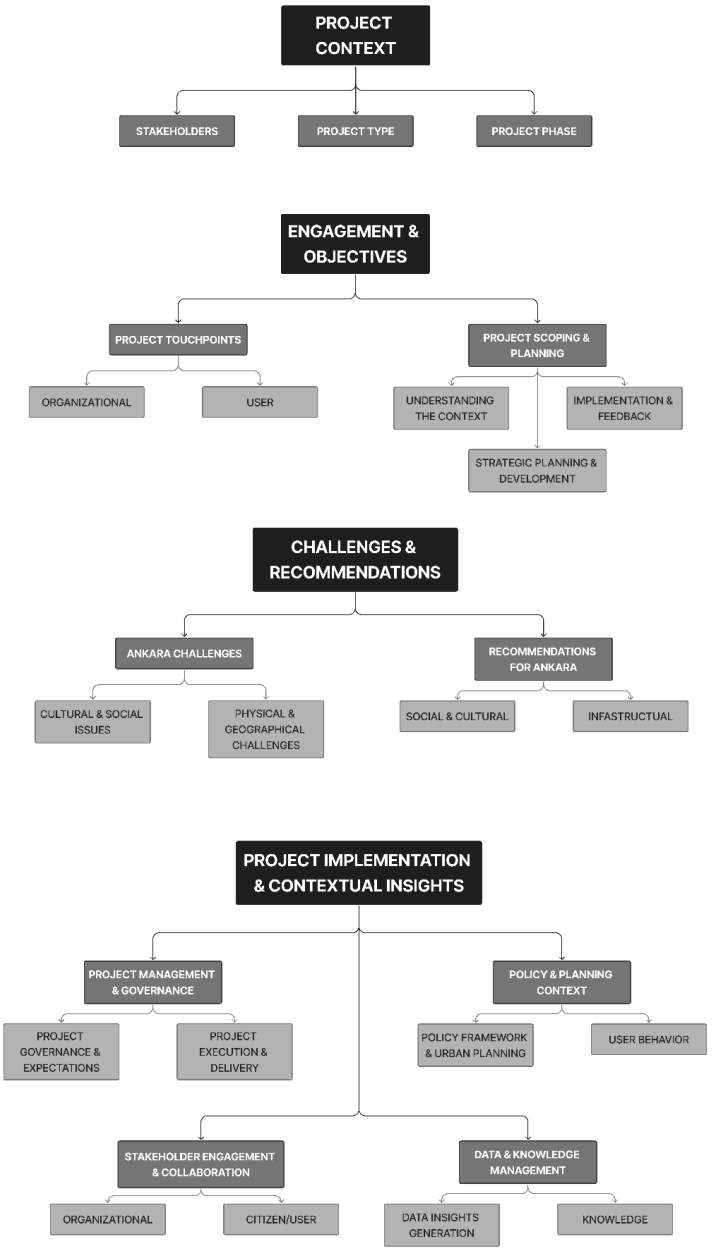


Figure 3.2. The main themes and subtitles of the thematic code tree from the expert interview analysis.

The coding process involved a detailed examination of the interview transcripts, resulting in the identification of key codes representing the core elements of micro-mobility projects discussed by the experts. These codes were organized into a thematic code tree (See Appendix), grouped under four main umbrella categories: Project Context, Engagement & Objectives, Ankara Challenges & Recommendations, and Project Implementation & Contextual Insights.

3.2 Generative Focus Groups

Generative Focus Group (Oğur, 2014) is a Generative Research Method where it follows an individual timeline before the focus group session. Generative Research Methods aim to sensitize the users or participants to the research topic with various tools such as Cultural Probes (Gaver et al., 1999) which are various tasks or tools to facilitate gathering users' experiences and make them think about the research (Sanders et al., 2013; Visser et al., 2005).

The individual timeline of the Generative Focus Group utilized the Diary method, implemented via a Google Form (See Appendix D). Participants were briefed on the research process and provided informed consent before proceeding. As part of the diary activity, participants were asked to use a fitness tracking application called Strava (2009), which has been widely popular among cyclists for recording routes, activities, and statistics while sharing them within a social community. Each participant was instructed to record one of their preferred daily cycling routes using Strava and submit the data via the Google Form to the researcher. This diary task was a one-time activity to be completed before scheduling the focus group sessions. It did not involve recurring submissions or impose specific time constraints, allowing participants flexibility in their contributions. Following the submission of the diary entries, focus group sessions were scheduled based on the common availability of the participants.

To recruit participants for the generative focus group stage, 10 civil society organizations (CSOs) and university cycling clubs were contacted. Of these, 3 expressed interest, and 1 cycling CSO fully completed the research stage. From this CSO, 9 cyclists initially expressed interest, 7 signed consent forms, 6 completed the individual user journey diary, and 4 participated in the face-to-face focus group session.

Following the first focus group, snowball sampling facilitated the involvement of a second cycling CSO, which also fully completed the research stage. From this CSO, 6 cyclists expressed interest, 4 signed consent forms and completed the individual user journey diary, and 3 attended the face-to-face focus group session.

Additionally, an Instagram post shared on the Department of Industrial Design's page invited further contributions to the research. This post attracted 2 individuals who were not affiliated with any cycling CSO; however, only 1 signed the consent form but did not complete the individual user journey diary.

In total, two generative focus groups were successfully conducted, with 4 women in the first group and 3 men in the second group, resulting in a total of 7 participants (See Table 3.2). All participants were affiliated with a cycling CSO.

Table 3.2 Participants in the generative focus groups.

Focus Group	Participant	Gender	Age	Occupation	Years
1	P1	Female	45	Mediator	2
	P2	Female	37	Civil Servant	6
	P3	Female	47	Financial Advisor	7
	P4	Female	30	Graduate Student	2
2	P5	Male	57	Consumer Rights Specialist	10
	P6	Male	38	Biologist	9
	P7	Male	22	Undergraduate Student	2

The generative focus group was designed to explore participants' experiences, preferences, and challenges related to cycling in Ankara, with an emphasis on understanding user needs and motivations for potential Citizen Science applications. The session also included a combined map (See Figure 3.3) of the participants cycling routes that they have shared with the researcher in the Diary stage including the photographs and insights.



Figure 3.3. Combined map for the first generative focus session.

The generative focus group was designed to explore participants' experiences, preferences, and challenges related to cycling in Ankara, with an emphasis on understanding user needs and motivations for potential Citizen Science applications. The session also included a combined map (See Figure 3.3) of the participants cycling routes that they have shared with the researcher in the Diary stage including the photographs and insights.

The map assisted in fostering a dynamic and interactive discussion space, where participants can refer (See Figure 3.4) to the map (See Figure 3.7) while sharing their experiences, see and comment on each other’s separate and overlapping paths and

add their own insights by directly drawing (See Figure 3.6) on the map or with the given post it notes (See Figure 3.8) if they choose to.



Figure 3.4. Participant referring to one of the routes on the map.

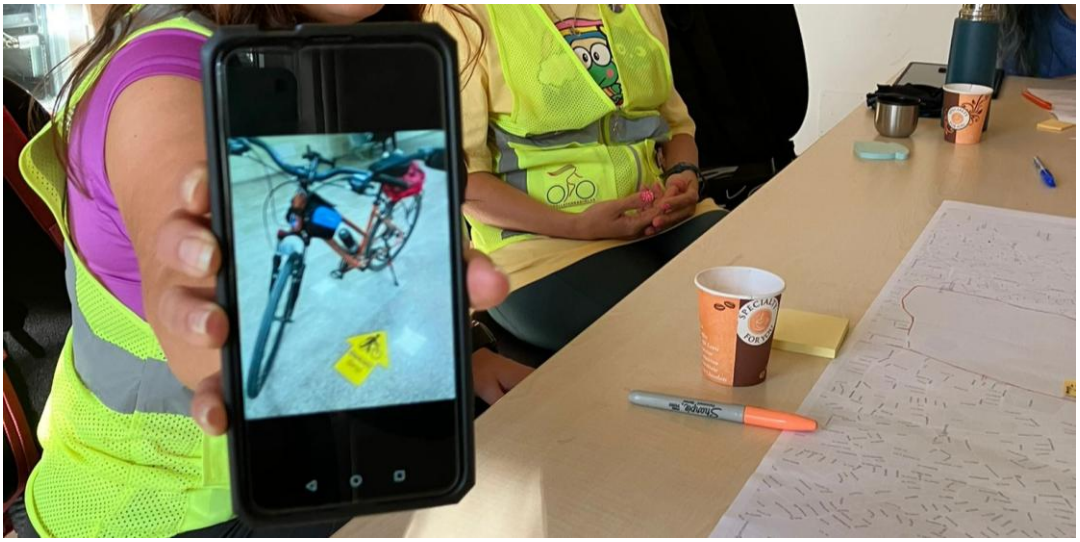


Figure 3.5. One of the participants sharing a photograph related to their experience during the discussions.

During the sessions participants were also allowed to share images, videos and written content related to cycling from their personal devices while reflecting on their experiences and behaviors around cycling or regulations concerning cycling.

The focus group was structured around the following key areas (See Appendix F):

- **Introduction and Context Setting:** Initial discussion and presentation (See Appendix G) to introduce the research topic, the concept of Citizen Science, various challenges that could be faced while cycling and the flow of the focus group.
- **Exploration of Cycling Challenges:** Participants were engaged in discussions about the challenges faced while cycling in Ankara, including specific issues related to bicycle lanes and shared paths.
- **Route Analysis and Map Interaction:** Participants analyzed their chosen cycling routes, focusing on factors such as safety, slope, and comfort. They also interacted with a map to indicate preferred routes, suggest improvements, and categorize routes based on safety and other factors.
- **Application Feature Brainstorming:** Participants discussed desirable features for a potential cycling application, such as recommendation submissions, complaint reporting, and social interaction functionalities.
- **Motivations and Sharing Preferences:** The group explored what would motivate them to use a cycling application, the type of feedback they would provide, and how they would engage with other users through the app.

Scenario-Based Discussions: Real-life scenarios were used to explore how participants would use the application to report issues, share experiences, and interact with the cycling community.



Figure 3.6. One of the participants drawing their own preferred route on another participant’s route they shared during the Diary stage.

This structured approach facilitated a comprehensive understanding of the participants' perspectives, which can be used to inform the design of Citizen Science applications in urban cycling contexts. The diary stage was designed to be flexible, allowing participants to complete it at their convenience before the focus group sessions. The dates for the face-to-face focus group sessions were coordinated based on the participants' mutual availability. While the diary entries were completed by participants between late summer and fall of 2023, the focus group sessions took place in November 2023. The focus group sessions were planned to last approximately an hour and a half and were conducted in the UTEST Product Usability Testing research lab meeting room at the Middle East Technical University (METU) Faculty of Architecture. The focus group session was voice recorded with

a mobile phone and video recorded with a camcorder to be utilized in the transcription and analysis processes.

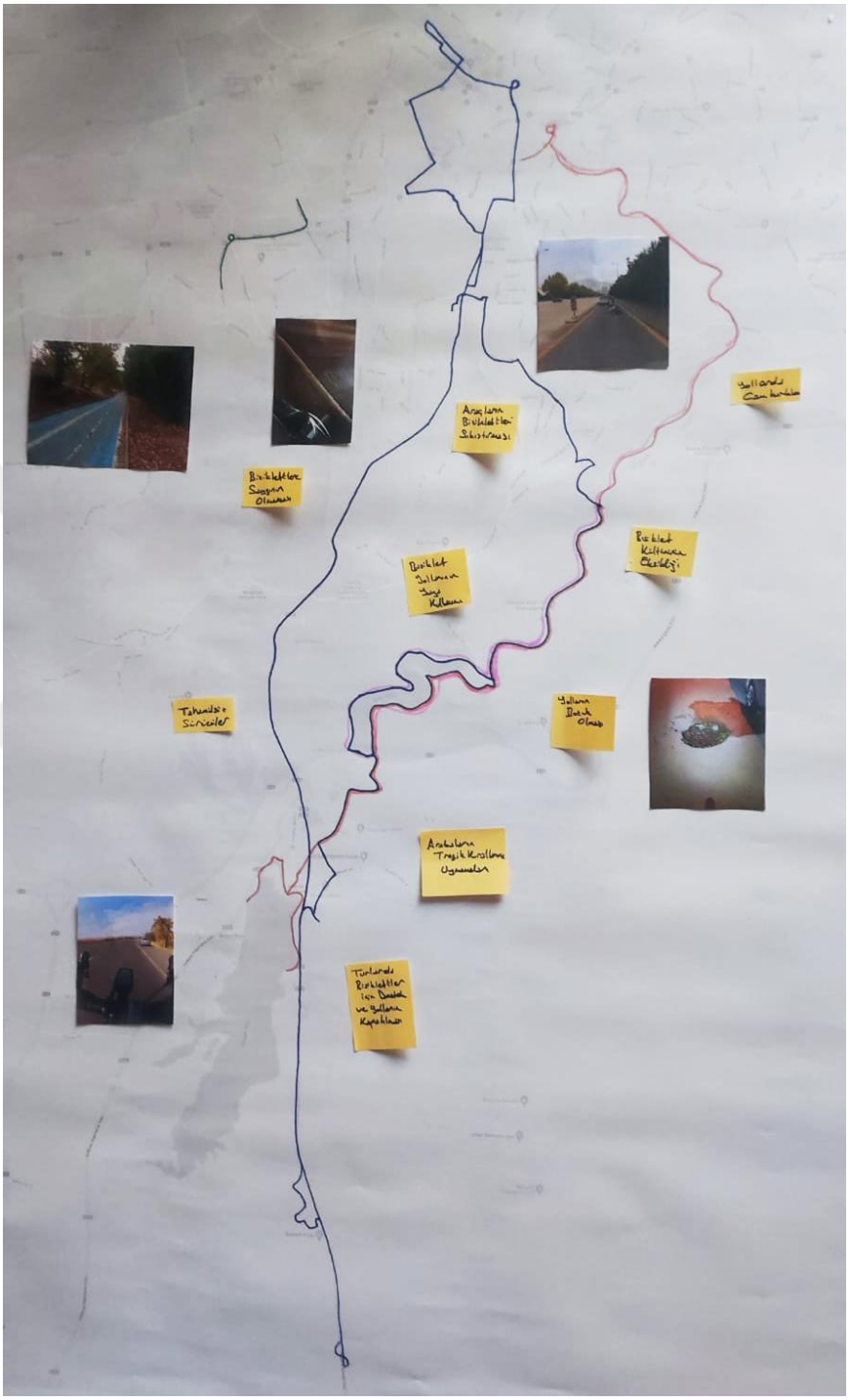


Figure 3.7. Combined map for the second generative focus group session.



Figure 3.8. Focus group setting with the researcher’s laptop for presentation, combined map, post it notes and pens.

3.2.1.1 Data Analysis— Coding and Analysis of Generative Focus Groups

Following the generative focus groups, the data analysis process was designed to systematically examine the discussions to extract meaningful insights related to participants' cycling experiences in Ankara. This involved transcribing voice recordings into text, with video recordings referenced as needed for accuracy. The transcriptions were then coded using both deductive and inductive methodologies to uncover key insights and findings, aligning with the research objectives.

To guide the coding process a set of deductive codes derived from the literature review and prior expert interview analysis were used. These deductive codes focused on several core areas:

- User Profile: Identifying different types of cyclists and understanding their purposes for cycling.
- Cycling Behavior: Examining behaviors exhibited while cycling, including route preferences, adaptations to traffic, and motivations.
- Challenges & Recommendations: Addressing challenges faced by participants in Ankara, including infrastructure limitations, safety concerns, and social attitudes, as well as capturing participants' suggestions for improvements.
- Sharing Dynamics: Mapping how participants shared their experiences, including what they shared, why, how, with whom, and the responses they received, highlighting the flow of information and support within the cycling community and system.

These deductive codes provided a foundational framework for categorizing participants' engagement with the cycling ecosystem and structuring the initial analysis. Following the deductive coding, inductive coding was employed to explore emerging themes directly from the data. It broadened the themes like user motivations and behaviors. Additionally, participants' perceptions of the cycling environment in Ankara were captured, focusing on infrastructure, safety, and accessibility. Broader systemic challenges, including infrastructural and societal barriers, were highlighted, along with participants' engagement with the cycling system, such as advocacy efforts, community involvement, and collaboration with authorities.

The combination of deductive and inductive coding provided a comprehensive understanding of participants' experiences, motivations, and the challenges they faced as cyclists in Ankara. After coding, both deductive and inductive codes were organized into a thematic code structure (See Appendix H) (See Figure 3.9) that provided insights into participants' cycling experiences and engagement with the cycling ecosystem, and guiding the findings from the research stage.

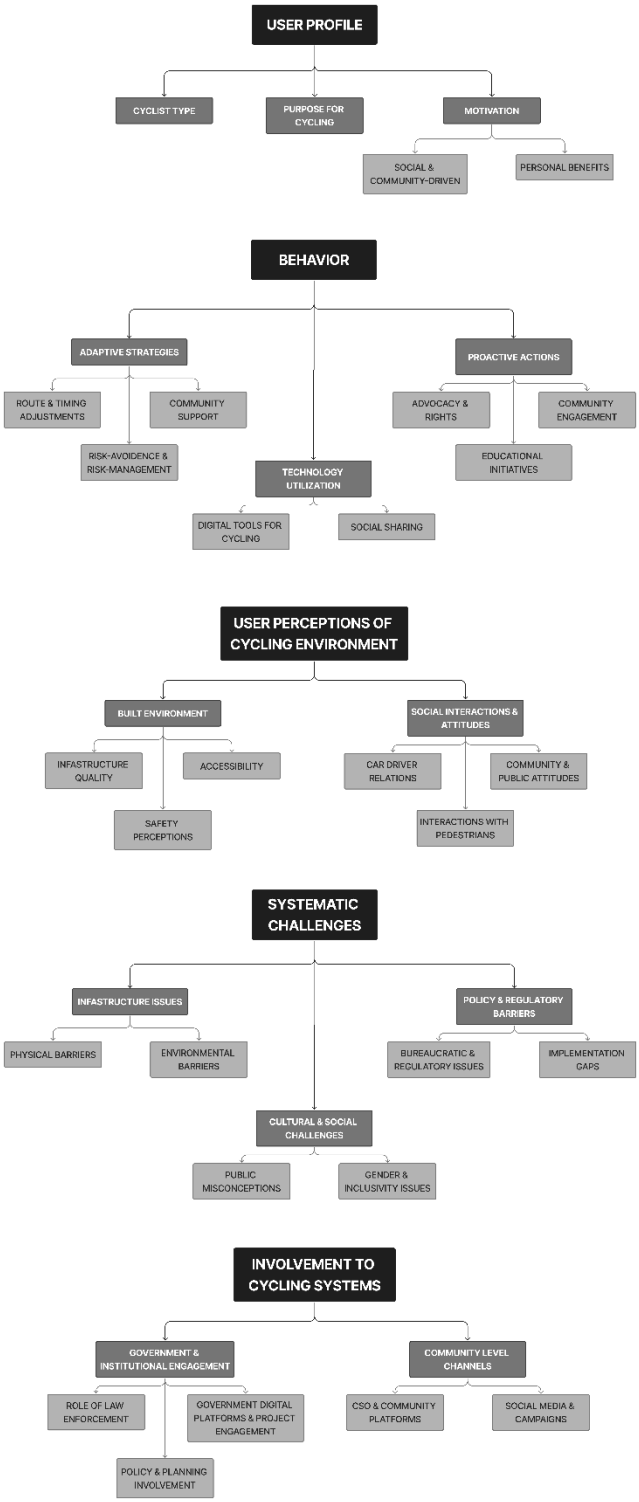


Figure 3.9. The main themes and subtitles of the thematic code tree from the generative focus group analysis.

CHAPTER 4

FINDINGS

This chapter presents the findings derived from the expert interviews and generative focus groups, providing an in-depth analysis of the cycling projects processes and ecosystems in Ankara. By synthesizing insights from both research stages, this chapter aims to construct a comprehensive understanding of the factors influencing these initiatives. The chapter concludes with a synthesis of the findings, reflecting on the potential integration of Citizen Science, and emphasizing the interconnected nature of all aspects within the system.

4.1 Expert Interviews

Through the coding and analysis of the interview data, several key categories emerged, each highlighting different aspects of the micro-mobility initiatives discussed. These categories—Project Context, Challenges & Recommendations, Engagement & Objectives, and Project Implementation & Contextual Insights—encompass the practical realities of project implementation, the complex interactions between stakeholders, the role of user engagement in shaping project outcomes, and the broader considerations of sustainability, cultural barriers, and policy frameworks.

4.1.1 Project Context

This umbrella category encompasses the foundational aspects of micro-mobility projects, focusing on the stakeholders involved, the nature of the projects undertaken, and the various phases these projects undergo.

4.1.1.1 Stakeholders

The expert interviews revealed that various organizations are involved in the planning and execution of micro-mobility projects, highlighting the diversity of actors and their varying levels of influence. All the projects discussed with the experts were connected to various government agencies, ranging from local municipalities to national ministries. These agencies, with varying levels of involvement, play essential roles in providing regulatory frameworks, funding, and strategic direction. Their participation is crucial to ensuring that the projects align with broader urban mobility and environmental policies.

While the main stakeholders are connected to the government, other non-governmental institutions also play important roles in the processes of these projects. The interviews highlighted the involvement of the private sector, particularly in consultancy roles for planning and design. The private sector contributes specialized expertise and has the potential to expand into providing technical and technological support, driving innovation in project first analysis, planning and implementations.

Another important actor is NGOs, which play a crucial role in supporting both private and governmental organizations with their expertise and knowledge. They facilitate community engagement and advocate for sustainable infrastructure. According to the interviews, NGOs often bridge the gap between public entities and citizens, providing critical support in terms of funding, expertise, and advocacy. The interviews also revealed that foreign governmental organizations provide essential funding and expertise. These organizations encourage the adoption of global best practices and support the development of sustainable and inclusive urban mobility initiatives

The involvement of universities and research institutions was highlighted as invaluable. According to the experts, their contributions can help ensure that projects are informed by the latest academic insights and aligned with best practices in urban mobility. These institutions also serve as testing grounds for potential pilot projects

and innovative implementations. Civil society organizations support a wide range of initiatives by offering expertise, advocacy, and community engagement. The interviews suggested that CSOs are often treated as direct points of contact with users, helping to ensure that projects are inclusive and reflective of the needs of the broader public.

4.1.1.2 Project Type

Different types of projects with varied scopes and focuses were mentioned in the interviews. Mainly, the discussions revolved around the key mobility and transportation projects. Some projects aimed at creating inclusive urban solutions that address social inequalities, empower disadvantaged groups, and improve access to transportation. Other initiatives that focused on enhancing the livability of urban spaces by improving infrastructure for non-motorized transport, making cities more accessible and pedestrian friendly were also discussed. This includes projects such as living street initiatives and public area designs that the experts mentioned.

Experts also gave examples of other types of projects, such as those concerned with general sustainability without a specific focus. Broader urban planning frameworks, strategies, and initiatives aimed at comprehensive city planning and design were also discussed, along with smaller-scale, temporary projects often used as trials before full-scale implementations.

4.1.1.3 Project Phase

The experts discussed different stages of the project development and lifecycle. The first analysis phase was the most frequently mentioned stage. Preliminary data analysis and site assessments are crucial for understanding the local context and informing the design and planning phases. These analyses provided critical insights for project design and implementation, and this phase was emphasized the most in the interviews.

The master Plan/Zoning phase, which is the initial phase, often involves the development of comprehensive master plans or zoning strategies that set the framework for all subsequent activities and ensure planned implementation according to the decisions made. This was the primary delivery phase for most of the experts and micro-mobility projects discussed.

The design stage involves the translation of plans into real-life implementations. Among the micro-mobility projects, only two had pilot implementations, and only one expert played a contributory role in these implementations.

Quality/Monitoring phases involve continuous monitoring and refinement during the master plan or design phases to ensure that the projects meet quality standards and address any emerging challenges. All experts were involved in this stage during the master plan/zoning phase, with only one expert also involved in the design phase as an observer.

4.1.2 Engagement & Objectives

This category focuses on the strategies employed to engage stakeholders and users, as well as the objectives guiding these efforts throughout the projects' planning processes that underpin the development and implementation of micro-mobility projects.

4.1.2.1 Project Touchpoints

In the project timelines, there are different points of interaction between the project and its stakeholders. Through the interviews, experts revealed there were more processes and methods focused on and planned for organizations involved in the projects. Most of the projects involved collaborative processes where the organizations were the main focus, including workshops, stakeholder relations, and site visits. All experts also expressed carrying out evaluation processes such as GIS

analysis, stakeholder mapping, and interviews, and focus groups that are done with organizations. These methods inform project planning and execution by facilitating a comprehensive understanding of the urban context, enabling effective planning.

Compared to the organizational processes, experts expressed that fewer processes and methods focused primarily on end users—citizens and the general public. Nevertheless, there were activities that involved direct contact with users, such as focus groups and site visits, where direct insights and feedback from users were gathered. The project that involved the focus group had to be carried out online, and the site visits couldn't be done due to the pandemic. Experts also mentioned co-design workshops and other participatory methods that involve users in the design and planning process. These were mainly mentioned in relation to other project types or mobility projects conducted abroad, rather than the key mobility projects discussed in the interviews.

Techniques including surveys, and people counting methods to gather user input without direct engagement. These methods provided broad insights into user demographics and preferences, guiding infrastructure planning. Online platforms and apps were also mentioned in relation to different projects other than the key mobility projects.

Most of the projects also involved on-site observations and field-based data collection, providing critical insights into user behavior and infrastructure needs, and gathering user feedback that led to practical adjustments that enhance project effectiveness.

4.1.2.2 Project Scoping & Planning

This subcategory addresses the planning strategies used to ensure the projects meet user needs and broader goals. Experts highlighted the importance of analyzing the physical environment and understanding user needs to provide accurate data that aligns with the specific characteristics of the urban landscape. One of the most

frequently mentioned strategies was spatial analysis and infrastructure assessments, which are used to plan effective cycling routes and facilities by thoroughly analyzing the physical context, including land use, GIS data, and site visits.

Identifying user needs and integrating them into project goals, ensuring that infrastructure development aligned with user preferences. This process, which includes demographic analysis, user behavior insights, and problem identification from the user perspective, ensures that projects are tailored to meet the specific requirements of the population, making them more relevant and sustainable.

Experts also emphasized the importance of developing strategic plans that ensure projects are grounded in a comprehensive vision, with clear goals and objectives guiding all phases of development, including area selection, idea generation, and policy development.

The execution of these plans, ongoing project monitoring, and gathering feedback through post-implementation reviews are crucial for refining and improving projects based on real-world performance. Feedback mechanisms, such as public display initiatives and safety infrastructure feedback, play a significant role in ensuring the long-term success of these initiatives.

4.1.3 Ankara Challenges & Recommendations

This category captures the challenges encountered in the development and implementation of micro-mobility projects in Ankara, particularly cultural, social, and infrastructural issues, as well as the recommendations provided by experts to address these challenges.

4.1.3.1 Ankara Challenges

Experts identified specific challenges in the context of Ankara, relating to local culture, social norms, and the physical environment. Challenges related to local

culture and social norms included perceptions of cycling, traffic culture, and communication barriers. According to the experts, Ankara's car-centric culture and social resistance to cycling were significant obstacles that hindered the adoption of micro-mobility solutions. Overcoming these barriers required innovative community engagement strategies and public awareness campaigns aimed at shifting perceptions to promote cycling as a viable mode of transportation.

The physical environment also presented a series of challenges, including Ankara's topography, climate, and current infrastructure limitations. Experts highlighted that these factors influenced the feasibility of developing certain cycling routes and required adaptable infrastructure solutions to ensure the cycling network's functionality and accessibility throughout the year.

4.1.3.2 Recommendations for Ankara

To address the cultural and social challenges, experts provided several recommendations aimed at increasing community involvement in cycling projects. Experts recommended targeted community engagement initiatives designed to raise awareness and increase cycling adoption, with communication strategies tailored to local cultural and social dynamics. Such initiatives need to be designed to effectively reach diverse segments of the population, addressing specific concerns and promoting cycling as a sustainable and socially acceptable form of mobility.

Policy recommendations were also a key focus, with experts stressing the importance of policy changes and enforcement measures to enhance safety for cyclists and create a supportive regulatory environment. These policy efforts were seen as essential for integrating cycling more effectively into Ankara's broader urban transportation strategy. Experts emphasized the need for clear regulations that prioritize cyclist safety, such as dedicated cycling lanes, speed limits, and strict enforcement of traffic rules favoring non-motorized transport users.

Addressing infrastructural challenges was another critical theme. Experts recommended the development of infrastructure specifically dedicated to cycling, with provisions to support diverse user needs, such as e-bikes and bicycle lifts. Such solutions aim to overcome the physical challenges posed by Ankara's topography, making cycling accessible for a broader range of users. The development of dedicated cycling infrastructure should include features like protected bike lanes, appropriate signage, and facilities that support year-round cycling.

Tailoring infrastructure development to meet specific user needs, and ensuring proper planning and prioritization, were identified as crucial components of successful implementation. Experts stressed the value of incorporating user feedback and insights in the planning and design stages to ensure that the resulting infrastructure is not only functional but also responsive to the community's needs. This participatory approach would enhance the effectiveness and user-friendliness of cycling paths, ultimately contributing to the sustainability and success of micro-mobility projects in Ankara.

4.1.4 Project Implementation & Contextual Insights

This umbrella category delves into the operational aspects of project execution, stakeholder engagement, data management, and the contextual insights necessary for the successful implementation of micro-mobility projects.

4.1.4.1 Project Management & Governance

This section explores the critical components of project management and governance, focusing on the structures and practices required for effective implementation and the fulfillment of stakeholder expectations. It discusses the governance framework, management of project processes, expectations of outcomes, and collaboration with stakeholders. Each of these components is crucial for ensuring that micro-mobility projects are aligned with their intended vision, adaptable to

challenges, and capable of delivering meaningful outcomes that meet the needs of the community and stakeholders.

Effective management throughout the project lifecycle is crucial for maintaining alignment with project goals and ensuring successful outcomes. Experts highlighted the importance of structured process management to maintain coherence with the project's overarching vision, allowing for coordinated and efficient implementation. Establishing clear goals and expected outcomes guides the project's direction, ensuring all efforts align with the vision set by project stakeholders. This shared vision facilitates coordinated efforts and ensures that project outputs meet the needs and expectations of all involved parties. The interviews particularly pointed out the significant impact of government and funder influences on this aspect.

For all the projects discussed in the interviews, except one, the responsibility for delivering everything necessary to inform subsequent phases lay with the projects themselves. However, the actual planning and execution of activities were typically handed over to government agencies, such as municipalities, to ensure that outcomes were aligned with the initial plans and were practical and responsive to community needs. One project involved a pilot implementation, which was integral to its successful outcome. Accessing and building upon previous masterplans or projects were significant adjustments in the project processes. Adaptations were often necessary in response to unforeseen challenges. The interviews revealed that flexibility in project delivery was crucial, as evidenced by the adjustments made in response to disruptions caused by the pandemic, including alterations to engagement strategies and project deliverables.

Stakeholder engagement and collaboration were consistently identified as vital for the smooth execution and management of the projects. The interviews underscored that collaboration with government bodies is essential for aligning projects with national policies, securing regulatory support, and ensuring effective implementation and long-term sustainability. Maintaining strong relationships with these agencies throughout the project lifecycle is critical to facilitate smooth execution. Experts also

noted challenges such as poor communication and disconnection between local governing bodies, often due to the absence of a dedicated branch for cycling and micro-mobility, which can hinder progress. Additionally, it was observed that local cycling and micro-mobility projects significantly influenced high-level authorities in policy development and guidance, affirming the need for effective and ongoing collaboration.

The role of civil society organizations (CSOs) was also highlighted as crucial in advocacy, providing expertise, and fostering community engagement. In the projects discussed, CSOs were viewed as representatives of users and citizens, helping to bridge gaps between policymakers and the public. Their involvement ensures that diverse perspectives are considered and that projects remain inclusive and relevant to the communities they serve. However, challenges such as misalignment and conflicts between civil society organizations and government agencies were noted, which can create friction, impede progress, and necessitate adjustments. Additionally, motivating contributors—who are often volunteers—during the initial analysis and planning phases, before visible implementation begins, was identified as a significant challenge.

The interviews emphasized that effectively addressing user needs and disadvantages is essential for increasing bike user rates, which can be achieved primarily through active user participation in the project process. Moreover, certain projects were required to incorporate participatory methods, either due to stakeholder expectations or as a standard organizational practice. The interviews identified several key challenges, including miscommunication, reluctance to participate, and difficulties in coordinating collaborative activities. Experts revealed that in the projects discussed, citizen involvement was often minimal, with participation primarily focused on organizations, and citizens only engaging in minor or temporary tasks. When collaboration was attempted, active participation proved difficult to achieve. Communication barriers between experts and citizens, along with a lack of tools for effective engagement, further limited user involvement. Additionally, it was mentioned citizens did not feel a sense of ownership or connection to the projects.

4.1.4.2 Data & Knowledge Management

Another critical aspect was data and knowledge management, particularly the generation of data insights. The interviews pointed out the importance of gathering data directly from the field to understand user behavior and infrastructure needs. In-person observations by experts were noted as a valuable method for collecting real-time data, which informed project design and implementation, ensuring that the infrastructure aligns with the specific needs of the community. Walkthroughs in potential areas were conducted in some of the projects discussed, though the idea of bike rides through these areas, while mentioned, was not utilized in any of the key projects. Additionally, observations of user behavior were referenced in relation to other projects, but not in the primary projects discussed in the interviews.

Experts highlighted the use of advanced technology, such as GIS tools and modeling software, as crucial for data-driven planning and informed decision-making, aligning with best practices in urban mobility. While some projects discussed leveraged technology for collecting quantitative data, the application of these tools to understand user behavior and preferences was primarily associated with other projects. Additionally, experts expressed interest in the potential data and insights that could be gained from digital tools and platforms, like cycling tracking apps that are owned by private companies.

The integration of users' and citizens' insights, experiences, and feedback into project planning and design was consistently emphasized. Experts particularly highlighted the value of understanding citizens' preferred cycling routes and paths, as these insights can significantly enhance the effectiveness of micro-mobility projects. Incorporating user feedback was deemed crucial for addressing specific challenges and refining project elements, especially post-implementation.

All the experts emphasized the importance of specialized knowledge to ensure that projects adhere to international standards and incorporate best practices in urban mobility planning, thereby enhancing the effectiveness of project processes. They

highlighted the critical role of expert perspectives and detailed insights in guiding project execution. Additionally, the interviews underscored the value of effective knowledge transfer among stakeholders, which supports project processes, builds capacity, and enhances the overall impact and sustainability of the projects.

4.1.4.3 Policy & Planning Context

Throughout the interviews the importance of the policy and planning environment surrounding micro-mobility projects was emphasized, focusing on the regulatory frameworks, urban planning strategies, public perceptions, and user behavior that shape the development and adoption of cycling infrastructure. Understanding these elements is crucial for addressing the challenges and leveraging the opportunities for effectively integrating cycling into urban transportation systems.

The interviews revealed significant challenges within the regulatory environment that hinder the effective implementation of cycling infrastructure. Experts highlighted issues such as conflicting policies, insufficient support for cycling, and the car-centric nature of the current urban planning, which has prioritized vehicles over non-motorized transport. These regulatory challenges are further complicated by inconsistent policy enforcement, particularly in areas like e-scooter usage, which can endanger users. Additionally, there is a concerning trend where the broader benefits of cycling infrastructure are overlooked in favor of profit-driven agendas, leading to bike usage being deprioritized in urban zoning and planning decisions.

The integration of cycling into the broader urban transportation network was identified as essential for creating a cohesive and sustainable mobility system. Experts emphasized the importance of connecting cycling infrastructure with other modes of transport, such as public transportation, to enhance usability and accessibility. Some of the projects discussed had already incorporated this integration into their planning processes. Additionally, the interviews highlighted the need for policies that support the implementation of cycling infrastructure and

actively encourage bike usage. However, there was concern that the role of cycling in urban transportation planning is often overlooked, emphasizing the need for a more deliberate and context-sensitive approach to process framing and knowledge-sharing at the local level. The development of bike-sharing programs for urban use was also frequently mentioned by experts as a key component of effective urban mobility strategies.

The interviews underscored that public perception is crucial to the success of cycling initiatives and the development of related infrastructure and policies. Experts emphasized the need to shift public views from seeing cycling merely as a recreational activity to recognizing it as a viable and safe mode of transportation. In some projects, cycling was predominantly framed for intercity recreational use rather than daily commuting. The interviews also revealed significant concerns about the safety of cycling in traffic, especially within car-centric environments. Experts pointed out that the predominant traffic culture, which prioritizes motor vehicles, poses substantial challenges to the adoption and safety of cycling.

Analyzing user preferences, travel patterns, and the barriers that prevent cycling was also highlighted as essential. Experts noted that many potential cyclists, categorized as "Interested but Concerned," are willing to cycle but are deterred by safety concerns and the lack of adequate infrastructure. Additionally, the discussions highlighted how both communities and individuals develop coping tactics in areas lacking dedicated cycling infrastructure, often resorting to sharing car roads or pedestrian paths to continue cycling.

The findings identified through this analysis reflect the multifaceted and complex nature of micro-mobility initiatives in Ankara and Türkiye. By systematically categorizing these, the analysis highlights the critical factors that influence the success and sustainability of such projects. The connections drawn between the codes and expert insights provide a deeper understanding of the practical challenges, opportunities, and strategies that emerged during the interviews.

4.2 Generative Focus Groups

The coding and analysis of the generative focus group discussions revealed several key categories, each offering distinct insights into the cycling ecosystem in Ankara. These categories—User Profile & Motivation, User Behavior, User Perceptions of Cycling Environment, Systematic Challenges, and Involvement to the System—provide a comprehensive understanding of what it means to be a cyclist in Ankara. They highlight how cyclists navigate the urban environment, the adaptive strategies they employ, their advocacy efforts for systemic improvement, and the barriers they encounter.

4.2.1 User Profile & Motivation

This umbrella category captures the diverse backgrounds (See Table 4.1) of cyclists, focusing on their reasons for cycling, the types of cyclists involved, and their motivation to cycle in Ankara. The profiles are analyzed with categories borrowed from the literature and they underline the significance of taking different levels of comfort, experience and diverse purposes for cycling into account while designing micro-mobility systems as well as integrating citizen science into these systems.

Table 4.1 User Profiles that participated in the generative focus groups with cyclist type and cycling purpose.

Focus Group	Participant	Gender	Age	Occupation	Years	Cyclist Type	Cycling Purpose
1	P1	Female	45	Mediator	2	Cautious Majority	Commute, Recreational, Race
	P2	Female	37	Civil Servant	6	(Very) Comfortable Cyclists	Commute, Recreational, Race

	P3	Female	47	Financial Advisor	7	(Very) Comfortable Cyclists	Commute, Recreational
	P4	Female	30	Graduate Student	2	Cautious Majority	Commute, Recreational
	P5	Male	57	Consumer Rights Specialist	10	(Very) Comfortable Cyclists	Commute, Recreational
	P6	Male	38	Biologist	9	(Very) Comfortable Cyclists	Commute, Recreational, Sport/Performance
2	P7	Male	22	Undergraduate Student	2	(Very) Comfortable Cyclists	Commute, Recreational, Sport/Performance

4.2.1.1 Cyclist Types

Participants were categorized based on their comfort levels and experiences. Initially, Geller's Four Cyclist Types framework was used for analysis; however, the empirical segmentation model developed by Cabral & Kim (2020) was later deemed more appropriate, based on the argument that no cyclist is entirely fearless. Most participants exhibited behaviors consistent with the '(Very) Comfortable' and 'Cautious Majority' types. According to Geller's typology, some of the '(Very) Comfortable' cyclists could also be categorized as 'Strong and Fearless' or 'Enthused and Confident'.

Participants categorized as the 'Cautious Majority' expressed significant concerns about their safety and the lack of adequate infrastructure, leading to mixed-traffic use. They preferred cycling with companions or in groups and adopted various strategies to navigate the urban environment more effectively. Conversely, '(Very) Comfortable' cyclists demonstrated a level of desensitization to traffic conditions and

behaviors that could be perceived negatively by other road users. These cyclists navigated mixed traffic with confidence and were experienced in long-distance, suburban, or intercity routes. However, they shared some concerns with the 'Cautious Majority' but were generally more adept at coping with these challenges, allowing them to continue cycling without letting these issues significantly impede their experience.

4.2.1.2 Cycling Purpose

Participants had diverse purposes for cycling, ranging from practical to recreational. All participants indicated that they used cycling for commuting to some extent, with some citing it as their primary mode of transportation to work, while others used it less frequently for commuting purposes. Additionally, all participants engaged in cycling for recreational activities, often centered around their communities and social interactions. Some participants also cycled in races and expressed using cycling for sports, exercise, and performance purposes.

4.2.1.3 Motivation for Cycling

Participants had diverse motivations for cycling, which can be categorized into two major themes: social and community-driven motivations and personal benefits. All of them have expressed a strong desire to foster a sense of belonging and build community, which served as a significant motivator. Engaging in group rides and participating in community events provided a sense of social fulfillment. Some participants were also driven by advocacy for sustainable mobility, seeking to improve cycling infrastructure and experiences through activism and community involvement, with visibility in public spaces being a key strategy. Additionally, some participants mentioned their involvement in initiatives aimed at supporting visually impaired cyclists, emphasizing a sense of community and inclusion.

From a personal benefits perspective, cycling was described by all participants as a source of enjoyment and emotional well-being, contributing positively to their mental health and social lives. For some, cycling was an integral part of their lifestyle, motivating them to maintain it as a regular activity. Many participants highlighted health as a significant motivator, noting the physical fitness, mental well-being, and overall lifestyle improvements associated with cycling. Economic considerations, such as the rising cost of fuel, also motivated individuals to cycle as a cost-effective alternative to car use. Moreover, encouragement and support from the cycling community were important motivational factors, particularly for those new to cycling.

4.2.2 Cycling Behaviors & Practices

This category focuses on the behaviors cyclists and different strategies adopted for the cycling ecosystem in Ankara. These behaviors include adaptive strategies, technology utilization, advocacy actions, and proactive community involvement.

4.2.2.1 Adaptive Strategies

Due to deficiencies in cycling infrastructure, cyclists frequently adapt their routes and timing to mitigate exposure to mixed traffic, unsafe roads, or peak congestion periods. Many participants reported using sidewalks as a temporary adaptation to avoid unsafe road conditions, thereby underscoring the lack of dedicated cycling infrastructure. Cyclists often planned their routes to circumvent high-traffic or hazardous areas, demonstrating how infrastructure inadequacies directly influence cycling behavior. Some participants also noted avoiding or planning alternatives to hilly routes to reduce physical strain. Furthermore, to minimize risk, certain participants avoided cycling during specific hours, particularly peak traffic times or adverse weather conditions, and some explicitly avoided specific routes during nighttime.

Cyclists adopt a range of strategies to manage risk and ensure safety in an urban environment that often fails to accommodate them. Participants indicated that they exercised considerable caution when navigating traffic, which included maintaining lower speeds and heightened alertness to other vehicles. Familiarity with routes perceived as safer was also a common approach, as cyclists often memorized these routes to better manage risks associated with unexpected obstacles. Participants used various safety accessories to mitigate the risks associated with cycling in a mixed-traffic environment, such as helmets, lights, and some even expressed carrying dog repellent for stray animals on routes. Group cycling was a commonly adopted approach to reduce individual vulnerability and facilitate safer navigation through challenging conditions, thereby emphasizing the critical role of community support.

Community support emerged as a vital element in enhancing the safety and inclusivity of cycling. Group rides not only provided a sense of security but also fostered a feeling of community and mutual support among cyclists. Knowledge-sharing within the community was also highlighted, as participants discussed how sharing experiences and safety practices improved the overall skill set of cyclists. Additionally, some participants mentioned using tandem bicycles to support visually impaired cyclists, emphasizing efforts toward inclusivity within the community.

4.2.2.2 Technology Utilization

Cyclists use various digital tools and technologies to enhance safety and optimize their cycling experience. Participants frequently utilized cycling/fitness tracking apps for route tracking, fitness monitoring, and urban navigation, illustrating the integration of technology into everyday cycling practices. However, some cyclists perceived shorter or routine rides as not significant enough to track. Phone holders were commonly used to facilitate safer navigation, enabling cyclists to access their devices without compromising safety or attention.

Technology also played a significant role in fostering social interaction and advocacy within the cycling community. Participants reported using action cameras or mobile phones to document their cycling experiences, both as a personal record and to highlight infrastructural or traffic-related challenges. The recorded content was shared within their social circles and on social media platforms, serving as both a medium for personal expression and a tool for advocacy. Such documentation was utilized to advocate for improved cycling conditions and raise awareness about the challenges faced by cyclists.

4.2.2.3 Proactive Action

All participants were actively involved in civil society organizations (CSOs) related to cycling, with broader community engagement deemed essential for enhancing public perception and promoting cycling. Participation in cycling events provided valuable opportunities for community involvement and advocacy, raising awareness about cycling and fostering a cycling-friendly culture. Participants emphasized the importance of cultivating a positive image of cyclists to foster better relationships with other road users and to legitimize cycling as a respected mode of transportation.

Education was identified as a crucial component in fostering a culture of safe cycling and encouraging broader adoption of cycling as a viable mode of transport. Participants underscored the importance of training initiatives and awareness campaigns aimed at educating both cyclists and other road users on safe practices. The cycling community was also proactive in encouraging new cyclists, particularly those who were hesitant, by providing support, initiatives for training and sharing knowledge to ease their transition into regular cycling.

Participants actively engaged in advocacy to promote inclusivity within the cycling community, including initiatives aimed at supporting disadvantaged groups, such as visually impaired cyclists. Many also advocated for enhanced compliance with cycling standards and improved enforcement of existing regulations through various

channels, aiming to create safer conditions for cyclists. Participants consistently made both formal and informal requests to improve cycling infrastructure, emphasizing the critical need for dedicated bike lanes and safer urban design to facilitate everyday cycling.

4.2.3 User Perceptions of Cycling Environment

This category explores how cyclists perceive the infrastructure and social environment, identifying key barriers and challenges.

4.2.3.1 Built Environment

Participants highlighted significant infrastructural shortcomings that undermine cycling as a viable mode of transport. The lack of dedicated bike lanes was frequently mentioned as a major barrier, forcing cyclists to share space with cars and pedestrians, thus increasing safety risks. The lack of dedicated bike lanes was frequently mentioned as a major barrier, forcing cyclists to share space with cars and pedestrians, which increases risk. Dangerous infrastructure elements on sidewalks or roads, and poorly maintained bike lanes, along with them being occupied by parked cars, trash containers, or pedestrians, were recurring concerns. These issues not only compromise the safety of cyclists but also reflect broader infrastructural neglect. Additionally, the absence of secure bike parking and insufficient lighting were highlighted as major deterrents to cycling, especially for commuting purposes. Participants expressed that these shortcomings contributed to feelings of vulnerability, particularly during nighttime cycling. Safety concerns, especially related to conflicts with motorized traffic and the inadequacies of mixed-use paths, are central to the cycling experience in Ankara.

4.2.3.2 Social Interactions & Attitudes

Public perception and societal attitudes towards cycling significantly shape the experiences of cyclists in Ankara. Many participants noted that cycling predominantly viewed as a recreational activity rather than a practical mode of transportation. This perception limits efforts to improve cycling infrastructure and contributes to the marginalization of cyclists. The car-centric culture in Ankara further exacerbates this marginalization, as it prioritizes motor vehicles over non-motorized forms of transportation, reducing the legitimacy of cycling as an everyday commuting option.

Participants frequently described conflicts with car drivers and pedestrians, reflecting a general lack of awareness and respect for cyclists' space. These conflicts underscore the societal challenges that cyclists face in advocating for their rights to safe road use. Accidents involving stray animals were also highlighted as a significant risk, adding to the array of hazards that cyclists encounter in the urban environment. Female cyclists reported additional challenges, including harassment and feelings of insecurity, particularly in poorly lit areas or during nighttime rides. These gender-specific challenges not only limit the mobility of female cyclists but also highlight broader issues related to safety and inclusivity within the urban environment.

4.2.4 Systemic Challenges & Barriers

This category highlights the systemic issues faced by cyclists, from infrastructural barriers to cultural attitudes and policy challenges.

4.2.4.1 Infrastructural Issues

The absence of adequate infrastructure is a primary barrier to safe cycling. Participants consistently pointed out the lack of safe, continuous bike lanes as a key

barrier to making cycling more practical and safer. Problems such as parked cars in bike lanes, poor road conditions, and insufficient maintenance make cycling hazardous, particularly during peak hours.

Environmental factors, such as the city's topography, were noted as challenges that make cycling inaccessible to less experienced cyclists. The geography of Ankara, with its hills and uneven terrain, makes cycling impractical for many, especially for commuting.

4.2.4.2 Cultural and Social Challenges

Public attitudes, gender issues, and social perceptions play a significant role in limiting cycling adoption. The widespread view of cycling as a hobby rather than a legitimate commuting method reduces support for policy change and infrastructure investment. Inclusivity and gender specific issues were also highlighted. Female cyclists face additional barriers, including harassment and the absence of female representation in cycling focused spaces. Event and race plannings being mainly for male cyclists also indirectly discriminate female and disadvantaged groups.

4.2.4.3 Policy and Regulatory Barriers

The focus group discussions highlighted several regulatory and implementation gaps that hinder cycling development. Participants discussed regulatory challenges in recognizing cycling as a legitimate mode of transportation, as well as the lengthy bureaucratic processes that often hinder cycling infrastructure projects. There was also opposition from institutions against cycling infrastructure, with car drivers being prioritized, often for political gains.

Poor integration of cycling infrastructure with public transport systems, surface-level implementations without concrete action, and a predominant focus on recreational rather than commuter cycling solutions were highlighted as significant barriers.

Additionally, participants noted the lack of transparency and feedback in planning processes, which further diminished their confidence in the effectiveness of cycling initiatives.

4.2.5 Involvement in Cycling Systems

This category delves into how cyclists engage with systems, including government bodies, community organizations, and advocacy efforts.

4.2.5.1 Government & Institutional Engagement

Participants discussed in what ways they engage with the government and institutions, and the varying degrees of success. While there have been efforts to involve cyclists in policymaking approaches and discussions to a degree by the municipality, the reach was usually mentioned to be limited to Ankara Bisiklet Meclisi. Additionally, participants frequently expressed frustration over the lack of transparency and follow-through from government bodies, noting that despite their involvement in announced development processes, substantial progress or implementation rarely followed.

Participants reported mixed experiences with using government digital platforms for providing feedback. While some participants found these platforms useful, and had positive experiences and responses, others noted issues with transparency and inefficiency. Participants also mentioned instances where digital platforms were used for political gains without substantive action.

The role of law enforcement was described as inconsistent; while officers sometimes supported cyclists, there were often instances where they ignored or failed to enforce regulations, contributing to distrust in formal systems. Some participants even noted that law enforcement occasionally advised behaviors that contravened cycling regulations, further complicating the cycling environment.

4.2.5.2 Community Level Channels

Cyclists in Ankara rely heavily on community organizations for support, advocacy, and information sharing Civil society organizations (CSOs) play a crucial role in mobilizing cyclists and advocating for improved infrastructure. However, participants mentioned that these forums and chat groups could become overcrowded with nonessential information, limiting their effectiveness. The creation of community platforms for centralized cycling information by one of the participants was seen as a positive development. Yet issues with coordination and alignment among different CSOs remained a significant challenge.

Social media continues to be an important tool for raising awareness and sharing experiences. Participants commonly used online petitions and campaigns to advocate for regulatory and policy changes. Sharing positive interactions and cycling experiences on social media was also seen as a way to foster a positive public image of cyclists and encourage broader community engagement through incentives.

4.2.6 Key Challenges and Areas for Improvement

This category addresses the key challenges that need to be addressed to improve the cycling experience and enhance adoption in Ankara.

Infrastructure Development: Participants emphasized the need for well-connected and maintained bike lanes, secure parking facilities, and appropriate lighting. There is a need for comprehensive infrastructure planning that makes cycling safe and accessible for all.

Policy & Governance Improvements: Transparent planning processes, consistent enforcement of cycling regulations, and recognition of cycling as a legitimate mode of transport are crucial to improve the current state of cycling. Bridging the gap between policy announcement and implementation is also necessary to build trust between cyclists and authorities.

Gender Representation & Planning: Addressing gender specific challenges is critical to making cycling inclusive. Participants emphasized the need for gender sensitive considerations, safer routes, and greater representation of women in the planning processes and cycling.

Public Perception Shift: Changing public attitudes towards cycling is vital. Education campaigns highlighting the health, economic, and environmental benefits of cycling could help transform cycling from a recreational activity to a practical commuting solution.

Community Empowerment: The focus groups showed that cyclists rely heavily on their community for support and advocacy. Strengthening community networks, increasing their involvement in formal processes, and incentivizing community driven initiatives are essential to sustain cycling growth and adoption.

4.3 Synthesis of Findings with Implications for Citizen Science

This section synthesizes the findings from expert interviews and generative focus groups, systematically organized around six major themes: Project Implementation & Contextual Insights, Stakeholder Dynamics, User-Centric Design and Engagement, Sustainability and Long-Term Impact, Cultural and Social Barriers, and Policy and Governance. The following subsections provide a detailed exploration of each theme, offering a comprehensive understanding of the factors that influence the success and sustainability of cycling-focused micro-mobility projects in Ankara.

Each theme is explored in depth, supported by excerpts that reflect the perspectives of both experts and cyclists, and includes reflections on the role and potential of Citizen Science. The chapter concludes with a cross-thematic analysis that highlights the interconnections among these themes and situates the findings within the broader context of the study, particularly focusing on how Citizen Science can be integrated into micro-mobility initiatives.

The synthesis reveals significant insights into the dynamics of micro-mobility initiatives and the cycling ecosystem in Ankara. By examining the intersection of stakeholder engagement, infrastructural challenges, user behavior, and governance frameworks, several themes emerge that have broader implications for the potential integration of Citizen Science. This section discusses how Citizen Science can help address identified challenges, foster community engagement, and contribute to more inclusive and effective cycling initiatives.

For each theme, the implications of the findings for the design of Citizen Science applications are elaborated. This involves first defining the problem space using direct references to experts' and cyclists' opinions, followed by identifying the potential contributions of Citizen Science and outlining how its integration should be executed effectively. This approach ensures a clear understanding of the challenges and opportunities for Citizen Science in enhancing micro-mobility projects, creating a roadmap for more community-driven, adaptable, and sustainable solutions.

4.3.1 Project Implementation & Contextual Insights

The successful implementation of micro-mobility projects requires a deep understanding of the local context, including the specific needs of users, infrastructural conditions, and socio-cultural dynamics. This theme is fundamental to analyzing micro-mobility projects in Ankara, as it focuses on how these initiatives were realized within the city's unique urban environment. Moreover, by examining the practical challenges and necessary adaptations, it provides a detailed understanding of the operational realities faced during project implementation. Current approaches often rely on a top-down perspective, with decision-making centralized among experts and government bodies, as a result this leads to limited community involvement during planning and execution phases. Integrating Citizen Science into these projects would allow the voices of end-users—the cyclists and

community members—to be effectively incorporated, and therefore, leading to more adaptable and contextually relevant solutions.

This section explores how involving citizens in participatory planning can enhance the implementation process, ensuring that projects are better tailored to community needs and behaviors. It underscores the importance of local context by highlighting how specific environmental and cultural factors influenced project outcomes, emphasizing the need for flexibility in project management. The adjustments made in response to challenges in Ankara demonstrate how adaptive approaches can lead to more effective results. Overall, this theme grounds the analysis in real-world experiences, making the findings both relevant and actionable.

Throughout the expert interviews, it became evident that the primary flow of micro-mobility projects was centered around the organizations involved, particularly those responsible for funding. As Expert 1 noted:

> *"If we look at what was done in that project, of course, in this final project, the funder had certain criteria that needed to be met… and within that framework, the projects that were approved and had a relationship with them were funded, and I can say that the projects were developed within the scope of that funding."*

This emphasis was particularly evident during the initial stages, such as the first analysis and master plan/zoning phases. Despite many experts expressing the importance of involving users from the outset, user participation typically occurred later in the process, primarily during the design and monitoring stages, after key decisions had largely been made. As a result, user involvement often appeared more focused on validating the project's predetermined course rather than actively influencing its direction from the start. Expert 2 highlighted this by stating:

> *"What kind of information did we receive?... But generally speaking, we were presenting our suggestions and waiting for their evaluations, or rather for them to provide feedback."*

The focus groups revealed that participants' involvement in project processes, when invited, closely aligned with the experts' descriptions. Participants primarily tested already implemented systems or validated predetermined bike routes, rather than influencing decisions from the start. Cyclist 3 shared their experience:

> *"They included us in that group. They gave us cards that we would all use, and we used them. We shared our feedback in the group."*

Cyclist 2 also described their limited role:

> *"Actually, when we talked about the routes… Bike lanes were part of the initial master plan. In a way, the plans were already prepared for us. We just wanted something to happen, at least."*

In the focus group discussions, participants revealed that the municipality suggested that the Ankara Kent Konseyi Bisiklet Meclisi would study where bike lanes and infrastructure could be implemented. However, participants expressed that these routes were not utilized in any projects or integrated to the system to their knowledge. Cyclist 5 elaborated:

> *"...Now, there was a formation called the Bisiklet Meclisi, and here the municipality had its own cycling groups within Ankara and had a say in it, and someone was elected to lead. Then we were asked what our concerns were. Of course, the most talked-about issue is bike lanes… they said to us, 'Okay, where could they be? You do some groundwork on this and tell us.' … we identified roads in Ankara that could accommodate bike lanes… For the roads where bike lanes wouldn't be possible, we asked for signs to be put up to raise awareness for cyclists. … I mean, we already raised these issues under the municipal umbrella, and we are continuing to do so, but how much progress have we made? We're not really making progress."*

The experts interviewed did not mention any reference to such a map of routes being used in their processes. Furthermore, while the municipality's request was an attempt to include cyclists in the process, it lacked collaboration with experts, as well as proper guidance or structure. This approach contradicts the experts' strong advisement on combining expert knowledge with user perspectives to ensure the best outcome. As Expert 1 explained:

> *"... Through projects... Yes, of course, there's an expertise side to this, and planning the most suitable routes and paths or improving efficiency in urban transportation is really important."*

Expert 3 also described as:

> *"... Bicycles are a bit more technical. ... For that reason, of course, you take input from participants at certain points, but at other points, you shouldn't. Because it becomes an engineering matter at that stage; it's mathematical, and they might not understand that part. The user knows their side of it."*

This signals a disconnect between the experts running the projects for Ankara's cycling systems and the cyclists attempting to contribute to the systems. As a result, this disconnect creates an atmosphere of frustration within the cycling community, as their contributions do not seem to lead to tangible actions. Cyclist 3 echoed this sentiment:

> *"But as I said, after collecting them (feedback), it was said that it would be made available for public use in November of that year, but it's already been a year or two since then. Like I said, they were included in the process. The municipality ... wanted our opinions to be consulted often. He carried out the process with us like this, but it didn't reach a conclusion. ... It didn't progress much further. I mean, it got stuck at some point and stayed there, after it started. I don't know. I'm not a member of the Bisiklet Meclisi anymore,*

and maybe my friends would know better, but they're not very active right now either."

Cyclist 1 also added:

"But all of those were within the scope of a project. Of course, a grant was obtained, and they were done within the scope of that grant. They were all placed in front of the metro stations and Ankaray, but they're not there anymore. Will they be there eventually? They definitely will, because it's a European project, meaning it has to be completed. The contract must be fulfilled, and the timeline must be adhered to. But whether it's related to the municipality, I don't know."

This lack of transparency and the resulting frustration could undermine confidence in future projects, reducing the willingness of community members to participate. Experts have already highlighted the challenges of fostering active participation, particularly in the early stages before tangible outcomes are visible, making this an important area to address. Expert 1 mentioned:

"... actually, most people don't want to talk, and workshops often turn into arguments or conflicts."

Some experts also mentioned the difficulty of mobilizing volunteers before reaching the outcome phase, which many projects discussed concluded with the handing off guides and plans to inform implementation, rather than completing the entire project cycle. Expert 1 also described:

"When it comes to something truly based on voluntary participation ... it's really difficult to create momentum and motivate people. ... and most of the time, after we plan an event and get out there on the ground, a lot of people become interested. But beforehand, when people hear about it and say, 'I want to contribute too,' it's really very few people in comparison."

There also seems to be a disconnection between what participants and cyclists expect projects to achieve and the actual delivery expectations. Most projects do not see full implementation but are handed over to government bodies, mainly municipalities, for further execution. Expert 2 explained:

> *"... Maybe municipalities need to be a bit more transparent and play a more active role, but we often fall short in that regard. ... we proposed around 80 routes, although I can't remember the exact number. ... But we already made our proposal to the municipality in phases. ... the goal was to continue with implementation under the municipality's responsibility until 2040, as agreements were made. ... Only a very small part of it has actually come to life. ... implementations like these, are around 2 kilometers in length, that are more focused on integration. ... Actually, the municipalities need to handle those themselves…"*

Expert 3 also stated:

> *"I don't have an example to give at the moment, because after we made the plan—I'm speaking as an urban planner now, not on behalf of my organization—once the plan is made, it's under the responsibility of the municipality. Of course, if we're doing another project with the municipality, we do go back and check whether it's being used in the field or not, but we don't take any formal action on it."*

Expert 4 also illustrated the situation as:

> *"If it (implementations from the project) happened, I'm not aware of it, because it was distributed to all public institutions a year ago so action could be taken. The wheels turn very slowly in the public sector. ... All of these are 'if' statements. If they do it—well, if they don't, there's no obligation or enforcement anyway... It's not a law.*

... We need some passionate people in the public sector to implement these."

The findings from both stages indicate that the process often reaches a bottleneck, typically on the side of governmental bodies. There is a lack of transparency regarding project outcomes, with no accountability or obligation to follow through on the recommendations and plans produced. This is where Citizen Science has the potential to address these issues—by fostering greater transparency, accountability, and engagement throughout the project lifecycle, thereby ensuring that the voices of citizens are not only heard but acted upon.

Incorporating Citizen Science at early stages can better align community expectations with project outcomes, ensuring a more meaningful impact. By involving citizens from the initial stages, Citizen Science can elevate participation from mere validation to actively shaping project scopes and roadmaps. Establishing such a platform would also ease outreach processes, creating a defined channel of communication between experts and cyclists. Expert 2 mentioned their outreach and engagement with the community:

“In addition, we had focus group meetings. We invited everyone we could reach who lived in Ankara to those. From there, we involved initiatives, cycling initiatives, associations, ... We were in communication with all of them for these three years, ... compared to the municipality, which we held regular meetings, less frequently.”

The creation of such a platform could also help define the responsible branch or body within government organizations in Ankara. Currently, there is significant ambiguity regarding which entity oversees cycling matters, making it challenging to navigate the official system, as expressed by Expert 3:

"... we never managed to work with Ankara. We worked on bicycle-related projects in 14 cities, but not in Ankara. We

couldn't work with Ankara—it didn't happen. There's no one to communicate with either. Ankara should open a department for cycling, like the cycling departments in Istanbul and Izmir... Here, I think it's EGO that's responsible in Ankara. But EGO is ultimately a bus company. At first, it was fine, but now a department needs to be established—there's no one responsible for cycling. We're holding workshops, and no one from Ankara Municipality is coming... We're that disconnected from these issues."

Moreover, a Citizen Science platform could democratize participation, making it accessible to more cyclists or citizens who are interested in contributing but do not want to be active members of a CSO or the Bisiklet Meclisi. This would enable individuals to participate in project processes or share their insights without formal affiliations. Some participants expressed feeling disconnected from project processes after leaving the Bisiklet Meclisi or being unable to contribute, even though they were willing. Cyclist 1 shared:

"… We need to be volunteers, of course. Now, why am I not involved in this situation? Because I'm not in the Bisiklet Meclisi. They once told me to fill out a form, but I chose not to. So, I don't know (the project state), but those who filled out the form and participated in the process are in the loop. (I'm not involved) Because a president is elected there, you have voting rights, etc. It's a different platform. Sometimes it causes issues, sometimes it doesn't. It's related to the individual's (willingness to) voluntary commitment, of course."

It has been revealed in the focus group discussions that the participants already do share feedback and their experiences while cycling through various channels, such as the existing application of the Ankara municipality, which has yielded positive outcome. Cyclist 4 recounted:

"... there's a pedestrian path on the right side, in the opposite direction, and I pass through there. It's always full of broken glass—people throw liquor bottles there, or there are glass shards, and even car headlights are broken there. That's why I wrote a complaint. I asked, I think it was Mavi Masa (old name of the municipality's app) back then—I'm not sure if it's still called that now. I said, 'This is the situation; I use this route regularly. Every other day, ... I ride daily on average.' They actually sent someone over there. They cleaned it and sent me a photo of it. I was shocked. I said, 'Wow, they actually took it seriously and had it cleaned.' ... they sent five people to clean it, and they sent photos and videos of it being cleaned, noting the time."

It is evident that the cyclists were surprised and very appreciative of the response and the outcome of the situation with very clear transparency from the municipality's side. However, it is also seen that this path of resolution was discovered through an assumption and shared past experiences from others. It can be argued that processes not being a known and openly advertised way of resolution by the officials might make it difficult for everyone to know and use it, limiting the engagement. Citizen Science can provide a clear, accessible path to resolution and for all citizens to contribute, ensuring that everyone's voice is heard effectively. Participants also shared other more informal channels such as social media to relay their requests, that ended with putting pressure on institutions to act. One experience shared by Cyclist 4:

"... It was a private company, and I wanted to park (the bike) there, but the private company didn't care and said it wouldn't be possible. So, I complained on Twitter. ... (the company's) Brussels office directly emailed me. They wrote in English, saying, 'We've heard about your complaint, how can we help?' Later, the (company) management came down to our office, and everyone,

including my boss, got all worked up like, '…what are you doing?' (If you had just sent an email, they might not have cared much, but Twitter created pressure.) Exactly, definitely—it's a brand, after all."

Cyclist 2 also added:

"… exactly, especially the grates... We take photos and send them, and thankfully (the mayor of Ankara) takes care of it and replaces them. We send them to the (Ankara) Metropolitan Municipality, and (the mayor)—we took a video, shared it on Twitter, and they got back to us, fixed it, and even sent videos of the fixture along with photos, and they did this within two days."

The current state of implementation and context of Ankara's cycling system clearly demonstrates issues and gaps. The examples illustrate the potential for citizen-driven initiatives to foster greater accountability and trust between the community and governing bodies. Establishing formalized channels for citizen input through a dedicated platform could enhance these efforts, making community involvement more systematic and impactful. By creating formal mechanisms for ongoing community input, Citizen Science could help ensure that projects not only meet initial goals but adapt dynamically as community needs evolve. A potential Citizen Science platform would complement the existing system while elevating the short comings, strengthening the dynamics between the project teams, experts, the end-users of these systems, the citizens of Ankara that cycle and the government which is the ultimate facilitator in the end.

4.3.2 Stakeholder Dynamics

The findings from the analysis reveal the inherent complexity of involving a diverse array of stakeholders, whose interactions significantly shape project outcomes. This section presents insights into the dynamics between key stakeholders—government

agencies, private sector entities, NGOs, civil society organizations, and the general public—and how these dynamics influence the planning, implementation, and sustainability of micro-mobility projects in Ankara. The findings highlight how different stakeholders contributed and collaborated, ultimately influencing the trajectory of these initiatives. This includes insights into power relations, influence, and conflicts that arose during the project lifecycle, as well as the mechanisms through which goals aligned or diverged. Additionally, the findings underscore the role of Citizen Science as a crucial tool for bridging gaps, enhancing transparency, and empowering community-driven contributions in urban mobility projects.

As evidenced in the findings, the key stakeholders in the micro-mobility projects for the cycling system include government organizations alongside the other organizations that are involved as consultants or funders. However, the analysis revealed a disconnect with experts and government authorities regarding cycling, as well as a lack of coordination within the government levels themselves, as illustrated by Expert 3:

> *"... we looked at who deals with cycling across different units, because there isn't a specific bicycle department in the municipality. It involves different units, like the parks and gardens department, the cultural directorate, etc... and actually, people involved with cycling fall under all of these units, but it's like they aren't aware of each other."*

The scattered nature of government-level resources for cycling systems can lead to inefficiencies, spreading resources thin and making it difficult for different departments to collaborate effectively, even without involving external stakeholders. This lack of a defined authority responsible for cycling infrastructure can create confusion, leading to delays and missed opportunities for project integration. A defined Citizen Science platform can help clear the responsible team or branch allowing for a direct contact point.

However, along with organizational collaboration issues, adding citizens further complicates the dynamics. Multiple experts expressed their active efforts to bridge the gap between government levels and the public, as stated by Expert 1:

> *"Usually, when we work with municipalities, one of their requests is for us to be a bridge in the participation process."*

This need for a bridge was further illustrated by Expert 3:

> *"... issue between municipalities and CSOs—they don't really like working together. Because CSOs can be very activist, and their activism can sometimes manifest as pushing the municipal employee. There's a regulation, and the municipal employee is simply implementing it—they have no choice. ... In such situations, the gap between them widens, and communication breaks down. So, to establish that communication, for instance, we encouraged them to work together."*

This disconnect highlights the need for an impartial facilitator to mediate these conflicts, which is where Citizen Science could play a transformative role, by facilitating dialogue without the constraints of activism or bureaucratic regulations. It also illustrates how cyclists are marginalized in the light of institutional barriers. Participants in the focus groups were proud of their activism and advocacy efforts. However, it could be argued that the main issue is the regulations in place not satisfying cyclists' needs, thus causing this divide.

Some experts expressed their hope that different models of collaboration could help mitigate these challenges, as stated by Expert 1:

> *"The issue is bringing them (CSOs) together with the municipality, but that can lead to a serious problem. It requires designing with different models that can prevent this, really creating an environment for dialogue and communication... If it's within the*

realm of possibility, the municipality and CSOs can still come together, but we hold separate meetings."

A Citizen Science initiative could be the different model needed to accommodate all parties and bridge the gap. Such an approach can act as a neutral platform for enhancing collaboration between stakeholders, providing structured methods for dialogue and aligning stakeholder interests more effectively.

The findings highlight the fragmented nature of government responsibilities, power imbalances, and the challenges of bridging gaps between stakeholders, including CSOs and municipalities. Citizen Science emerges as a promising model to mediate these complexities, offering an impartial, community-driven solution that can empower all parties involved and facilitate more cohesive project outcomes.

4.3.3 User-Centric Design and Engagement

Previous sections established that the current system largely follows a top-down approach, with minimal contributions from citizens that extend beyond validation of decisions already made or planned for the cycling systems. The contributions cyclists make are generally limited to providing feedback and submitting minor correction requests. However, integrating user perspectives in the design and implementation of micro-mobility projects is crucial, particularly in the context of participatory planning and Citizen Science. This theme critically assesses the extent of user involvement in project processes and evaluates the effectiveness of current engagement strategies. It underscores the importance of developing better tools and processes for gathering user insights during the initial stages of project and system development, as well as for collecting feedback on existing systems and user experiences, ensuring that users feel connected to the projects. This analysis is key, reflecting the growing emphasis on user-centered design in urban mobility initiatives.

The expert interviews highlighted the importance of user behavior, particularly with respect to their preferred cycling routes. Expert 1 emphasized the significance of user preferences, stating:

> *"... there's an expertise side to this and planning the most suitable routes and paths or improving efficiency in urban transportation is very important, but along with that, understanding which of these designated routes has demand is also very important."*

Expert 3 also expressed their expectation during the planning process, saying:

> *"... I would like to see, first of all, the numbers. I would like to see the density. Whether it comes as a notification or something else in such an application, I would definitely want to see the most heavily used route, like traffic maps."*

These insights strongly resonate with user practices of tracking their routes through various applications. Experts deem this data crucial, as improperly planned paths that are not preferred by cyclists often end up being occupied by other road users, such as cars parking in bike lanes. Such occupations lead to the misconception that there are not enough users to justify dedicated cycling infrastructure or projects. Expert 1 shared their concerns:

> *"If a certain path or implementation isn't being used by people, then these routes either become vehicle parking areas, get abandoned, or are taken over by encroachments and violations. These, in turn, create other problems."*

Expert 3 further stressed the impact of improper planning:

> *"... maybe the road there is wrong. Maybe it shouldn't be there at all ... But sometimes that's the case. Sometimes... it's like this—you need to have a valid point for defending the route you're*

advocating for. Otherwise, it's just a pointless effort... Both sides end up wasting their time…"

These statements underscore the importance of harmonizing expert perspectives with user experiences. During the research stages, it was also evident that many of the experts were not cyclists based in Ankara, and the limited access to the users' experiences and preferences in the early stages of projects lead to well-known routes taken by cyclists in Ankara being overlooked. One of the most important strategies utilized by experts is to connect recreational areas to the rest of the urban area. This is highlighted by Expert 3:

"... the situation is different in Istanbul... It started from the coast, and they're trying to integrate it inward to the city. It's a logical approach... It's used frequently in Istanbul—much more so than in Ankara. ... What Ankara needs to do, since it doesn't have a coastal route... the easiest way to create awareness and adapt people is to start with recreation."

The biggest recreational area that cyclists utilize in Ankara is at Eymir lake. Cyclist 5 expressed this by saying:

"When it comes to cycling, Eymir is one of the few prominent spots, there's really no other example. Mogan Lake is not a great place, because it's also a picnic area—it gets crowded. Not too much, but the nature there is beautiful, and incredible things could be done there. MTB (mountain biking) trails could be created from the paths. People could be encouraged more. Eymir Lake has such high potential, but it hasn't been updated or developed in any way."

Experts are also aware of Eymir Lake as a predominant area for recreational cycling. Expert 3 explained:

"... there's Eymir, for example. Is there a bicycle path in Eymir? No... Is it a pedestrian path? No... It's just paved asphalt... It's unclear what it is—pedestrian, bicycle, or something else. In large park areas, for example, truly safe, designated bike paths could be created, and then by connecting these areas to each other, it could be easily integrated into the city. I think it's definitely possible... but it's (the path to Eymir from Oran) a hill that's impossible to climb, even if you manage to go down."

Expert 4 also commented on the recreational perception around cycling and the difficulty of reaching Eymir by bike:

"... there's a perception that bicycles are only used for recreational purposes. And based on this perception, cycling continues intensely in areas with recreational spaces. Around places like Mogan, Eymir, the channels, the Çubuk area, the area around Çubuk Dam, and Mavi Lake... around the lakes, particularly around Eymir Lake. If people don't want to rent, they bring their own bikes using bike racks attached to their cars. Generally, people reach this area by going down the hill next to TRT from Dikmen Hill. But for those who want to get there with their own bike, the well-known route becomes practically unusable."

However, cyclists in Ankara can reach Eymir by a relatively straightforward road (Figure 4.1) connecting Kızılay around Kurtuluş directly to Eymir through Imrahor Valley. Cyclist 6 explained the route they use and a potential bike path scenario:

"Imrahor Valley is actually very nice; there isn't much vehicle traffic. It's a comfortable, flat road, only with some dogs since it's a route that stretches across Ankara and connects to Kızılay, extending to Kolej. I say if they expanded this road and made a bike path here (drawing on the combined map), it would be

amazing—like, incredibly enjoyable. ... If they built a proper road here, it could be expanded beautifully. These are things that are within the realm of possibility. The road could even start here, surround Eymir Lake, and connects to Mogan. ... It should start at Kurtuluş Park, with a wide, flowing path—only the road on the Akdere side is very narrow. ... In my opinion, a route could be made from those roads. ...”

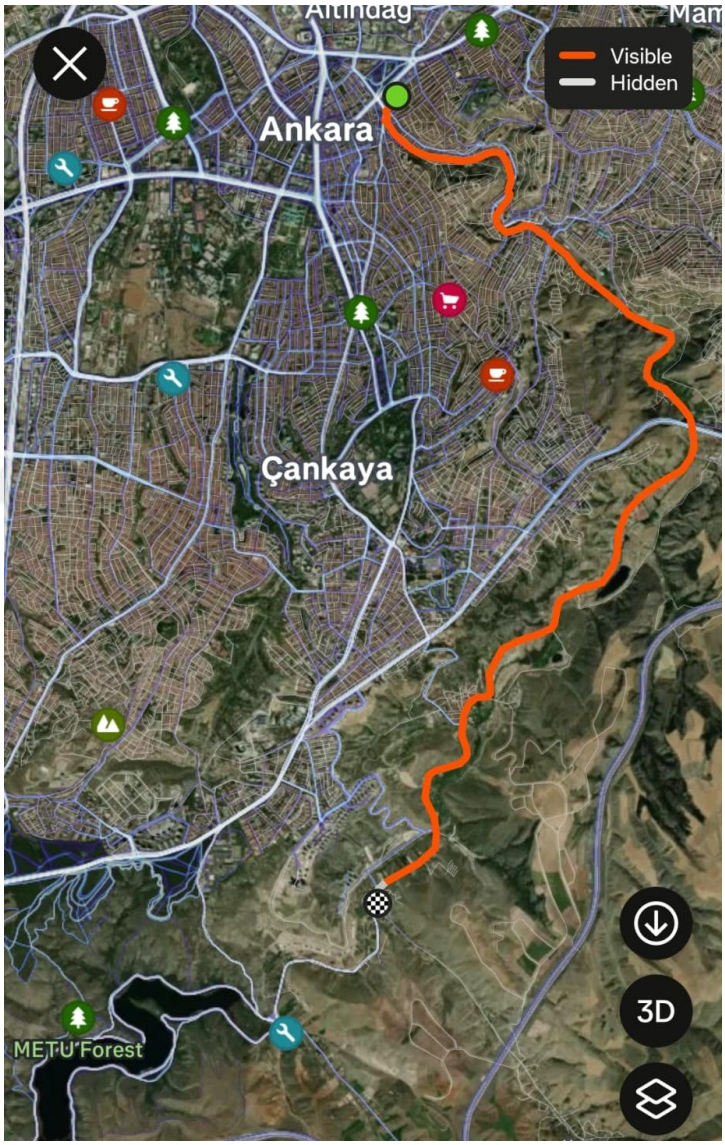


Figure 4.1. Map of the route to Eymir Lake from Kurtuluş Park through Imrahor Valley from the author’s Strava recordings of her personal ride.

When shared with the experts during the interviews, many expressed not knowing this popular and well-utilized route, which fits into the most common strategy for cycling systems. This further emphasized the urgent need for user experiences and knowledge to be utilized and shared with the project teams working in Ankara.

The discussions during the focus groups revealed how closely participants' behaviors and shared understandings align with a shift towards a more collaborative approach. Cyclist 4 expressed the potential platforms similarity with:

> *"Ankara's version of Strava, in my opinion."*

The participants expanded the concept by connecting their usual practices for communicating the challenges they face and the diary process of the research. Cyclist 2 elaborated:

> *"Applications like Strava, for example, are usually for sharing your own experience, like saying, 'Look, I rode 60 km today.' If we were to use something similar for communicating with the municipality… Normally, on Strava, we can't show the issues we face—you can only see the distance I rode. I recorded a video with audio (during the diary stage), and that could be amazing because then I count everything out—'there's this here, there's that there'—and they (authorities) would probably get overwhelmed and send an email. … If there were someone truly dedicated and willing to do this, then maybe things could really be fixed. Maybe something could really change."*

In the Project Implementation and Contextual Insights section it was explored how cyclists already engage with the current system through official and informal channels, using videos, photographs and other types of media to reach out for resolutions. These forms of input could still be effectively utilized within a Citizen Science platform, further extending user contributions with geolocation and mapping capabilities, drawing parallels with the existing geographical information systems

(GIS) that experts and projects are already using. Following the example scenario illustrated by Cyclist 2, connecting route information with potential barriers or requests that users encounter would ease the process of mapping preferred routes alongside the challenges faced by users, thereby expediting the planning processes already undertaken by experts.

The experts also expressed that knowing the local context and the challenges users face on the daily basis through inputs from their perspective, would be valuable assistance to their process. Expert 2 explained, in comparison to other participatory approaches utilized by other projects abroad, highlighting the lack of similar approaches in Türkiye:

> *"I haven't seen an example of it here yet, but abroad, when these types of things are done, they place a board nearby where people can write their ideas or stick stickers to share their thoughts. Or there's apps where people can take a photo of the problem area and send it directly to the relevant municipal department or a collective's department, like a solution desk, from where it gets distributed to the necessary departments. So, I've seen systems designed to increase the relationship between users and the public sector. However, we haven't done anything with those, like a board or an app, but I believe these should now be included in the process."*

A Citizen Science platform where users can directly relay their input to the relevant establishments and experts involved in these system projects, can elevate many steps that are currently challenging to implement. Cyclist 1 expresses the potential of such a system:

> *"If there are 20 complaints about the same spot on that route, then they will definitely take it seriously. I mean, the municipal employee, police, whoever—it will definitely be taken seriously. It's definitely something important, and I wish it would be done."*

With Citizen Science initiatives there's a potential for contributors to see the number of contributions, and how these translate to actions creating the appreciative reaction that's already seen when the municipality is responsive and transparent with the cyclists' requests. This promotes a sense of accomplishment and ownership over the system, which Expert 3 highlighted as invaluable for the continuity of the cycling systems:

> *"…Because if the public doesn't take ownership of this, doesn't know about it... these bike lane implementations will also be removed. There are many examples of this."*

The findings in this section emphasize the necessity of integrating user perspectives into the planning, design, and implementation stages of micro-mobility projects. The current top-down approach, which often neglects the nuanced experiences of cyclists, has led to inefficiencies and missed opportunities for improving urban mobility. Both experts and users highlighted the importance of understanding and incorporating user preferences, particularly with regard to popular routes and recreational areas like Eymir Lake. There is a clear need for better coordination and communication between government bodies, experts, and the cycling community.

Citizen Science emerges as a promising avenue for bridging these gaps. By providing a structured platform for users to contribute data, share their experiences, and highlight challenges, Citizen Science can transform passive feedback into active participation. This collaborative approach has the potential to not only enhance the quality of cycling infrastructure but also foster a sense of ownership and community among cyclists. Moving forward, embracing user-centric methodologies and integrating Citizen Science tools can be crucial for the successful and sustainable development of micro-mobility projects in Ankara.

4.3.4 Cultural and Social Barriers

Cultural and social factors play a significant role in the adoption and success of micro-mobility solutions. This theme explores the specific challenges faced in implementing and promoting cycling in Ankara, where car-centric attitudes and social norms often hinder progress. By examining these barriers, this analysis provides a nuanced understanding of why certain initiatives struggle to gain traction. Moreover, it reflects on how Citizen Science can help overcome these barriers by fostering a cultural shift and increasing visibility. Citizen Science initiatives have the potential to empower community members to actively participate in project processes and awareness campaigns, thereby fostering a sense of ownership and contributing to a broader cultural transformation. Addressing these cultural and social barriers is critical for the successful implementation of micro-mobility projects, making this theme highly relevant to the local context of Ankara.

Throughout the research stages, participants consistently highlighted the importance of cultural factors. Experts underscored the relevance of understanding local culture for effective project implementation, while cyclists pointed out that cultural attitudes were among the most significant factors affecting their experiences. The main barrier to cycling culture in Ankara is the city's deeply rooted car-centric planning and social values. Expert 3 describes this phenomenon and its effect on collaboration and future projects:

> *"... There's a strong focus on individual car use. ... people in Ankara love buying cars. ... it's just a different culture here in Ankara. ... That's why those kinds of companies (shared systems) focus more on Istanbul, Izmir, and Eskişehir. If they're going to expand somewhere in Anatolia, they go to Eskişehir. Because in Ankara... unfortunately, is the city in Turkey with the highest car ownership, and everyone has a car. You can't really get anywhere without a car. So, who are you going to get on a bike, that person won't leave their car to ride a bike."*

This highlights that car ownership is deeply ingrained as a staple mode of transportation in society and a necessity, which limits the appeal of alternative modes of transport, including cycling. Expert 1 also emphasized the correlation between area selection for implementation and cultural attitudes:

> *"... the municipality also needs to take serious ownership of this issue and take action... Prioritizing work in this area supports the use of bicycles in those spaces. But I can say that, for sure, this is also a matter of culture and habits."*

Focus group participants echoed similar perspectives. Cyclist 3 briefly summarized the situation:

> *"Ankara is a car city—its culture is oriented towards cars."*

Cyclist 1 elaborated further:

> *"In my personal opinion, Ankara is really bad in this regard. We are very far behind—it's not just a little behind, but really far behind. Can it be done? Yes, it can. Elsewhere, on a narrow road, they've even narrowed it down to a single lane for cars and made a bike path. We can do this too, but we aren't able to. It's people's culture, of course, they need to show respect. I think that respect hasn't developed in Ankara yet, but it could happen in the future."*

The participants recognized that changing the culture around cycling is essential—not just for cyclists, but for everyone in the city. Cyclist 7 articulated the broader social and environmental benefits:

> *"We're reducing carbon emissions. We're environmentally friendly, and the bicycle is an economical, healthy, and eco-friendly means of transport. Increasing the use of bicycles, and fostering a bicycle culture, is necessary not just for us but for everyone. After all, the world is heading towards global warming.*

Sure, fossil fuel cars have their place, but at least in good weather, healthy people could commute by bike."

The lack of a cycling culture is particularly evident in interactions with car drivers. Many cyclists expressed concerns about driver behavior, even as some have become desensitized to these challenges. Safety is one of the most important parameters in urban planning cycling systems, and essential for users to consider cycling as a mode of commuting. Cyclist 5 explains:

"So, think about large vehicles, like buses or trucks. When they pass by us, the wind they create affects us negatively. On top of that, they honk their horn, which scares us. We get nervous when riding a bike—honking has no meaning at that moment, I mean, if they were going to hit me, they would anyway; it's just like they're saying, 'I'm coming.' ... It makes us jump, and we get scared, wondering if there's something wrong. It affects us negatively. .."

This stems from bicycles not being recognized as legitimate vehicles in the transportation network, effectively rendering them invisible to many car drivers. Cyclist 6 further explains:

"People tend to drive in a bit of an impatient way, like they're in a rush to reach their destination. ... But the braking capacity of a car is not the same as a bicycle's. When they hit the brakes, a car can stop quickly, but a bike might not be able to. Once they get into that mindset, they don't pay attention to anything. Especially a bicycle—it just vanishes from their attention completely."

These statements underscore the perception that bicycles are not seen as legitimate vehicles on the road, leading to dangerous situations for cyclists. The absence of dedicated infrastructure further contributes to this sense of vulnerability. As Expert 1 noted:

> *"There was a study conducted in the UK, if I'm not mistaken, around 2015, which showed that 85% of cyclists don't feel safe without proper infrastructure. And because they don't feel safe, they don't choose to ride a bike. Therefore, infrastructure here isn't just about painting a bike path; rather, it's about designing and providing proper infrastructure where people feel good and that they can stay away from traffic collisions—it changes a lot of things."*

Most cyclists also expressed they avoid busy, high traffic roads for this reason. Collisions and accidents involving cyclists are not uncommon in Ankara, and harassment from car drivers compounds this problem. Cyclist 5 describes the seriousness of the situation:

> *"I mean, if we (cyclists) have a place in the law, then we should use these roads with mutual respect. But unfortunately, many people lack this respect, and because they are uneducated and unaware, we end up paying the price with our lives. In the last two years, between 300-350 of our friends have died. Across Turkey, that's a large number, and it has increased even more in recent years."*

If it's not an accident, it's harassment towards the cyclists. Cyclist 2 shared their experience:

> *"... for example, today, while coming here, Cyclist 4 was crowded by a female driver. There was a bus, and we were passing right beside it. Of course, we did our part by blowing the whistle and ringing the bells. During that moment, the female driver, unsure where to go, ended up crowding Cyclist 4, almost hit her mirror a bit. The gestures from the driver weren't nice at all. Normally, if I had experienced something like that, I would have pulled over and*

asked, 'Are you okay?' I mean, after all, we are all human beings. We don't necessarily have to be driving a car to deserve respect."

Cyclist 1 also shared:

"Harassment happens quite a lot, especially at night, when we're not causing any harm to anyone. Especially from male drivers—they shout, make loud noises, honk as they pass by. I think one day I might end up being the victim of an accident because of it. I do react, for example, I blow my whistle… I signal, saying that I'm going straight, but still, a driver cuts in front of me. … if an accident happens, it could be fatal—we might lose control, fail to slow down in time. I think they do it intentionally now. These are very serious and important issues. Maybe we can tolerate grates or poor road conditions to some extent, but these are really serious—they go beyond harassment and are deliberate attempts to harm."

The lack of safety and respect for cyclists deters many from using bicycles. These issues are further complicated by gender dynamics, as female cyclists reported facing more frequent harassment on the roads. Cyclist 4 shared their experience:

"I think it was in 2018. I was working near Kavaklıdere, and I tried cycling from home to see if I could do it. A taxi driver close-passed me near the embassies on Atatürk Boulevard, and I got really scared and gave up cycling. Later, I had the chance to work abroad, and that helped me overcome my fear. … Back then, the taxi driver also verbally harassed me because, you know, you're not only a cyclist, but also a female cyclist, which seems to invite more harassment. I can say that it's more open in Turkey. The attitude is like, 'Go cycle in a park or something,' and they see you as little girl, child. That can be very unsettling. …"

The perception of cycling as merely recreational or suitable only for children, rather than a legitimate mode of transportation, also contributes to cultural barriers. Cyclist 8 explained:

> *"…There's this thing in society about bikes being gifts for good report cards, but we've never looked at it that way. … But if the traffic or public awareness in Ankara were better, these people would genuinely use bicycles more for transportation. Because these are people who are aware of the traffic and everything happening on the road. They also know that drivers could get too close and even hit them. People want to ride bikes, but they're scared, and they have every right to be."*

Cyclist 5 adds to the discourse about gender:

> *"… Women actually want to ride bikes, but they don't have the courage because they're afraid of harassment in traffic, of those people's attitudes and behaviors. What we want is for you, for women to ride, for everyone to ride, in society. There was a lady over here who said something like, 'When I see a woman riding a bicycle, I feel a sense of freedom.' If I can find that quote, … 'women, bicycles, freedom'."*

This sentiment was echoed by other female participants, who emphasized the importance of initiatives within their community to teach women how to cycle and navigate traffic. Cyclist 1 explains:

> *"… there are very few women cyclists in cities in terms of training and adapting to traffic. There are a few women's groups here and there, but aside from that, most groups are mixed, and about eighty percent of them are men. Men are already riding, but women hold back. They hesitate to wear tights—they feel that dressing like that while riding makes them seem provocative. They hold back. But*

once they believe that it's not like that, there's no problem anymore. If they believe in themselves, others will believe in it too, and encouraging that is already the goal. Of course, men should ride, and women should ride too."

Cyclist 4 expanded on the significance of bicycles in empowering women:

"Bicycle is a great vehicle to liberate women, especially in areas with lower socio-economic levels."

The lack of gender representation is also evident within cycling organizations. Cyclist 1 shared her experience of indirect discrimination through event planning:

"... we participated in the cycling race in Ankara with tandem bikes. It was actually a bit of an activism-driven participation. To be honest, I knew I wouldn't be able to complete the course, even if I did it on my own, because the roads in Ankara are very hilly and they chose a terrible route. The cut-off times, meaning the points that you have to reach within a certain period, were poorly chosen—they shortened those times at the last minute, on the last day, which caused many people to be disqualified. Many of our female friends could have completed the course, but were disqualified because of that."

Cyclist 2 expanded on the lack of female representation:

"... they will get used to it over time. When you look at the visuals of these kinds of races, the representation is centered on male cyclists—there's no presence of women. It's like women don't even exist. The medals, all the visuals, the advertisements—everything. Even for regular non-tandem rides, all the visual materials are focused on male cyclists. That's one of the reasons why we wanted to participate."

These examples reflect the deep-seated cultural and societal barriers that persist, very complex and multi-dimensional. This lack of culture becomes apparent when cyclists try to contribute and engage with the system, or even when experts plan their projects around it, trying to fit in to the boundaries of what's left and deemed enough for cyclists. One example of locals being opposed to implementations was from the bike lane implementation done at Anıttepe. Cyclist 5 shared an example of backlash against cycling projects by local businesses:

> *"Their routes have been prepared—the routes are already connected to universities and industrial zones, but it can't be implemented. We could give a few examples of why this is the case. For instance, the road built near Anıtpark wasn't welcomed by the local shopkeepers and residents in that area. Why didn't they want it? Because they said, 'Where are we going to park our cars if a bike path is built here?' A solution was found—the road was narrowed a bit more. It was initially wider, but when it was narrowed, cars ended up being parked along its edges."*

Expert 4 confirmed this by noting:

> *"Yes, they did it (Anıttepe bike lane), but I'm not sure how effectively it's being used. Because, as far as I remember, there is also the issue of cars parking on the bike path there. Population density has a big impact here, as does the number of vehicles. Of course, where are they going to park? This problem extends all the way to parking planning—sure, let's integrate bikes into the shared road, but then what? Let's slow down the vehicles and turn all of Maltepe and Dikmen into a Citta slow. But car and population density are all so high—where will these people park? Now, there's a street where cars have slowed down and shared bike paths are used. Cars move along, cyclists are riding, but cars*

start parking in the area meant for bikes, buses try to pull in, and cyclists can't use it."

This also stresses the importance of right planning and area selection. Other than the opposition from locals, institutions also tend to oppose to cycling projects near them. Cyclist 2 explains:

"We do have a few bike paths, although not many. There used to be a bicycle path master plan, and it was on Ankara's agenda—back when (the mayor) first took office, we were in the middle of such an initiative. But it ended up on the shelf, even though it was being funded as a grant and didn't have any cost. The process is moving very slowly. We do have a few kilometers of bike paths in the city, but those also faced bureaucratic obstacles, which delayed the process. Many institutions along the route didn't want a bike path, specifically the one extending to Beşevler. It didn't pass through UKOME (Transportation Coordination Center)."

Such resistance from local businesses and institutions reflects the broader cultural prioritization of cars over other forms of transportation. This preference limits opportunities for cyclists and reinforces the challenges that hinder cycling culture.

Cyclists often face backlash when they attempt to engage with the system and share their experiences. Cyclist 5 described their experience after sharing a video of an accident on social media:

"For example, in the video we took here, a car is entering the road, ... there's a group of cyclists on that road. The car is trying to join the same road, but it's narrow, and the car is big, so it passes by crowding the cyclists, without considering, 'Could there be inexperienced riders in this group?' ... He's just thinking, 'I'll pass by as closely as possible, and they should stay on the side.' This video was uploaded to an Instagram page called Ankara Traffic,

> *and if you look at the comments, …People wrote things like, 'What are cyclists doing on the road?', 'Go ride somewhere else. ', ' Don't let cyclists on roads', 'I don't want to see them there.' They wrote all sorts of things."*

This type of experiences can deter the user to ever cycling again, or to voice their challenges in anyway, discouraging cyclists from providing valuable insights or feedbacks.

Addressing these cultural barriers requires initiatives that can shift public perceptions and create a safer, more inclusive environment for all cyclists. Citizen Science initiatives offer a potential solution by establishing a neutral, safe platform for cyclists to voice their concerns and share their experiences. This kind of platform would not only provide a space for cyclists to participate actively but also help legitimize cycling as a mode of transport within urban planning processes.

Moreover, Citizen Science initiatives could help track and address harassment and safety concerns systematically, ensuring that cyclists feel heard and supported. By formalizing these channels of communication, Citizen Science could promote greater accountability and foster a sense of ownership among cyclists, ultimately contributing to a cultural shift towards greater acceptance of cycling in Ankara.

Despite the cultural and social backlash cyclists face, they do have a tight-knit community where they support each other and organize awareness campaigns and events. The events these CSOs organize revolve around cycling but also address broader causes, from national holidays to pressing issues like cancer awareness. Cyclist 1 shared:

> *"… It's (community cycling events) actually a very nice thing for raising awareness. Tomorrow, we have our breast cancer awareness ride… we'll have pink balloons. We have a nurse who's experienced in this area, and she'll give a presentation. It's a small*

place, but we'll also be giving presentations. However many people it helps…"

However, more widespread topics like national holidays can cause disagreements and problems between different CSOs, as they struggle to agree and collaborate for joint events. This challenge also reflects on the Bisiklet Meclisi, where they fail to organize joint events. Cyclist 1 explained:

"…There are so many cycling groups, and there's a lot of conflict between them. It's really interesting—everyone is caught up in 'me, me,' and we can't come together. That's the problem…"

A potential Citizen Science initiative could provide a common space for all the communities to converge, with a dedicated team to facilitate inclusive, Ankara-wide events and campaigns. This could further strengthen the community and increase their visibility.

Such strategies to facilitate engagement, visibility, and awareness were also mentioned as very important by experts. Expert 2 summarized their approach:

"... we first devised a communication strategy, since in Ankara—or rather, in any city in Turkey—people are generally more car-dependent and tend to view cycling more as a leisure activity rather than a mode of transportation. So, we focused on first developing an active communication strategy to figure out how we could get people to adopt the culture to cycling as a mode of transportation."

Expert 3 also mentioned occasionally contacting CSOs regarding campaigns:

"Sometimes, if we meet with CSOs, we ask, 'Something is going to be developed here, what should we do? What kind of campaign should we run? Should we organize a festival or do some

promotion?' It really depends entirely on the project—things change accordingly."

A Citizen Science initiative could bridge the gap between experts and cyclists, providing a direct, regular channel for contact instead of occasional consultations. Such an initiative could also allow campaigns to be better tailored to specific projects and needs, creating a more cohesive strategy for promoting cycling culture in Ankara.

Ultimately, overcoming these cultural and social barriers is critical not only for the current viability of micro-mobility initiatives but also for creating a future where cycling is an integrated, respected, and accessible mode of transport in Ankara. Citizen Science initiatives provide an invaluable opportunity to cultivate this cultural shift, ensuring the community's active involvement and sustained support.

4.3.5 Policy and Governance

The success of micro-mobility projects, particularly cycling initiatives, is shaped by the policy and governance frameworks within which they operate. While regulatory frameworks exist to support cycling and other green infrastructure, there is often a disconnect between policy on paper and implementation in practice. This gap limits the effective integration of cycling initiatives into urban transportation systems This section examines how Citizen Science can contribute to improving these frameworks by providing community-driven insights to inform policy and governance decisions. The connection between governance structures and micro-mobility outcomes has been explored in the literature review and is further substantiated by parallels in the findings presented. By exploring regulatory and institutional factors that facilitate or hinder micro-mobility, it highlights the potential of Citizen Science to bridge gaps and support more effective and sustainable integration of these initiatives into urban transportation planning.

There are currently regulations and policies in place intended to support the implementation of cycling and other green infrastructure. The government has even introduced economic incentives to encourage municipalities to integrate these regulations into their urban planning processes. Expert 3, who has been involved in drafting some of these cycling regulations, explained:

> *"The ministry—specifically, the Ministry of Environment and Urbanization—says to municipalities, 'If you build bike paths according to my regulations and standards, you can receive grants from me. If you do not build them according to these standards, you will not receive grants from me.' There was such an enforcement mechanism. The regulation and plan were shown as an annex and an example implementation. This is also available on the Ministry of Environment and Urbanization's website, in those projects."*

Although such mechanisms are designed to ensure compliance with standards, the reality shows a disconnect between policy intentions and their practical realization. The participants of the focus group were also very vocal about these newly implemented regulations, contributing to the frustration of disconnect between what is discussed and presented on the government level and what is actually acted upon in reality. Cyclist 5 expressed:

> *"According to the latest temporary article of the master zoning plan, it is mandatory to include bike lanes in newly constructed roads. ... some of the things we mentioned earlier remain very theoretical—they stay on paper. We don't see them in practice. Our goal is to see it in practice. Let me give a very clear example: in the 2022 investment program, there is supposed to be 53.6 km of bike lanes in Ankara, but they still haven't materialized."*

This sentiment points to a clear need for greater transparency and accountability in implementing cycling-related policies. There is a clear need for keeping record of

all the regulations and policies around cycling in the community to make the public aware and educated on the topic, fostering a point of reference and accountability against the pushback cyclists face daily. Cyclist 5 took matters into their own hands by contributing to a community-created website that compiles relevant regulations, making them accessible to the public:

> *"In December 2019, a regulation on bike lanes was issued. ... There are several pieces of legislation related to it. I compiled all of them in one place. I posted it online—it's a site that hadn't been done in Türkiye before. When you enter the informative guide section, the 'Bike Guide,' you'll find information on workshops about cycling, master plans from the Ministry of Environment—there are extensive master plans and modules. There's also a module from the Ministry of Education, and a book taught in sports high schools for the years 2016, 2017, and 2018. ... a ten-page table based on Law No. 2918 on traffic and its regulation. In that table, there's the definition of bicycles in the regulation, all the concepts related to bicycles as mentioned in the law and regulation."*

By compiling and making these regulations accessible, the community website not only educates the public but also serves as a tool for accountability, empowering cyclists to understand their rights and responsibilities.

In addition to compiling these important regulations, cyclists also strive to ensure their enforcement in their daily lives. Cyclist 2 shared an experience of reporting vehicles parked illegally on bike paths:

> *"For example, let me also say this—we take photos of vehicles parked on bike paths, with the license plate visible, and report them. Recently, when I was heading to Meşeler station, I saw a car parked like that. I took a photo, and just ahead, there was a traffic police officer. I went and explained the situation. Should I report*

it, or would you take care of it? I followed up. The officer went, said, 'Okay, I'll take care of it,' and issued a fine."

Participants also discussed the concept of the Honorary Inspectorate, a system allowing citizens to report traffic and environmental violations, including illegal parking. The Honorary Inspectorate system exemplifies how community-driven efforts can complement formal enforcement mechanisms, reinforcing the need for active citizen engagement in governance. Cyclist 1 shared their experience with applying to become an honorary inspector:

"I applied to become an honorary inspector, but I'm still waiting. I don't know how many months it's been—it's been quite a while, but they said it would take about a year. ... I'm going to be their worst nightmare."

Despite the existing regulatory frameworks, there remain gaps in their effective implementation. Experts highlighted that regulations are frequently overlooked in favor of commercial priorities, resulting in challenges for cycling infrastructure. Expert 4 described the issue:

"As for what can be done (for implementing cycling in urban scale), the issue of shared roads in the city is extremely challenging to plan at the urban scale, ... The reason is that in the zoning work done so far, there has never been any zoning effort beyond pedestrian or motor vehicle traffic. Therefore, in all the properties, the businesses, and even the public institutions, none of them provide the 2.5-meter space needed for bicycles, and no one wants to give up the sidewalk or road for it. It creates a knot in the entire system there. Implementation could be within shared roads, but in the master plan we worked on, the criteria require that vehicles using shared roads must meet specific conditions. ... Before even starting the project, you conduct analysis and research on why that work is being done. If the client wants it, you

do the job, partly for your own financial situation and partly to meet the client's request…. Commercial concerns come into play, and nearly the same goes for bike path implementations...”

This statement highlights the tension between commercial priorities and sustainable urban planning, where profit-driven motives often overshadow the provision of essential space for cycling infrastructure. This challenge correlates with what was discussed in the previous section, where various parties oppose cycling infrastructure for different reasons.

Not only for commercial of monetary profits, participants of the focus group also expressed one of the other barrier: political gains and votes. Cyclist 3 explained:

“... I think there's no determination on this matter. It seems like there's no real willingness, as if they’re worried it would create backlash—that it might lead to a loss of votes. They think that since there are more cars in traffic, and that cars would be negatively impacted by this, losing the votes of car owners might outweigh the benefits. I think that’s what’s slowing down the process.”

Cyclist 7 also stated:

"I think the issue for decision-makers is how many votes they can get from people—it's all about getting votes. We're a small group as cyclists, while others are a larger group. ... Ankara's population keeps growing. ... We say, 'We need a bike lane,' but that guy just wants a lane for his car. He won't listen to me saying we need a bike lane. He’ll listen to someone saying, 'I need one more lane, two more lanes.' So that's their current priority—how to expand these roads, how to make traffic flow faster. That's what they're concerned about, not bicycles."

This also supports what was discussed in the previous chapter—the culture and society directly influence the political stances and what is implemented as a result.

As mentioned, there still are implementations done in Ankara, but described by Cyclist 1:

> *"The mayor is building bike paths, but he's making them in parks. For example, near Gölbaşı, across from Aselsan, he created a nice area. He built a 39 km path there, and he was boasting about it during the event that day. How am I supposed to go there and ride 39 km? I have to take my bike there by car, ride, and then drive back."*

This echoes the rhetoric of cycling being recreational and even cycling having a dependency on a car.

Citizen Science initiatives have the potential to fill these gaps by fostering direct community involvement, encouraging transparency, and advocating for the prioritization of cycling infrastructure in urban planning processes. It can act as the designated platform to accumulate and track regulations and projects along with the processes done. Citizens can assist in the monitoring and enforcing of these policies and regulations, complementing the formal system and broadening its reach. With a channel for effective feedback set in place, engaging the community through Citizen Science could ensure that cyclists' voices are included in decision-making, thereby bridging the gap between policy and practice. The visibility of this community, which is prone to be overlooked and marginalized within the hegemony of profit and car-users, is important to make sure they are taken seriously and considered in the development of the city they also live in and navigate. This, in turn, contributes to the overall wellbeing of the citizens in Ankara, making the city more livable and sustainable.

4.3.6 Sustainability and Long-Term Impact

The sustainability and long-term impact of micro-mobility initiatives are crucial elements in determining the success and endurance of cycling projects. This theme

explores how sustainability considerations are integrated into project planning, implementation, and community engagement, and examines how these initiatives can have lasting benefits for urban mobility. By addressing both environmental and social sustainability, this section provides a comprehensive understanding of the factors that influence the longevity and broader societal impact of micro-mobility initiatives in Ankara. Furthermore, this section also examines the interplay of all previous themes, such as stakeholder dynamics, user-centric design, and cultural barriers, in contributing to the overall sustainability. Citizen Science is highlighted as a pivotal tool in achieving these objectives, ensuring that projects remain responsive, community-driven, and capable of adapting to changing circumstances over time.

The environmental benefits of cycling are well-documented, particularly regarding the reduction of carbon emissions, noise pollution, and reliance on fossil fuels. However, the integration of these benefits into urban planning processes remains a challenge, especially in Ankara's car-centric environment. The findings from the expert interviews and focus group discussions reveal that while the sustainability aspect of cycling is often recognized, it is not always prioritized or effectively communicated to the public. Experts emphasized the potential of cycling as a key contributor to sustainable urban mobility, particularly in mitigating climate change impacts. This cultural shift is echoed in the focus group discussions, where participants highlighted the need for increased awareness of cycling's environmental benefits.

Incorporating Citizen Science into this process could facilitate the collection and dissemination of environmental data, such as emission reductions attributable to increased cycling. A Citizen Science platform could empower community members to track their cycling activity and collectively assess its impact on the city's carbon footprint. This data could then be used to advocate for more infrastructure and support from local government, providing tangible evidence of cycling's positive environmental impact. An approach like this also can facilitate to clearly communicate these benefits to the general public to foster the shift of perspectives.

Moreover, social sustainability involves creating an inclusive urban environment where cycling is accessible to all segments of society, regardless of gender, age, or socio-economic status. The findings indicate that current cycling initiatives in Ankara face significant barriers to inclusivity, particularly for women and disadvantaged groups. As discussed, female cyclists encounter specific challenges, including harassment and limited representation in cycling events and infrastructure planning.

Citizen Science initiatives have the potential to address these challenges by creating a more inclusive platform for all cyclists to share their experiences and contribute to project development. By involving a diverse range of voices from the outset, Citizen Science can help ensure that cycling infrastructure and policies are designed to meet the needs of all users, fostering a more equitable urban mobility system.

Economic sustainability is also a critical consideration, particularly in how economic factors influence the overall adoption of micro-mobility. Cycling offers a cost-effective alternative to car ownership, particularly in the face of rising fuel prices. Focus group participants noted that economic factors were a significant motivator for adopting cycling as a mode of transport. Economic sustainability is also a factor considered in implementing cycling systems. Experts have emphasized this, along with potential in elevating this barrier with private sector collaborations and bike-sharing systems, making it further accessible to use the bike infrastructure without owning a bike, making it even more economical.

By promoting cycling as an economically viable mode of transport, Citizen Science initiatives could help build broader public support for micro-mobility projects. Such a platform could also integrate a bike-sharing system, allowing users to track financial savings compared to car use. This feature could serve as a powerful motivator, encouraging more people to adopt cycling and thereby enhancing the long-term sustainability of these initiatives.

The long-term impact of micro-mobility projects depends largely on community involvement and ownership, which can be fostered through initiatives that actively

engage and empower local communities. As discussed in previous sections, the lack of community engagement in the planning and implementation stages of cycling projects has led to a disconnect between the needs of users and the solutions provided by authorities.

Citizen Science can play a crucial role in fostering this sense of ownership by providing a platform for ongoing community involvement. For instance, organizing community events, offering incentives for participation, and ensuring diverse representation in planning processes can effectively build a sense of shared responsibility and sustained interest in these projects. By enabling citizens to contribute to data collection, provide feedback, and participate in decision-making processes, Citizen Science initiatives can help ensure that micro-mobility projects remain responsive to the needs of the community and adaptable to changing circumstances.

Moreover, the findings indicate that a lack of transparency and follow-through from government bodies has undermined trust in micro-mobility initiatives. A Citizen Science platform could address this issue by providing a transparent channel for communication between citizens, experts, and government authorities. This would not only improve accountability but also foster a sense of collaboration and shared responsibility for the success of cycling projects.

The sustainability and long-term impact of micro-mobility initiatives also depend on their ability to adapt to future challenges, such as population growth, urban expansion, and climate change. The findings from both research stages highlight the need for flexible and adaptive planning processes that can respond to these evolving challenges.

Citizen Science can support this adaptability by providing a mechanism for continuous data collection and feedback. By involving citizens in monitoring the performance of cycling infrastructure and identifying areas for improvement, Citizen Science initiatives can help ensure that micro-mobility projects remain relevant and effective in the face of changing urban dynamics.

In conclusion, the sustainability and long-term impact of micro-mobility initiatives in Ankara depend on the effective integration of environmental, social, and economic considerations into project planning and implementation. Citizen Science offers a promising approach to achieving these goals by fostering community involvement, enhancing transparency, and providing the data needed to advocate for sustainable urban mobility solutions. By empowering citizens to play an active role in shaping the future of micro-mobility, these initiatives can contribute to a more sustainable, inclusive, and resilient urban environment.

4.4 Features and Functionalities of a Potential Citizen Science Platform for Micro-Mobility in Ankara

Building on the findings from expert interviews and focus groups, this section explores the potential features and functionalities of a Citizen Science platform tailored to Ankara's unique micro-mobility ecosystem. The proposed platform seeks to address specific challenges such as gaps in cycling infrastructure, cultural and social barriers, and limited stakeholder collaboration, while leveraging opportunities for community-driven innovation and engagement.

By integrating tools for data collection, community participation, feedback, and policy advocacy, the platform aims to empower users, facilitate evidence-based decision-making, and enhance the overall cycling experience. It emphasizes a participatory approach that fosters collaboration between cyclists, policymakers, and other stakeholders, creating a shared sense of responsibility for urban mobility development. This vision aligns with the broader goal of advancing sustainable, inclusive, and user-centered micro-mobility solutions for Ankara, while ensuring long-term engagement and impact.

4.4.1 Data Collection Tools

A potential Citizen Science platform can serve as a vital tool for collecting data from cyclists, enabling the identification of patterns and challenges within Ankara's micro-mobility ecosystem. One essential feature to support this is route tracking. Similar to commercial applications, this Citizen Science platform could allow cyclists to log their routes using GPS integration, offering both automatic tracking and manual logging options where users can mark start and end points or adjust the path. To enhance customization and analysis, users could categorize their rides based on purposes such as commuting, running errands, recreational activities, or sports, thereby providing insights into motivations and usage patterns.

Additionally, the platform could incorporate a tap-to-report interface, enabling users to report issues encountered during their rides or daily activities. Examples include damaged bike lanes, illegal parking, or heavy traffic. Reports could be categorized under predefined tags such as safety or infrastructure and supplemented with optional attachments like videos, photos or short voice notes for added context. To simplify the reporting process, GPS-based location detection could be employed, with an option for manual entry if necessary.

Periodic surveys integrated into the platform could track cycling habits, motivations, and perceived barriers over time. Quick polls targeting potential project decisions—such as "Would you use a bike lane connecting XYZ locations?" — would allow for data-driven decision-making aligned with user preferences. These insights could help create potential user profiles and route scenarios for planners and designers. To further enrich the data, targeted long-form questionnaires could be distributed to specific areas or demographics, offering deeper insights to inform the development and trajectory of cycling-related projects.

4.4.2 Community Engagement

A potential Citizen Science platform could incorporate a dedicated section for community engagement, fostering interaction among users while serving as a communication channel between cyclists, project teams, and government representatives. Forums and discussion channels could facilitate the sharing of best cycling routes, maintenance tips, and information on upcoming events. Moderated forums would ensure constructive discussions, enabling users to provide feedback on government initiatives, project processes, and infrastructure implementations in a structured manner.

To enhance user motivation and promote community involvement, the platform could host campaigns aligned with community and project goals. For example, cycling challenges could encourage users to collectively contribute kilometers toward goals such as tree planting or the development of new cycling infrastructure. Personal incentives, such as rewards and gifts (e.g., bike accessories, lights, reflectors, or maintenance tools), could further motivate participation. Additionally, individual milestones—such as time spent cycling or distances covered—could be recognized through leaderboards, virtual badges, or points, fostering a sense of accomplishment and friendly competition.

An integrated event calendar would allow users, project teams, and municipalities to share information about various events. This could include group rides, workshops aimed at skill development or community engagement, and meetings organized by the municipality or the Bisiklet Meclisi. Such a feature would strengthen connections among stakeholders, creating a dynamic and active cycling community while ensuring transparent communication about ongoing and future projects.

4.4.3 Feedback Mechanisms

Open feedback mechanisms are essential to complement reporting features and enhance user engagement in project contributions. Providing notifications about

actions taken based on user input—such as "Your hazard report at XYZ Street helped prioritize repairs,"—reassures users that their efforts are valued and impactful. Similarly, aggregated statistics like “20% of cyclists flagged Route ABC for unsafe conditions” can spotlight issues faced by a significant portion of the community, guiding attention and resources to critical areas and ensuring meaningful and efficient outcomes.

To further support transparency and engagement, the platform could integrate various dashboards for both users and experts. Heatmaps could visualize popular cycling routes, helping identify well-used paths and areas requiring improvements. Trend graphs of cycling activity over different time frames (e.g., daily, weekly, or monthly) could provide insights into user behavior and seasonal patterns. Additionally, comparative statistics—such as individual contributions to CO2 savings, calories burned, or kilometers cycled—could be displayed, offering users a sense of personal accomplishment while promoting sustainable practices.

4.4.4 Policy and Infrastructure Advocacy

The platform could play a pivotal role in policy and infrastructure advocacy by integrating features that promote transparency, accountability, and citizen empowerment. One such feature could be live tracking of ongoing infrastructure improvements, such as milestone countdowns for new bike lane construction or project progress updates. Providing information on budget allocation and deadlines for municipal projects would further enhance trust in the system, fostering transparency and accountability among stakeholders.

To deepen citizen participation and empower users, the platform could include options for commenting on or voting for draft cycling policies. Highlighting how citizen feedback has influenced decisions—such as adjustments to planned infrastructure or updates to policies—could exemplify the success of participatory processes and encourage continued engagement.

Additionally, the platform could host a section dedicated to official communication channels. Features like pre-written email templates would enable users to easily contact local officials regarding cycling-related issues or requests. Similarly, a petition creation tool could support community-driven initiatives, allowing users to rally support for change requests beyond the scope of ongoing projects. By facilitating these actions, the platform would not only enhance community involvement but also amplify the collective voice of cyclists, ensuring that their needs and concerns are actively addressed.

4.4.5 Educational Resources

The platform could serve as a centralized hub for essential cycling information, providing users with easy access to policies, regulations, and best practices. Modules on road safety, signaling, and traffic navigation could be included, offering comprehensive guidance for cyclists of all experience levels. Additionally, interactive videos and tutorials featuring local cyclists and cycling civil society organizations (CSOs) could provide practical tips and tricks tailored to Ankara's unique cycling environment. Guidelines on shared lane usage and respectful parking practices would further promote responsible cycling behaviors.

To foster hands-on learning and skill development, the platform could feature information on educational workshops organized by CSOs, project teams, experts, or government bodies. Users could easily register for in-person or virtual training sessions on topics such as bike maintenance, first aid for cyclists, or sustainable urban mobility practices. By integrating these resources, the platform would not only educate and empower its users but also contribute to fostering a more informed and engaged cycling community.

4.4.6 Integration with Existing Systems

In addition to fostering change and innovation, the potential Citizen Science platform should complement and enhance existing systems. This could include providing multimodal route suggestions that combine cycling with public transportation options such as buses or the metro. By supporting the integration of public transit with cycling, the platform would make sustainable mobility more accessible for cyclists of varying experience levels and suitable for longer distances. An integrated payment system within the platform could further simplify the user experience, with the added possibility of using points earned through the app to cover fees or receive discounts, thereby encouraging sustainable transportation behavior.

Should a bike-sharing system be operational by the time the platform is implemented, it could be seamlessly integrated for easy rental access. By combining the platform's features with the bike-sharing system, rental users could also contribute to the insights and data collection process, enriching user profiles and behavioral patterns. Real-time information on the availability of shared bikes and parking stations could be displayed, enabling users to plan routes efficiently and align their journeys with the bike-sharing infrastructure.

4.4.7 Custom Analytics for Decision-makers

In addition to serving the users of cycling systems, the Citizen Science platform should function as a valuable resource for experts and decision-makers responsible for planning and managing these systems. A secured dashboard could be provided for planners and designers, enabling access to aggregated, anonymized data collected from platform users. These dashboards could include advanced filtering options to analyze specific user groups or geographic areas, with the capability to connect or export data to existing Geographic Information System (GIS) platforms commonly used in urban planning processes.

The platform could also offer tools for scenario modeling, allowing decision-makers to evaluate the potential impact of proposed changes, such as adding a bike lane or reducing motor traffic in a particular zone. By simulating these scenarios, planners could make more informed decisions based on projected outcomes. Furthermore, data-driven predictive analytics could be employed to identify emerging cycling trends and areas requiring intervention. This capability would help direct attention and resources to where they are most needed, supporting evidence-based decision-making and more effective implementation of cycling-related initiatives.

4.4.8 Incentives and Rewards

For Citizen Science initiatives to succeed, ensuring sustained user engagement and continuous contributions is crucial. This success largely depends on motivating users to provide long-term inputs that contribute to sound and accurate data collection. One effective strategy is to implement a points-based system, where users earn points for participating in surveys, reporting issues, or logging their rides. These points could then be redeemed for discounts at local bike shops or restaurants, used within public systems, or accumulated for more substantial rewards, further encouraging sustainable transportation behaviors.

Recognizing user contributions is equally important for fostering a sense of accomplishment and ownership over the platform and its outcomes. Leaderboards could be introduced to highlight top contributors in categories such as “Top Reporter of Cycling Hazards,” “Most Distance Cycled,” or “Top Point Earners.” Certificates, virtual badges, or public shoutouts for active users could also be implemented to acknowledge their efforts and ensure continued engagement. These strategies would help build a loyal and motivated user base, supporting the platform's long-term success and its ability to generate meaningful insights.

CHAPTER 5

CONCLUSION

In this chapter, the study's findings are summarized and connected to its overarching aim of exploring how Citizen Science can enhance micro-mobility experiences in Ankara. The research questions that guided the study are addressed in detail, highlighting key insights and their implications. Additionally, this chapter reflects on the study's limitations and offers suggestions for future research, paving the way for further exploration and practical applications of Citizen Science in urban mobility systems.

5.1 Overview of the Research

This study focused on exploring how Citizen Science can serve as a transformative tool for improving micro-mobility experiences in Ankara, Türkiye. Using a multi-layered approach that included a literature review, expert interviews, and generative focus groups, the research bridged theoretical insights with practical applications. By synthesizing findings, the study proposed actionable solutions that could guide integrating Citizen Science into Ankara's micro-mobility systems to address systemic challenges and opportunities.

The study began with a comprehensive review of existing literature to address the research questions (see Chapter 2). The literature explored the concept of micro-mobility, with a particular focus on bicycles, emphasizing their role in fostering sustainability, reducing urban congestion, and promoting equitable transportation systems. Barriers to adoption, such as infrastructural gaps, cultural biases, and policy fragmentation, were examined alongside opportunities for integration. The review

also examined the role of social policies in laying the groundwork for effective cycling systems, offering historical and current perspectives on cycling in Türkiye. The concept of Citizen Science was then analyzed in-depth, highlighting its potential to empower citizens through data collection, community engagement, and policy advocacy. User-centered design principles were also explored, emphasizing the importance of features like real-time feedback, and participatory tools to sustain engagement. This literature review provided the theoretical foundation for the study's methodology and findings, effectively bridging the two areas.

Building on the insights from the literature, the research was conducted in two stages: expert interviews and generative focus groups (see Chapter 3). Document analysis was used to evaluate Ankara's current micro-mobility ecosystem and identify relevant experts for the interviews. The expert interviews engaged stakeholders such urban planners, and designers. These interviews provided insights into the current dynamics and processes of micro-mobility projects and the infrastructural and policy gaps, cultural resistance to cycling, and the potential for participatory approaches to address these challenges. The second stage, generative focus groups, involved local cyclists and aimed to explore their lived experiences, challenges, and suggestions. Participants contributed valuable input on how a Citizen Science platform could address critical issues such as safety, connectivity, and community building. Thematic analysis was used to synthesize the data collected from both methods, offering a robust understanding of the research problem.

The findings of the study (see Chapter 4) reveal a dual narrative of systemic barriers and untapped opportunities. While significant challenges persist, such as disconnected infrastructure, safety concerns, and cultural resistance, the findings underscore the potential of Citizen Science as a participatory tool for addressing these issues. The study offers a potential guide for implementing Citizen Science platforms as tools for participatory engagement and feedback mechanisms, fostering collaboration, transparency, and a culture of shared responsibility in urban mobility systems. With this foundation established, the following section revisits the research questions to synthesize the study's findings in light of its overarching aim.

5.2 Revisiting Research Questions

This section revisits the research questions guiding the study, synthesizing insights from the literature review, expert interviews, and focus groups to address each question comprehensively.

- How do citizens perceive the main opportunities for and barriers against adopting micro-mobility practices in Ankara?
- How do citizens perceive potential improvements and new directions for micro-mobility and its effects on social life in Ankara?
- How can Citizen Science be implemented to improve the micro-mobility experience in Ankara?

How do citizens perceive the main opportunities for and barriers against adopting micro-mobility practices in Ankara?

Citizens in Ankara, as discussed in 4.2 and further detailed in 4.3, recognize several promising opportunities for adopting micro-mobility practices. Cycling is seen as a potential solution to urban challenges such as traffic congestion, pollution, and transportation inequities. Its affordability compared to car ownership makes it an attractive option, particularly for individuals seeking cost-effective alternatives. Environmental benefits resonate strongly with the public, aligning with growing awareness of sustainability and global urban development goals. Community-driven movements, such as cycling advocacy groups, reflect an emerging cultural shift toward recognizing cycling as a viable urban mobility option. These groups provide both support and motivation, fostering a sense of community among cyclists.

However, as mentioned in 4.2.3 and 4.2.4 significant barriers hinder the widespread adoption of cycling in Ankara. The lack of safe and continuous cycling infrastructure is a critical issue, with existing bike lanes often poorly maintained or disconnected. Sharing roads with motor vehicles creates a sense of vulnerability among cyclists, further exacerbated by the lack of integration between cycling infrastructure and public transportation systems. Additionally, cycling is still perceived as primarily

recreational rather than a legitimate form of transportation, limiting its adoption for daily commutes and influencing the scope of related projects and policies.

Cultural and social barriers, as given in detail in Section 4.3.4, also play a role, particularly for women cyclists, who face harassment and limited acceptance. Ankara's hilly terrain poses physical challenges, requiring additional infrastructural support, such as e-bike options or alternative route planning. The absence of secure bike parking facilities, especially near workplaces and transit hubs, adds to the inconvenience. Finally, gaps in regulatory frameworks, including insufficient cycling-friendly policies and weak enforcement of motor vehicle regulations, further discourage cycling adoption. Addressing these barriers requires a holistic approach that combines infrastructure development, cultural transformation, and targeted policy interventions.

How do citizens perceive potential improvements and new directions for micro-mobility and its effects on social life in Ankara?

Citizens envision various improvements that could transform Ankara's micro-mobility landscape. A connected, well-maintained network of bike lanes physically separated from motor traffic is seen as essential to fostering safety and accessibility. Such infrastructure would not only address current safety concerns but also encourage hesitant and novice cyclists to participate. Integration with public transportation is another priority, enabling seamless transitions between cycling and other modes of transit. Enhanced facilities such as secure bike parking near metro stations and frequent destinations, bike racks on buses, and synchronized route planning would make cycling more practical for daily use.

Beyond physical infrastructure, citizens emphasize the need for cultural and educational initiatives. Public awareness campaigns, community events, and workshops focused on cycling safety, benefits, and technical skills like bike maintenance could shift public perceptions of cycling from a leisure activity to a legitimate transportation option. Citizens also noted a lack of transparency in government cycling projects, such as unclear timelines and insufficient follow-up on

announced initiatives. Leveraging digital platforms for real-time route information, cycling maps, and updates on infrastructure developments could address these concerns and enhance the overall cycling experience.

On a social level, improved micro-mobility systems are seen as catalysts for strengthening community engagement and inclusivity. Group rides, cycling events, and advocacy campaigns can foster a sense of belonging while encouraging non-cyclists to consider adopting cycling. Reclaiming urban spaces from car dominance to create pedestrian- and cyclist-friendly environments would promote healthier lifestyles, reduce social isolation, and foster equity in urban mobility. Citizens view these changes as pivotal to improving quality of life in Ankara, transforming micro-mobility into a socially inclusive and community-centered practice.

How can Citizen Science be implemented to improve the micro-mobility experience in Ankara?

Citizen Science presents a participatory framework to overcome barriers and capitalize on opportunities for micro-mobility in Ankara. A tailored Citizen Science platform would empower citizens to actively contribute to data collection, reporting, and decision-making processes. This platform could include tools for cyclists to log their routes, report hazards or infrastructure issues, and categorize trips by purpose, such as commuting, errands, or recreation. Aggregating and analyzing this data would provide planners with actionable insights, helping to identify patterns and prioritize interventions.

The platform could further include community engagement features such as forums and discussion boards, where citizens share experiences, propose ideas, and collaboratively address challenges. Feedback mechanisms, such as dashboards displaying citizen contributions and updates on actions taken based on user input, would ensure transparency and sustain engagement over time. Policy advocacy tools, including options for commenting on draft policies, voting on proposed projects, and participating in surveys, would connect citizens directly to decision-making processes. Scenario modeling tools and predictive analytics could assist urban

planners in evaluating the potential impacts of proposed changes, such as adding bike lanes or redesigning traffic flow in specific areas.

To maintain long-term participation, the platform could incorporate incentives like rewards, gamified challenges, and recognition for active contributors. Educational resources on road safety, bike maintenance, and cycling etiquette would complement these features, fostering a more informed and engaged cycling community.

By bridging the gap between citizens, policymakers, and other stakeholders, Citizen Science can create a participatory culture where citizens feel empowered to shape their urban environment. Beyond addressing immediate challenges, it promotes collaboration, social cohesion, and transparency. The long-term impact extends to creating a resilient, inclusive, and sustainable urban mobility system in Ankara. Moreover, this model could serve as a replicable framework for other cities, making Citizen Science a pivotal strategy for enhancing urban transportation systems globally.

5.3 Limitation and Future Research

This study provides valuable insights into how Citizen Science can enhance micro-mobility experiences in Ankara while highlighting several limitations and opportunities for future research. The research employed qualitative methods, including expert interviews and generative focus groups, to gain an in-depth understanding of barriers, opportunities, and user expectations. However, the findings are not generalizable to Ankara's broader population. Incorporating larger-scale quantitative studies and expanding qualitative sampling to include a more diverse demographic could provide a more comprehensive understanding of micro-mobility dynamics.

The study primarily focused on active cyclists and key stakeholders, such as urban planners, which provided critical insights. However, it did not explore the perspectives of non-cyclists, who represent a significant group of potential micro-

mobility adopters. Including these groups in future research could offer a more holistic understanding of the challenges and motivations associated with cycling adoption. Additionally, the contextual focus on Ankara's specific infrastructural, cultural, and policy-related dynamics presents limitations regarding the applicability of findings to other urban settings. Comparative studies across different cities could address this gap, examining the adaptability of proposed solutions to varied contexts.

Another limitation lies in the conceptual nature of the proposed Citizen Science platform. While the study outlined potential features and functionalities, these remain theoretical and untested. Piloting the platform in a real-world setting would be essential to evaluate its practicality, usability, and impact on fostering community engagement and policy advocacy. Time and resource constraints also limited the depth of stakeholder involvement, particularly among policymakers and institutional actors, whose expanded participation could yield richer insights and more actionable outcomes.

Future research could build on these findings through mixed-method studies that integrate large-scale surveys with in-depth qualitative analyses. This would provide a broader understanding of both current users and potential adopters. Longitudinal research could track the influence of Citizen Science initiatives over time, examining their effects on behavior change, community engagement, and policy implementation.

Evaluating the role of Citizen Science in shaping policymaking processes is another key area for future exploration. Assessing changes in policy responsiveness and implementation efficiency would offer valuable insights into its ability to bridge gaps between citizens and institutional actors. By addressing these limitations and pursuing these research directions, future studies can refine the application of Citizen Science in micro-mobility systems, creating sustainable, inclusive, and participatory urban mobility solutions for Ankara and beyond.

Lastly, future research should explore the potential benefits of collaboration among academia, the public sector/municipalities, and private industry to address existing

limitations. Such partnerships could combine academia's research expertise, the public sector's regulatory capacity, and private companies' technological innovations. Private industry involvement could also provide additional funding opportunities and practical insights, enhancing the scalability and sustainability of Citizen Science projects. Moreover, integrating Citizen Science platforms with widely used urban planning tools like Geographic Information Systems (GIS) could bridge the gap between participatory inputs and technical applications, facilitating the seamless incorporation of citizen-generated data into urban design processes. By fostering transparent and inclusive public-private partnerships, future efforts can promote innovative, sustainable, and participatory micro-mobility solutions.

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APPENDICES

A. Bireysel Taşıma Hizmeti (ESPEDAL Bisiklet Sistemi) Akıllı Bisiklet Abonelik Genel Koşulları

ESKİŞEHİR TEPEBAŞI BELEDİYESİ

ESPEDAL

BİREYSEL TAŞIMA HİZMETİ (ESPEDAL BİSİKLET SİSTEMİ) AKILLI BİSİKLET ABONELİK GENEL KOŞULLARI

MADDE 1 -SÖZLEŞMENİN TARAFLARI

Tepebaşı Belediyesi'nin hazırladığı ve Türkiye'de bir ilk olma özelliği taşıyan akıllı ve elektrikli modellerin kullanıldığı 'Paylaşımlı Bisiklet Sistemi' ESPEDAL, 30 adet elektrikli bisikletin kullanıma açılması ile hizmete sunuldu.

İş bu sözleşme; Hoşnudiye ,Mahallesi Şahin Caddesi no:84 Tepebaşı/Eskişehir adresinde mukim Tepebaşı Belediye Başkanlığı (Bundan böyle kısaca "ESPEDAL" olarak anılacaktır) ile [ABONE] adresinde mukim (Bundan böyle kısaca "ABONE" olarak anılacaktır.) arasında yapılmıştır.

MADDE 2 -Amaç

İşbu sözleşmede belirlenen koşullar altında, ESKİŞEHİR kentsel alanı içerisinde Bisikletlerin, ABONE 'lerin sorumluluğu altında istasyonlardan alınıp kullanılması ve iadesi hususlarının belirlenmesidir.

Madde 3- ABONE KAYDI

ABONE, abone merkezlerine başvurarak, mobil uygulama ve web sayfası üzerinden abone kaydı işlemlerini başlatacaktır. Abone kaydı işlemleri tamamlanınca ABONE 'lere bisikletleri kullanmak için Abone kartı verilecektir. Abone kartlar kişiye özel olup bir başkasına kullandırılamaz. Bunun tespitti halinde abonelik sözleşmesi ESPEDAL tarafından tek taraflı olarak fesih edilecek ve aboneye ve abone kartını kullandırdığı kişiye artık sözleşme ve abonelik kaydı yapılmayacaktır.

MADDE 4- Sözleşmenin Feshi

Kayıt silme işlemi; ABONE 'nin kendi isteği doğrultusunda ya da sözleşmeye aykırı davranış neticesinde, gerekçe göstermeden ESPEDAL tarafından silinir ve sözleşmesi tek taraflı olarak fesih edilir. Kayıt silinmesi durumunda abonelik bedeli iade edilmeyecektir.

MADDE 5- Akıllı Bisiklet Hizmet Sözleşmesi

ABONE, kartını kullanarak ESPEDAL ile olan sözleşme haklarına muktedir olacaktır. Her yeni bisiklet kullanımı kuralların kabul edildiği anlamına gelir.

MADDE 6- Abone Kart Geçerlilik Süresi ve Vize işlemi

Abone kart; ESPEDAL ile ABONE arasında yapılan sözleşme tarihinden itibaren geçerlidir. ESPEDAL de indirimli tarife yoktur. Kart teslimi öncesinde ve sırasında kart ücreti alınmamış olması daha sonra bu karta ücret talep edilmeyeceği anlamına gelmez. ESPEDAL teslim ettiği kullanımdaki her kart için dilediği zaman bedel talep etme hakkına sahiptir.

MADDE 7- Akıllı Bisiklet ABONE Yükümlülüğü

ABONE 'nin yükümlülüğü bisikleti sağlam olarak iade etmek ve Madde-10 hükümlerine riayet etmektir.

MADDE 8- Akıllı bisiklet Abonelik Şartı

ABONE yasal yaşta, trafik kurallarına aşina, ayrıca bisiklet sürme vasfına sahip olmalıdır. 18 yaş altı olanlar kati suretle abone karta sahip olma ve kullanma hakkına sahip değildirler. Sahip olduğu engelin yasal olarak bisiklet kullanmaya mani teşkil etmediğini belgeleyen engelliler abone kart alabilir ve bisiklet kiralama hizmetinden yararlanabilir.

MADDE 9- Akıllı Bisiklet ABONE Hakları

ESPEDAL ile ABONE arasında yapılan sözleşme, burada belirtilen limitler dâhilinde bisiklet kullanım hakkı sağlar. Bisikletler kullanıma hazır olarak ABONE 'lere sunulacaktır. ABONE alacağı hizmetin hükümlerini, şartlarını öğrenmek ya da çeşitli isteklerini iletebilmek için iklimtepebasi@tepebası.bel.tr web adresinden ve/veya ilan edilmiş telefon hatları üzerinden müşteri hizmetleri ile irtibata geçebilirler. ESPEDAL olabilecek en kısa sürede soruları ve talepleri işleme koyacak ve cevaplayacaktır. Bu süre ABONE 'nin iletişime geçmesinden itibaren en fazla 15 iş günü alacaktır. Eğer A. 'nin aldığı bisiklet kullanmak için uygun durumda değilse ABONE başka bir bisiklet alma hakkına sahiptir. Kullanım için uygun olmayan bisikleti ABONE 5 dakika içinde iade edecek, sistem ABONE 'ye başka bir bisiklet kiralama hakkı verecektir.

MADDE 10- Akıllı Bisiklet ABONE Yükümlülükleri

ABONE 'ler Akıllı bisiklet hizmetini kullanırken;

Hizmeti ve bisikletleri azami özenle kullanmak, sisteme veya bisikletlere hasar vermemek,
Herhangi bir durumda kendisine tahsis edilen bisikleti 3. şahıslara kullandırmamak, kullandırılması durumunda abonelik iptal edilecektir. 3. Şahıslara kullandırılmasından doğan zararlar ABONE 'den tahsil edilecektir.
Şehir bisikletlerini yalnızca kişisel seyahat için kullanmak,
Bisikletleri sadece, yol çizgileri ile belirtilen alanlarda kullanmak. Bu alan dışından kullanımda doğabilecek olumsuzluklardan ESPEDAL mesul tutulamaz.
Bisikletin etkilendiği herhangi bir arıza ya da kazada, yer ve durum bilgilerini gecikmeksizin ESPEDAL Müşteri Hizmetlerine bildirmek. Eğer bisiklet arızadan dolayı istasyona dönemezse, ABONE 'nin arızayı rapor etmesinden sonra bisikletin 2 saat süresince güvende kalmasının sorumluluğu ABONE 'ye ait olacaktır. Bu süre zarfında ESPEDAL belirtilen noktadan bisikleti teslim alacaktır.
ABONE, bisikletin istasyondan alıp geri bırakana kadar geçen sürede, bisikletlerin doğru şekilde korunması, bakılması ve güvende olmasından sorumludur. Kullanımdan sonra bisikletler istasyonlara geri getirilir ve kilitlendiğinden emin olarak ilgili yerlere bırakılır.
Bisikletler kullanılmak üzere alınırken, frenlerinin, oynar parçalarının kontrol edilmesi, koltuk yüksekliğinin ayarlanması ve son olarak da genel kullanıma uygunluğuna bakılması ABONE 'nin sorumluluğundadır.
ABONE bisikleti T.C. Kanunlarınca suç sayılabilecek şekilde ve diğer gayri kanuni işlerde ve yasak derecede alkol ve herhangi bir uyuşturucu alarak kullanamaz.
Bisikletin ABONE 'de olduğu süre içerisinde (ileride çıkacak da olsa) gerek bisiklete, gerek ABONE 'ye ve gerekse 3. şahıslara verilen zararlardan dolayı tüm maddi ve manevi tazminat sorumlulukları ABONE 'ye aittir.
Bisiklet kullanımından doğan trafik cezaları ABONE 'ye aittir.
ESPEDAL bisikleti tüm fonksiyonları çalışır vaziyette ABONE 'ye teslim etmiştir. ABONE kullanıma başladıktan itibaren bisikletin en iyi şekilde korunması için gereken tüm önlemleri alacak; kötü ve kurallara uygun olmayan kullanımlarından dolayı bisiklette meydana gelebilecek her türlü arıza ve onarım giderleri ABONE 'ye ait olacaktır.
ABONE, bisikleti istasyondan alabilmesi için abone kartında en az 5 TL bakiye bulundurması gerekmektedir.
Kullanım ücretleri; ESPEDAL tarafından belirlenmiş abone kart dolum istasyonlarından nakit olarak yapılacaktır.
Bildirilen tarihe kadar tahakkuk ettirilen cezaları ödemeyen ABONE 'lerin abone kartları iptal edilecek ve yasal takibat başlatılacaktır. Yasal tahsilat sürecinde tüm masraflar ABONE 'ye rücu ettirilecektir.
Kartı iyi kullanma ve saklama sorumluluğu ABONE 'lere aittir. Kartın kaybolması, kötü kullanım neticesinde zarar görmesi nedeniyle başka bir kopyanın istenmesi durumunda kartın idarece belirlenen yeni basımının masrafı 5 (Beş)TL ABONE 'ye ait olacaktır. Bu miktar bağlayıcı olmayıp sözleşmenin imzalanmasından sonra bu masrafın artması halinde ESPEDAL bu masrafları ABONE 'ye aynen yansıtacaktır.
Kask ve benzeri koruma malzemeleri ABONE 'nin sorumluluğundadır.

MADDE 11- Gizlilik

Taraflar; sahip oldukları bilgileri(kişisel/kurumsal) gizli tutmakla sorumludur. Elde edinilen bilgi ve belgeler kesinlikle 3. Şahıslarla paylaşılmayacaktır.

MADDE 12- Tebligat Adresi

Tarafların bu sözleşmede yazılı adreslerine yapılacak tebligatlar geçerlidir. Bu adreslerde bir değişiklik olması halinde adres değişikliği yapan taraf diğer tarafa yeni adresini yazılı olarak bildirmekle yükümlüdür. Bunun yapılmaması halinde eski adrese yapılacak tebligatlar kanunen geçerlidir.

Madde 13- Mücbir Sebepler

Yasalarda belirtilmiş olan mücbir sebepler dâhilinde yine yasalarda belirtilmiş olan hükümler geçerlidir.

MADDE 14- Uygulanacak Hükümler

Bu sözleşme ile ilgili olarak çıkabilecek bütün ihtilaflarda öncelikle sözleşme hükümleri, bu sözleşmede bulunmayan hükümlerde ise Türkiye Cumhuriyeti Kanunları uygulanacaktır.

MADDE 15- Delil Sözleşmesi

Taraflar işbu sözleşmenin tatbikinden doğacak itilaflarda ESPEDAL 'in kayıtların tek delil olarak esas alınacağını peşinen kabul etmişlerdir.

MADDE 16- Yetkili Mahkeme ve İcra Daireleri

İşbu sözleşmeden dolayı doğacak bütün ihtilaflarda ESKİŞEHİR Mahkemeleri ve İcra daireleri yetkili olacaktır.

MADDE 17- Yürürlük

ABONE, Üyelik Sözleşmesi ve Başvuru Formu 'nu eksiksiz doldurup imzaladıktan sonra müracaat etmiş olur. ESPEDAL tarafından müracaat onaylandıktan sonra yürürlüğe girer. İşbu sözleşme 4 sayfa ve 17 Maddeden ibaret olup, iki nüsha olarak tanzim edilmiş, ekleri ile birlikte taraflarca okunarak [TARİH] tarihinde karşılıklı imza altına alınmıştır.

ESPEDAL	ABONE
ADSOYAD - İMZA	ADSOYAD - İMZA

Kişisel Verilerinizin İşlenme Amacı, Dayanağı ve İlgili Haklarınız

TEPEBAŞI BELEDİYE BAŞKANLIĞI ("ESPEDAL") olarak siz ESPEDAL kullanıcılarına ait kişisel verileri, başta 6698 Sayılı Kişisel Verilerin Korunması Kanun ("Kanun") kapsamında Veri Sorumlusu sıfatı sahip olmamız ve ilgili mevzuattan kaynaklanan yasal yükümlülüklerimiz çerçevesinde işlemekteyiz.

Bugüne kadar olduğu gibi, bu kişisel veriler bundan sonra da Kanun'da belirtilen istisnalara veya verdiğiniz açık rızanıza istinaden, ESPEDAL tarafından belirlenen amaçlar ve kapsam dışında kullanılmamak kaydı ile bilgi güvenliği tedbirleri de alınarak işlenecek ve Kanun'un emrettiği süreler boyunca saklanacaktır.

Kişisel verilerinizin ESPEDAL tarafından hangi amaçlarla işlendiğine ve hangi amaçla yurt içinde bulunan kişilere aktarıldığına ilişkin detaylı bilgilere aşağıda yer verilmiştir.

KİŞİSEL VERİ	VERİ İŞLEME AMACI	HUKUKİ SEBEP	AKTARIM DURUMU VE AMACI
v. Kimlik Bilgisi v. (Ad-Soyad, Doğum Tarihi, T.C. Kimlik Numarası, Pasaport Numarası) v. İletişim Bilgisi (E-posta, Telefon, Adres)	v. Üye kayıt, kiralama sözleşmesi ve kiralama süreçlerinin yürütülmesi	v. Sözleşmenin kurulması ve ifası	Yapıdrom – ESPEDAL sistemi için altyapı hizmeti alınması

KİŞİSEL VERİ	VERİ İŞLEME AMACI	HUKUKİ SEBEP	AKTARIM DURUMU VE AMACI
v. İletişim Bilgisi (Telefon)	v. Kullanıma ilişkin bilgilendirme yapılması	v. Sözleşmenin kurulması ve ifası	Yapıdrom – ESPEDAL sistemi için altyapı hizmeti alınması. İş Ortağı Elektronik ileti gönderimi
v. Müşteri İşlem Bilgisi (Fatura Bilgileri) v. Finansal Bilgiler (Kredi Kartı İlk 6 Son 4 Hane)	v. Kiralama süreci ve ödeme işleminin tamamlanması	v. Sözleşmenin kurulması ve ifası	Yapıdrom – ESPEDAL sistemi için altyapı hizmeti alınması Bankalar – Ödeme teyidi gerçekleştirilmesi
v. Lokasyon Bilgisi (Konum) v. Fiziksel Mekan Güvenliği Bilgisi (Kamera Kaydı, Parola/Şifre Bilgisi) v. İşlem Güvenliği Bilgisi (İmza)	v. Kiralama süreçlerinde güvenliğin sağlanması	v. Kiralama süreçlerinde güvenliğin sağlanması	Yapıdrom – ESPEDAL sistemi için altyapı hizmeti alınması
v. Müşteri İşlem Bilgisi (Kullanım geçmişi, yakılan ortalama kalori)	v. Kullanım kayıtlarının muhafaza edilmesi	v. Sözleşmenin kurulması ve ifası	Yapıdrom – ESPEDAL sistemi için altyapı hizmeti alınması

ESPEDAL, yukarıda sayılan veri işleme amaçları çerçevesinde, elde ettiği kişisel verileri Kanunu'nun 8 ve 9'uncu maddelerinde öngörülen şartlara uymak ve gerekli güvenlik önlemlerini almak kaydıyla, yukarıda tabloda belirtilen amaçlarla sınırlı olarak aktarmaktadır. Kişisel verileriniz elektronik ortamlarda toplanmakta ve yukarıda sayılan amaçlar doğrultusunda işlenmektedir.

İlgili kişi olarak dilediğiniz zaman Veri Sorumlusu olan ESPEDAL'a başvurarak 6698 sayılı Kanun'un 11. maddesinde belirtilen hakları kullanabilirsiniz.

Kanun'da belirtilen haklarınıza dair taleplerinizi, hangi hakların kullanılmak istendiğinin açık olarak belirtileceği ıslak imzalı bir dilekçe veya https://www.tepebasi.bel.tr/espedal.asp adresinden ulaşabileceğiniz başvuru formunda yer alan bilgiler doğrultusunda kimliğinizi tespit edici belgelerle ESPEDAL'e ulaştırabilirsiniz. İlgili kişi veya yasal temsilcisinden ESPEDAL'e iletilen ve yukarıda yer alan talepleri içeren yazılı başvurulara 30 (otuz) gün içerisinde cevap verilecektir.

Başvurular, Kişisel Verileri Koruma Kurulu tarafından alınacak karar ile bir ücret tarifesi yayınlamadığı sürece ücretsiz olarak yapılacaktır. Başvurulara verilecek cevapların 10 (on) sayfayı aşması halinde, her sayfa için 1,00 (bir) TL işlem ücreti alınacaktır. Cevabın CD, flash bellek gibi kayıt ortamında verilmesinin istenmesi halinde, istenen kayıt ortamının maliyetine göre ücret talep edilecektir.

Talep ettiğiniz konuda başkası adına hareket ediyorsanız bu konuda özel olarak yetkili olmanız ve yetkinizin belgelendirilmesi, başvurunun kimlik ve adres bilgilerini içermesi ve başvuruya kimliğinizi tevsik edici belgelerin eklenmesi gerekmektedir.

ESPEDAL UYGULAMASI

B. Ethical Approval

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

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07 NİSAN 2023

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Güzin ŞEN ve Yekta BAKIRLIOĞLU

Danışmanlığını yürüttüğünüz Demet DOĞANAY'ın **"Micro-mobilitiy in Ankara: The Consideration for a Potential Citizen Science Application"** başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek **0166-ODTUİAEK-2023** protokol numarası ile onaylanmıştır.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan

Prof.Dr. İ.Semih AKÇOMAK
Üye

Doç. Dr. Ali Emre Turgut
Üye

Doç.Dr. Şerife SEVİNÇ
Üye

Dr. Öğretim Üyesi Murat Perit ÇAKIR
Üye

Dr. Öğretim Üyesi Süreyya ÖZCAN KABASAKAL
Üye

Dr. Öğretim Üyesi Müge GÜNDÜZ
Üye

C. Expert Interview Questions

I. Isınma Soruları

1. Ne iş yaptığınızı ve sorumluluklarınızı anlatabilir misiniz?

- Ankara'da bisiklet kullanımına dair projelerde rol aldınız mı? Hangi rolleri üstlendiniz?

II. Bisiklet Altyapı Süreci

2. Bisiklet altyapısı neleri kapsıyor?
3. Bisiklet altyapı planı yapılması sürecini anlatabilir misiniz?

- Bisiklet yoluna ihtiyaç olduğunu nasıl belirliyorsunuz? Hangi etmenleri değerlendiriyorsunuz?
- Nereye bisiklet yolu yapılacağına nasıl karar veriyorsunuz?

4. Şu an üzerinde çalıştığınız projeler var mı? Kısaca bahsedebilir misiniz?

- Bu projelerin nasıl geliştirildiğinden bahsedebilir misiniz?
- Hangi projelere başlayacağınıza nasıl karar veriyorsunuz?
- Bütçeyi nerelerden temin ediyorsunuz?
- Projeler arasında bir önceliklendirme var mı? Bunu neye göre belirliyorsunuz?

5. Bu projelerde süreç nasıl ilerledi?

- Partnerleriniz oluyor mu? Partnerleriniz ile nasıl anlaşıyorsunuz?
- Kurumunuz proje içerisinde hangi sorumlulukları alıyor?

III. Kriterler ve Tasarım

6. Bisiklet kullanımına dair tasarım projeleri neleri kapsıyor?

- Yol yapımı
- Bisiklet paylaşımı
- Bisiklet güvenliği
- Bisiklet bakımı
- Yol yardım
- Acil durumlar
- Kural ihlalleri

7. Peki bunlar arasından, hangi tür projeler gerçekleştiriliyor?
8. Bu projelerde hangi kriterlere uyulması gerekiyor? Bu kriterlere nasıl karar veriyorsunuz?

- Proje kapsamı
- Yol tipi, hız, güvenlik...

9. Ankara ve Türkiye Master Planlarına uygun mu planlanıyor?

- Bu planların projelerin belirlenmesinde yeteri kadar etkili olduğunu düşünüyor musunuz?
- Uygulamıyorsanız, neden uygulamadığınızı anlatabilir misiniz?
- Projelerin bu master planlara uygun olup olmadığı nasıl denetleniyor?
- Projeler sırasında master planların geliştirilmesine yönelik sonuçlar çıkıyor mu? Bu sonuçlar master planlara nasıl yansıtılıyor?

IV. **Kullanıcılar**

Bu soruları cevaplarken şu ana kadar gerçekleştirilen projeler üzerinden düşünebilirsiniz.

10. Proje geliştirme süreçlerinde kullanıcılar ile araştırma, veri toplama ya da iş birliği yapılıyor mu?

- (Evet) Kullanıcılardan hangi bilgileri alıyorsunuz, ne soruyorsunuz?
    - Ne tür yöntemler ve veri toplama araçlarını kullanıyorsunuz?
    - Nasıl kullanıcılarla bir araya geliyorsunuz/görüşüyorsunuz?
- (Hayır) Görüşme yapacak olsaydınız kullanıcılardan hangi bilgileri almak sizin süreciniz için yararlı olurdu?

11. Proje uygulaması sırasında kullanıcılar ile araştırma, veri toplama ya da iş birliği yapılıyor mu?

- (Evet) Kullanıcılardan hangi bilgileri alıyorsunuz, ne soruyorsunuz?
    - Ne tür yöntemler ve veri toplama araçlarını kullanıyorsunuz?
    - Nasıl kullanıcılarla bir araya geliyorsunuz/görüşüyorsunuz?
- (Hayır) Görüşme yapacak olsaydınız kullanıcılardan hangi bilgileri almak sizin süreciniz için yararlı olurdu?

12. Proje uygulandıktan sonra kullanıcılar ile araştırma, veri toplama ya da iş birliği yapılıyor mu?

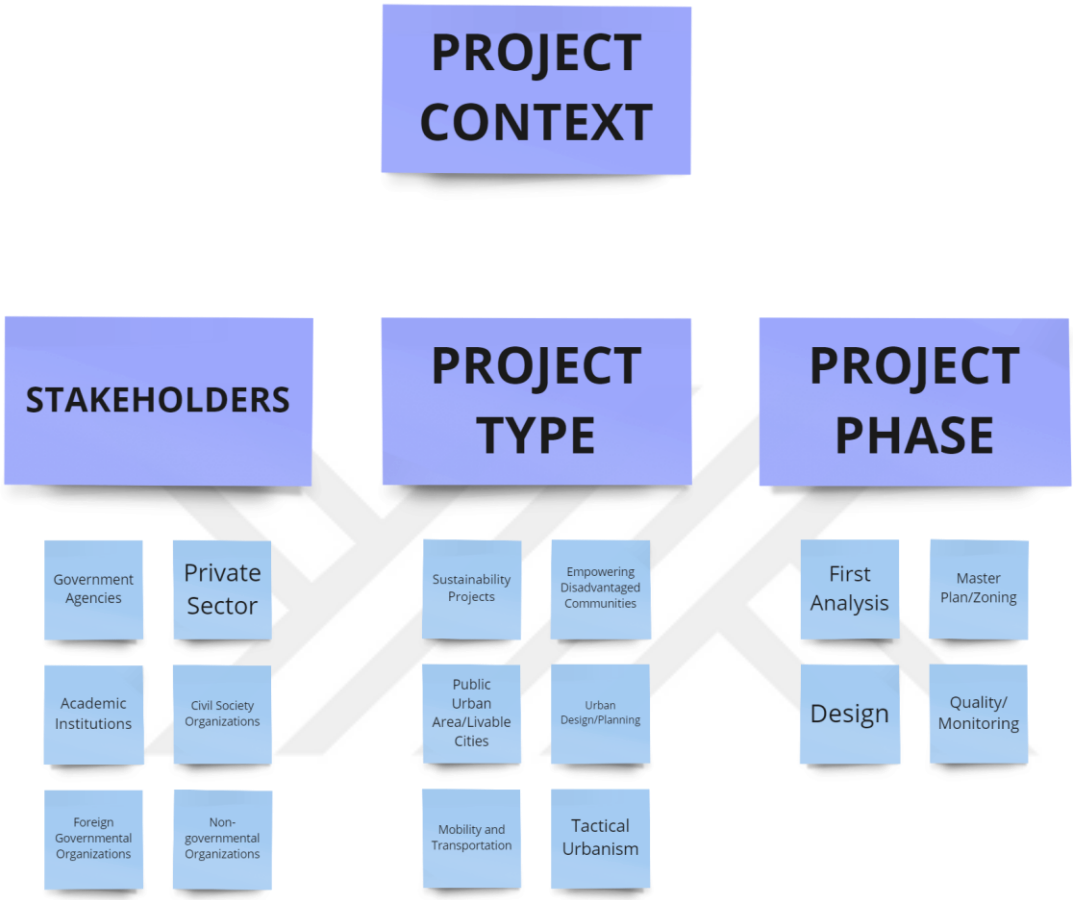
- (Evet) Kullanıcılardan hangi bilgileri alıyorsunuz, ne soruyorsunuz?
    - Ne tür yöntemler ve veri toplama araçlarını kullanıyorsunuz?
    - Nasıl kullanıcılarla bir araya geliyorsunuz/görüşüyorsunuz?
- Uygulandıktan sonra kullanıcılardan geri bildirim topluyor musunuz?
    - Nasıl topluyorsunuz?

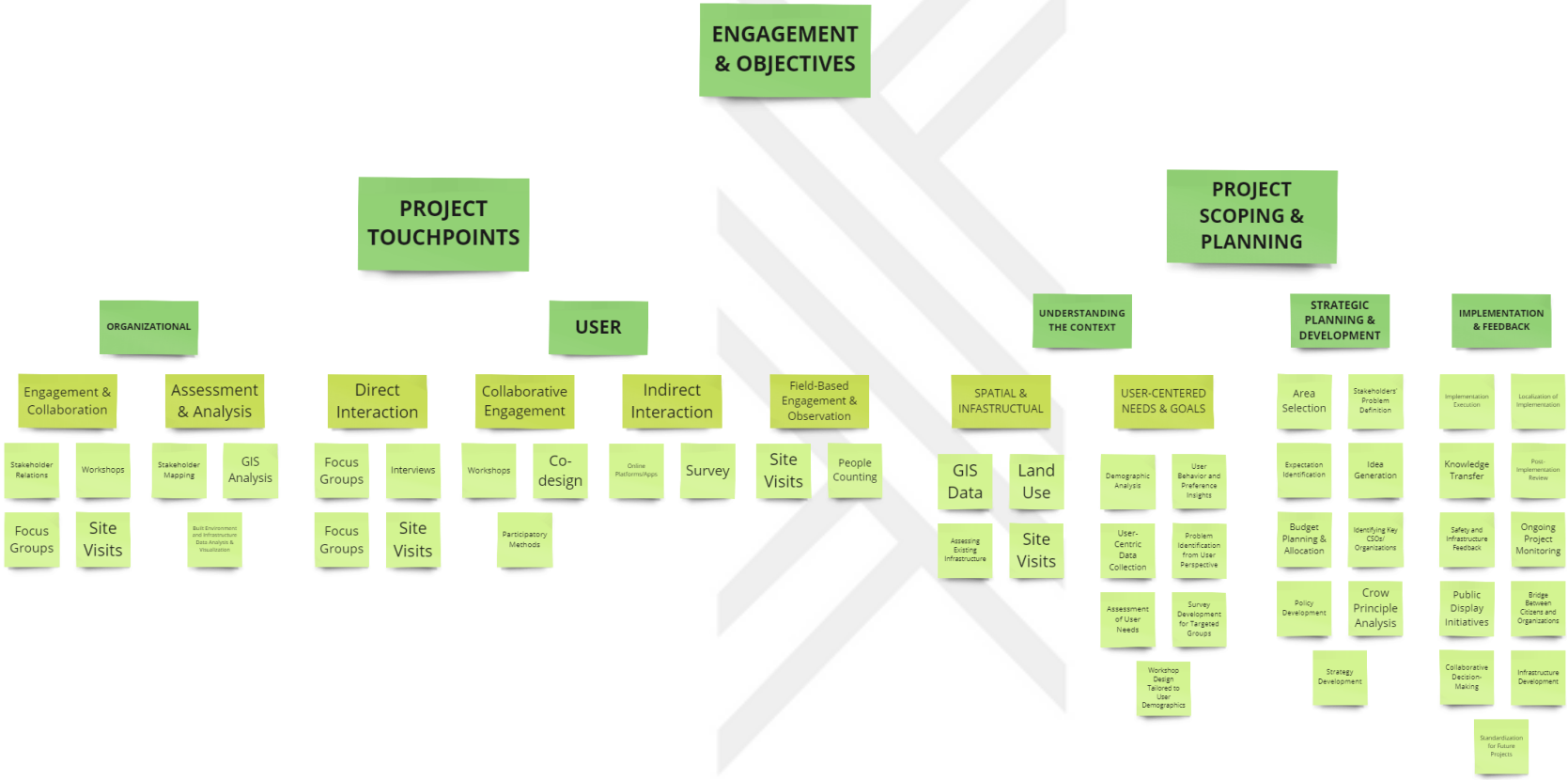
- Uygulanan projelerdeki bisiklet yollarının kullanımını engelleyen durumları denetleyen veya bunların bildirildiği bir sistem var mı?

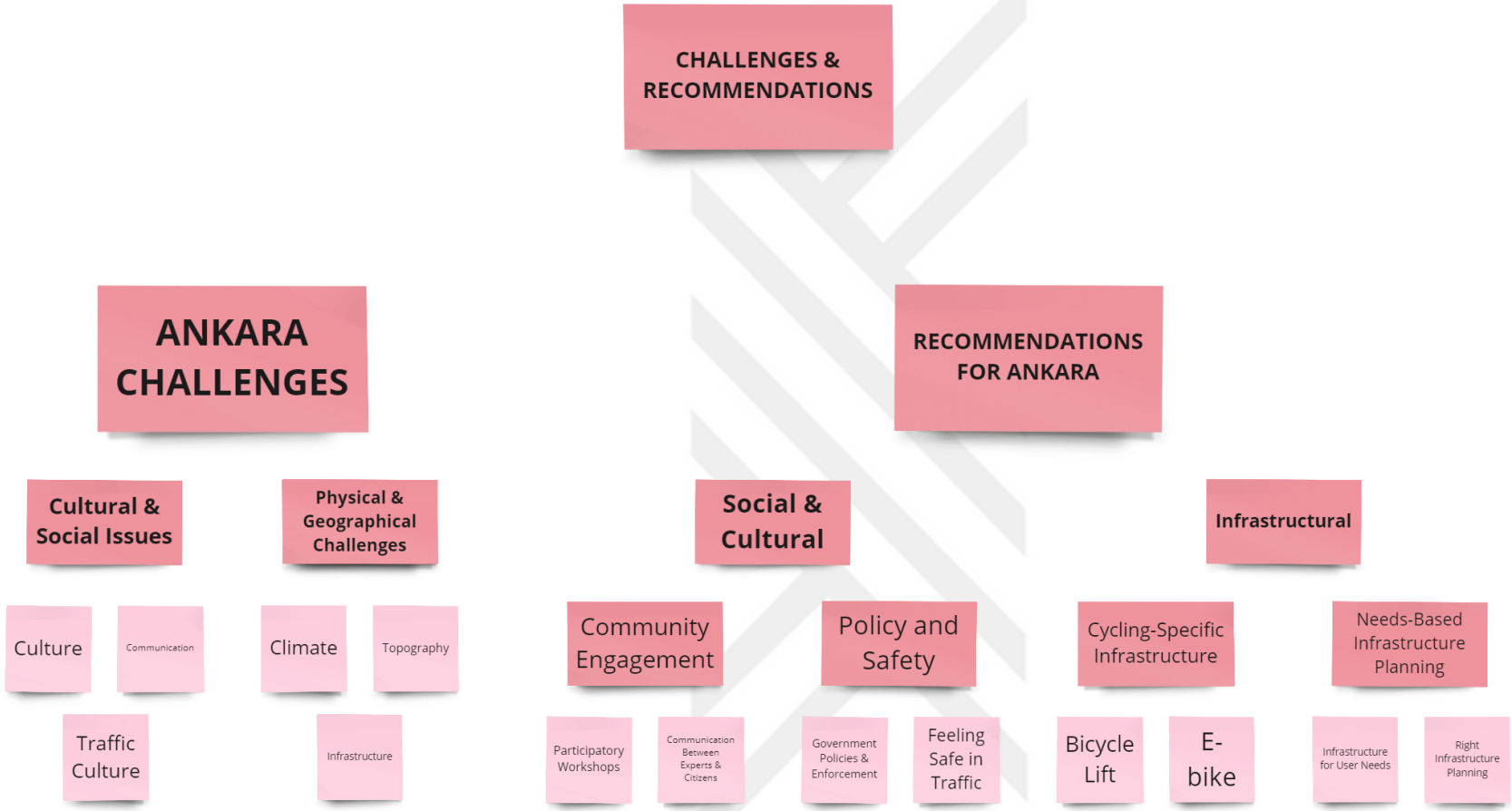
13. Bisiklet projelerine katkı sağlamak ve bisiklet kullanımına dair kullanıcılardan veri ve bilgi toplamak için bir uygulama düşündünüz mü?

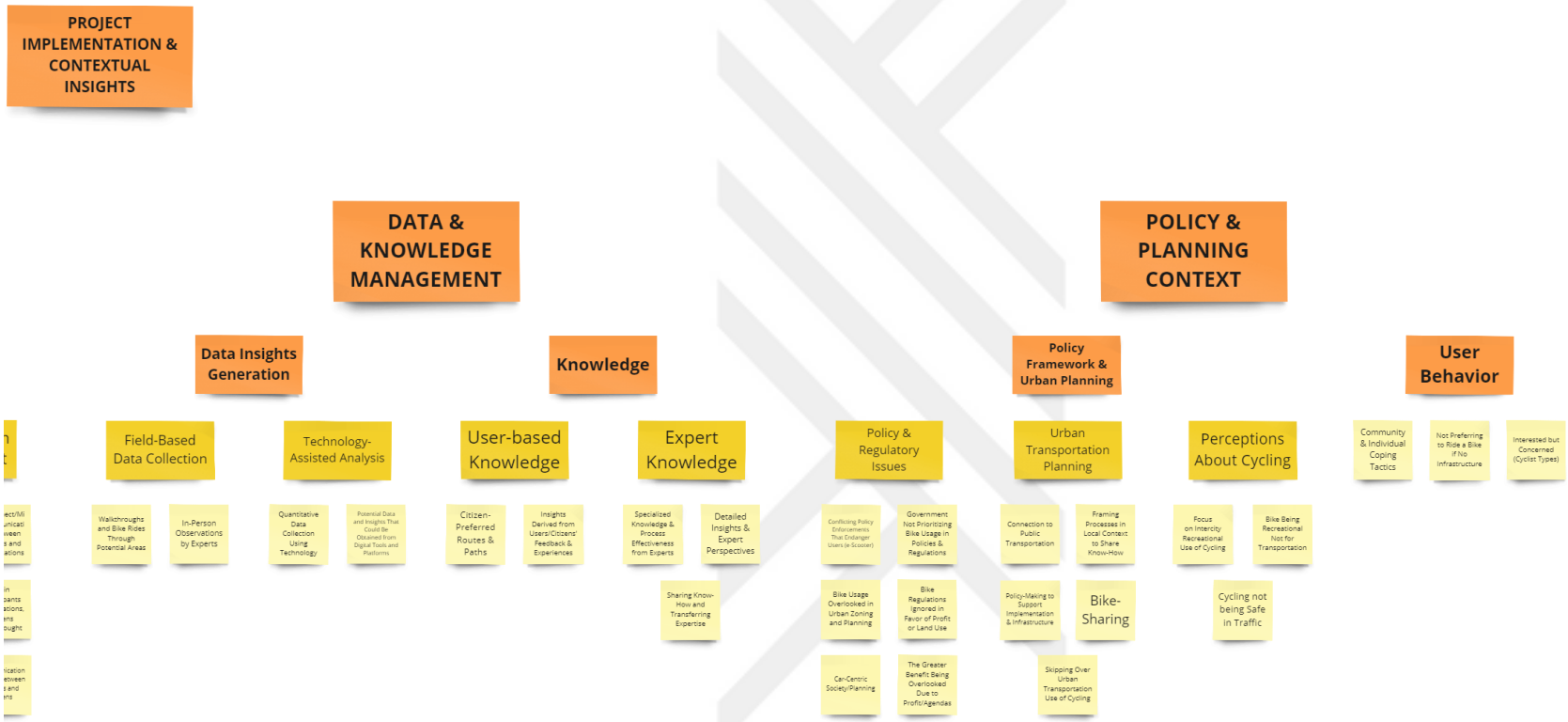
- Nasıl bir uygulama olmasını öngörürdünüz?
- Ne tür veri ve geri bildirim verilmesi sizin süreciniz için yararlı olurdu?
- Bu bilgilerin nasıl iletilmesi yararlı olurdu?

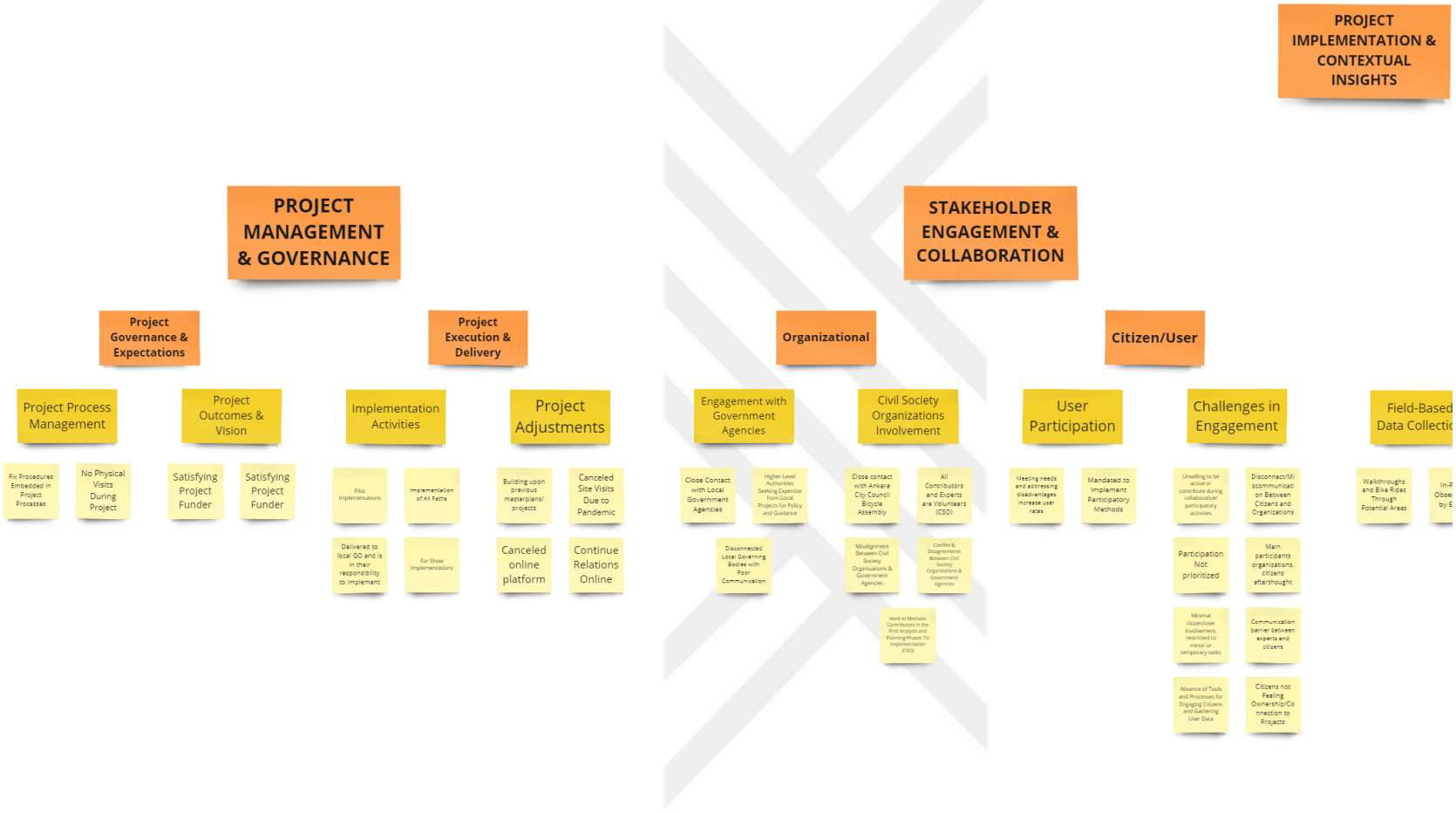
D. Code tree of the expert interviews



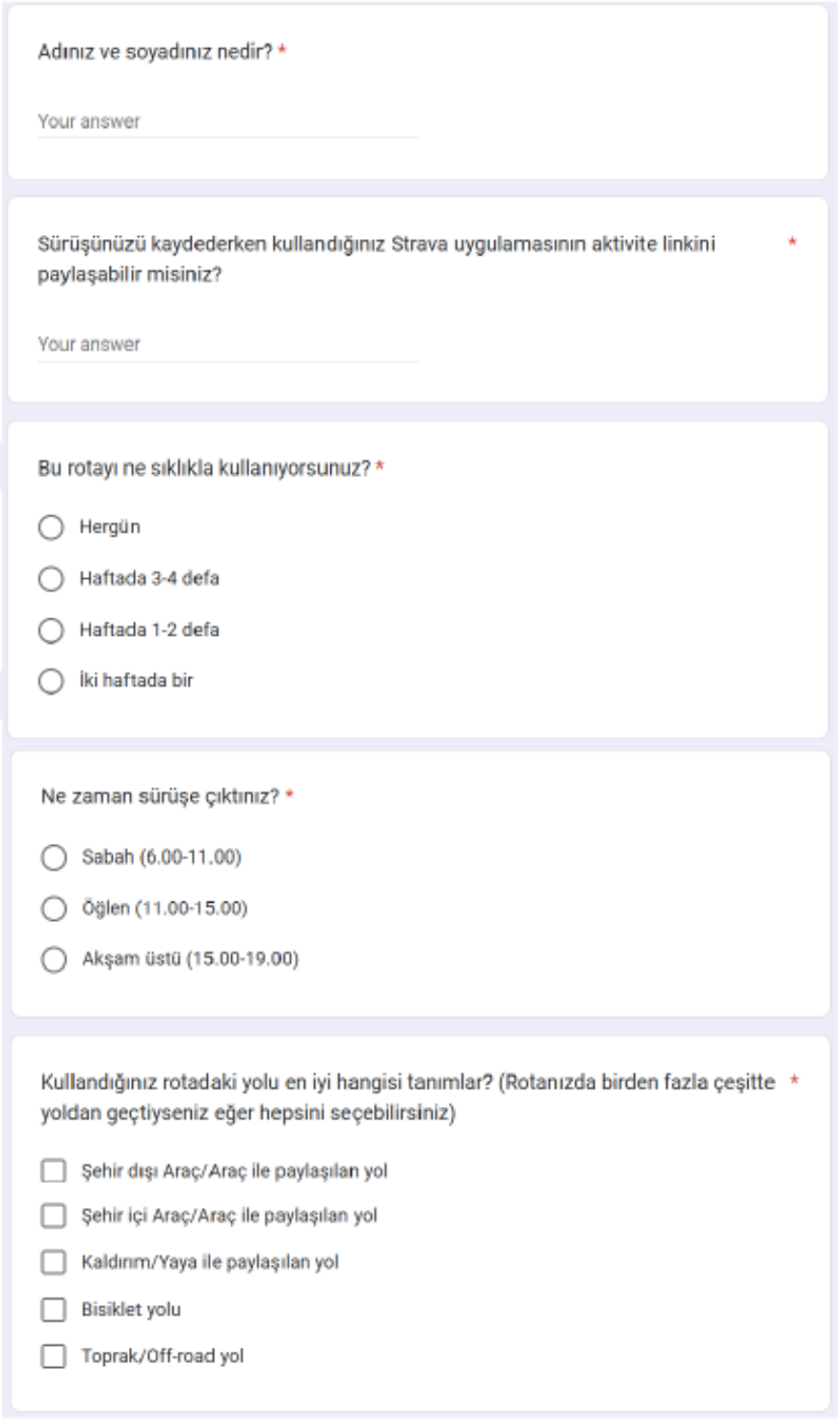

ENGAGEMENT & OBJECTIVES
PROJECT TOUCHPOINTS
ORGANIZATIONAL
Engagement & Collaboration
Stakeholder Relations
Workshops
Focus Groups
Site Visits
Assessment & Analysis
Stakeholder Mapping
GIS Analysis
Built Environment and Infrastructure Data Analysis & Visualization
USER
Direct Interaction
Focus Groups
Interviews
Focus Groups
Site Visits
Collaborative Engagement
Workshops
Co-design
Participatory Methods
Indirect Interaction
Online Platforms/Apps
Survey
Field-Based Engagement & Observation
Site Visits
People Counting
PROJECT SCOPING & PLANNING
UNDERSTANDING THE CONTEXT
SPATIAL & INFASTRUCTUAL
GIS Data
Land Use
Assessing Existing Infrastructure
Site Visits
USER-CENTERED NEEDS & GOALS
Demographic Analysis
User Behavior and Preference Insights
User-Centric Data Collection
Problem Identification from User Perspective
Assessment of User Needs
Survey Development for Targeted Groups
Workshop Design Tailored to User Demographics
STRATEGIC PLANNING & DEVELOPMENT
Area Selection
Stakeholders' Problem Definition
Expectation Identification
Idea Generation
Budget Planning & Allocation
Identifying Key CSOs/ Organizations
Policy Development
Crow Principle Analysis
Strategy Development
IMPLEMENTATION & FEEDBACK
Implementation Execution
Localization of Implementation
Knowledge Transfer
Post-Implementation Review
Safety and Infrastructure Feedback
Ongoing Project Monitoring
Public Display Initiatives
Bridge Between Citizens and Organizations
Collaborative Decision-Making
Infrastructure Development
Standardization for Future Projects


CHALLENGES & RECOMMENDATIONS
ANKARA CHALLENGES
RECOMMENDATIONS FOR ANKARA
Cultural & Social Issues
Physical & Geographical Challenges
Social & Cultural
Infrastructural
Culture
Communication
Traffic Culture
Climate
Topography
Infrastructure
Community Engagement
Policy and Safety
Cycling-Specific Infrastructure
Needs-Based Infrastructure Planning
Participatory Workshops
Communication Between Experts & Citizens
Government Policies & Enforcement
Feeling Safe in Traffic
Bicycle Lift
E-bike
Infrastructure for User Needs
Right Infrastructure Planning


PROJECT IMPLEMENTATION & CONTEXTUAL INSIGHTS
DATA & KNOWLEDGE MANAGEMENT
POLICY & PLANNING CONTEXT
Data Insights Generation
Knowledge
Policy Framework & Urban Planning
User Behavior
Field-Based Data Collection
Technology-Assisted Analysis
User-based Knowledge
Expert Knowledge
Policy & Regulatory Issues
Urban Transportation Planning
Perceptions About Cycling
Community & Individual Coping Tactics
Not Preferring to Ride a Bike if No Infrastructure
Interested but Concerned (Cyclist Types)
Walkthroughs and Bike Rides Through Potential Areas
In-Person Observations by Experts
Quantitative Data Collection Using Technology
Potential Data and Insights That Could Be Obtained from Digital Tools and Platforms
Citizen-Preferred Routes & Paths
Insights Derived from Users/Citizens' Feedback & Experiences
Specialized Knowledge & Process Effectiveness from Experts
Detailed Insights & Expert Perspectives
Sharing Know-How and Transferring Expertise
Conflicting Policy Enforcements That Endanger Users (e-Scooter)
Government Not Prioritizing Bike Usage in Policies & Regulations
Bike Usage Overlooked in Urban Zoning and Planning
Bike Regulations Ignored in Favor of Profit or Land Use
Car-Centric Society/Planning
The Greater Benefit Being Overlooked Due to Profit/Agendas
Connection to Public Transportation
Framing Processes in Local Context to Share Know-How
Policy-Making to Support Implementation & Infrastructure
Bike-Sharing
Skipping Over Urban Transportation Use of Cycling
Focus on Intercity Recreational Use of Cycling
Bike Being Recreational Not for Transportation
Cycling not being Safe in Traffic


PROJECT IMPLEMENTATION & CONTEXTUAL INSIGHTS
PROJECT MANAGEMENT & GOVERNANCE
Project Governance & Expectations
Project Process Management
Fix Procedures Embedded in Project Processes
No Physical Visits During Project
Project Outcomes & Vision
Satisfying Project Funder
Satisfying Project Funder
Project Execution & Delivery
Implementation Activities
Pilot Implementations
Implementation of All Paths
Delivered to local GO and is in their responsibility to implement
For Show Implementations
Project Adjustments
Building upon previous masterplans/ projects
Canceled Site Visits Due to Pandemic
Canceled online platform
Continue Relations Online
STAKEHOLDER ENGAGEMENT & COLLABORATION
Organizational
Engagement with Government Agencies
Close Contact with Local Government Agencies
Higher-Level Authorities Seeking Expertise from Local Projects for Policy and Guidance
Disconnected Local Governing Bodies with Poor Communication
Civil Society Organizations Involvement
Close contact with Ankara City Council Bicycle Assembly
All Contributors and Experts are Volunteers (CSO)
Misalignment Between Civil Society Organizations & Government Agencies
Conflict & Disagreements Between Civil Society Organizations & Government Agencies
Hard to Motivate Contributors in the First Analysis and Planning Phases Till Implementation (CSO)
Citizen/User
User Participation
Meeting needs and addressing disadvantages increase user rates
Mandated to Implement Participatory Methods
Challenges in Engagement
Unwilling to be active or contribute during collaborative/ participatory activities
Disconnect/Miscommunication Between Citizens and Organizations
Participation Not prioritized
Main participants organizations, citizens afterthought
Minimal citizen/user involvement, restricted to minor or temporary tasks
Communication barrier between experts and citizens
Absence of Tools and Processes for Engaging Citizens and Gathering User Data
Citizens not Feeling Ownership/Connection to Projects
Field-Based Data Collecti
Walkthroughs and Bike Rides Through Potential Areas

E. Google Form sent to participants to fill out for the individual stage of the generative focus group



Adınız ve soyadınız nedir? *

Your answer

Sürüşünüzü kaydederken kullandığınız Strava uygulamasının aktivite linkini paylaşabilir misiniz? *

Your answer

Bu rotayı ne sıklıkla kullanıyorsunuz? *

- ◯ Hergün
- ◯ Haftada 3-4 defa
- ◯ Haftada 1-2 defa
- ◯ İki haftada bir

Ne zaman sürüşe çıktınız? *

- ◯ Sabah (6.00-11.00)
- ◯ Öğlen (11.00-15.00)
- ◯ Akşam üstü (15.00-19.00)

Kullandığınız rotadaki yolu en iyi hangisi tanımlar? (Rotanızda birden fazla çeşitte yoldan geçtiyseniz eğer hepsini seçebilirsiniz) *

- ☐ Şehir dışı Araç/Araç ile paylaşılan yol
- ☐ Şehir içi Araç/Araç ile paylaşılan yol
- ☐ Kaldırım/Yaya ile paylaşılan yol
- ☐ Bisiklet yolu
- ☐ Toprak/Off-road yol

Kullandığınız rotayı veya bu sürüşünüzü güvenlik açısından (kendinizi güvende hissetme) nasıl değerlendirirsiniz? *

	1	2	3	4	5	6	7	
Hiç güvenli değil (Güvende hissetmiyorum)	○	○	○	○	○	○	○	Çok güvenli (Kendimi tamamen güvende hissediyorum)

Rotanızı veya bu sürüşünüzü güvensiz yapan (sizi güvensiz hissettiren) şey nedir?

Your answer

Bu rotayı genellikle ne için kullanıyorsunuz/tercih ediyorsunuz? *

Your answer

Sürüşünüze dair paylaşmak istediğiniz ve **olumlu** olarak yorumladığınız bir şeyler var mı?

Your answer

Sürüşünüze dair paylaşmak istediğiniz ve **olumsuz** olarak yorumladığınız bir şeyler var mı?

Your answer

Sürüşünüzden paylaşmak istediğiniz fotoğrafları, videoları, veya ses kayıtlarını buraya yükleyebilirsiniz. *

Upload up to 10 supported files. Max 1 GB per file.

Add file

F. Generative Focus Group Design and Timeline

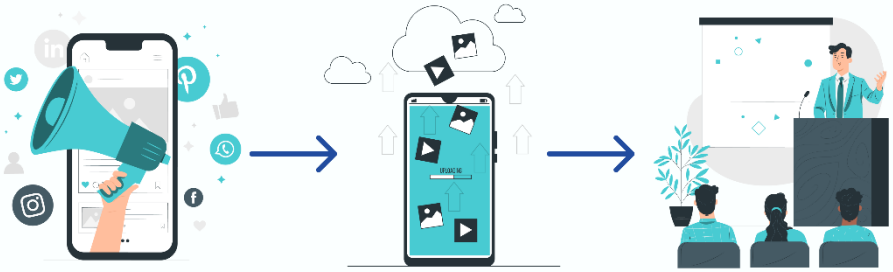


G. Generative Focus Group Presentation





Vatandaş Bilimi nedir?



İlgilerini çeken bir projeden yada araştırmadan haberdar olup, katkı sağlamak isterler.

Projenin yada araştırmanın platformu üzerinden katkılarını ve geribildirimlerini iletirler.

Proje ve araştırmanın süreci ve çıktıları herkes ve katkı sağlayanlar ile şeffaf bir şekilde paylaşılır.

Yanlış Kullanılıyor/Bakımsız







Trafik/Yaya Paylaşımlı Kullanım







Araçların Sıkıştırması



Bisiklet Yolu





Güvende Hissetme





Altyapı Problemleri



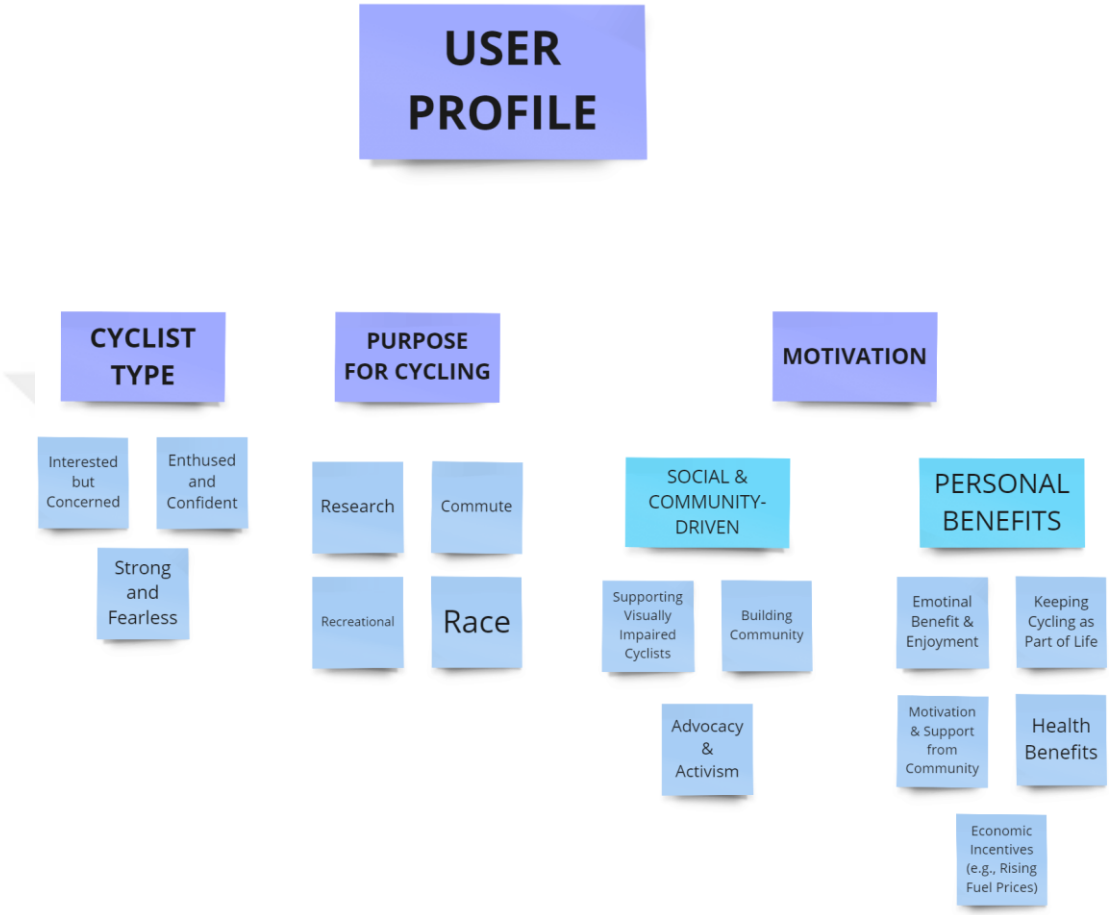


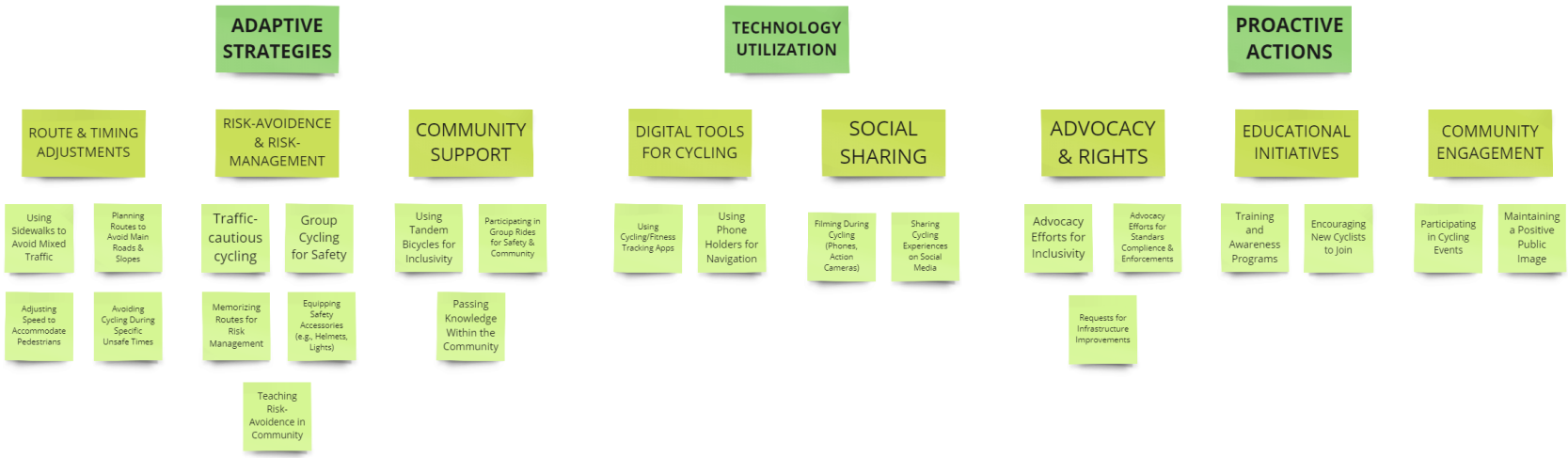


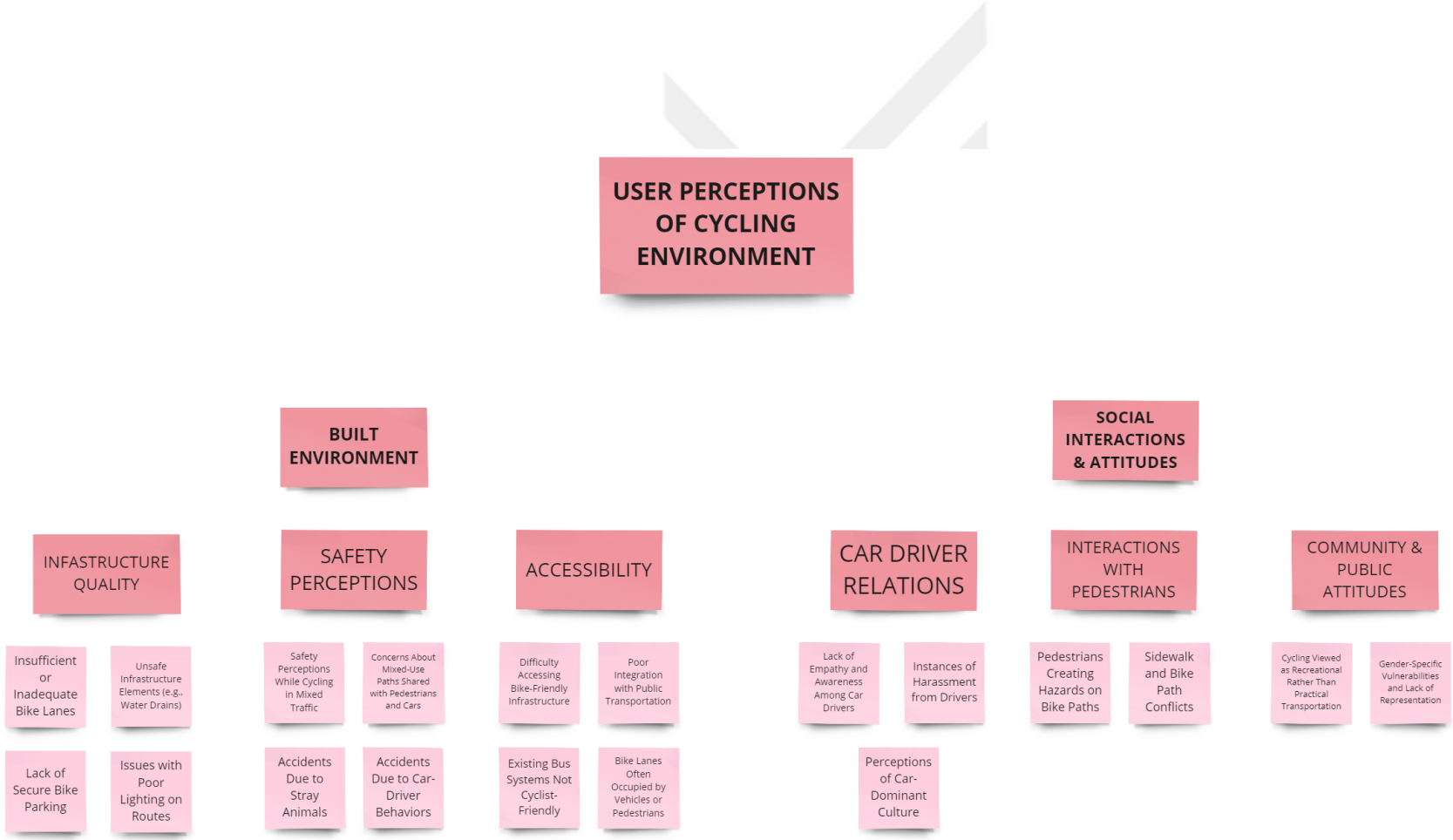
Yanlış Uygulama



H. Code tree of the generative focus groups

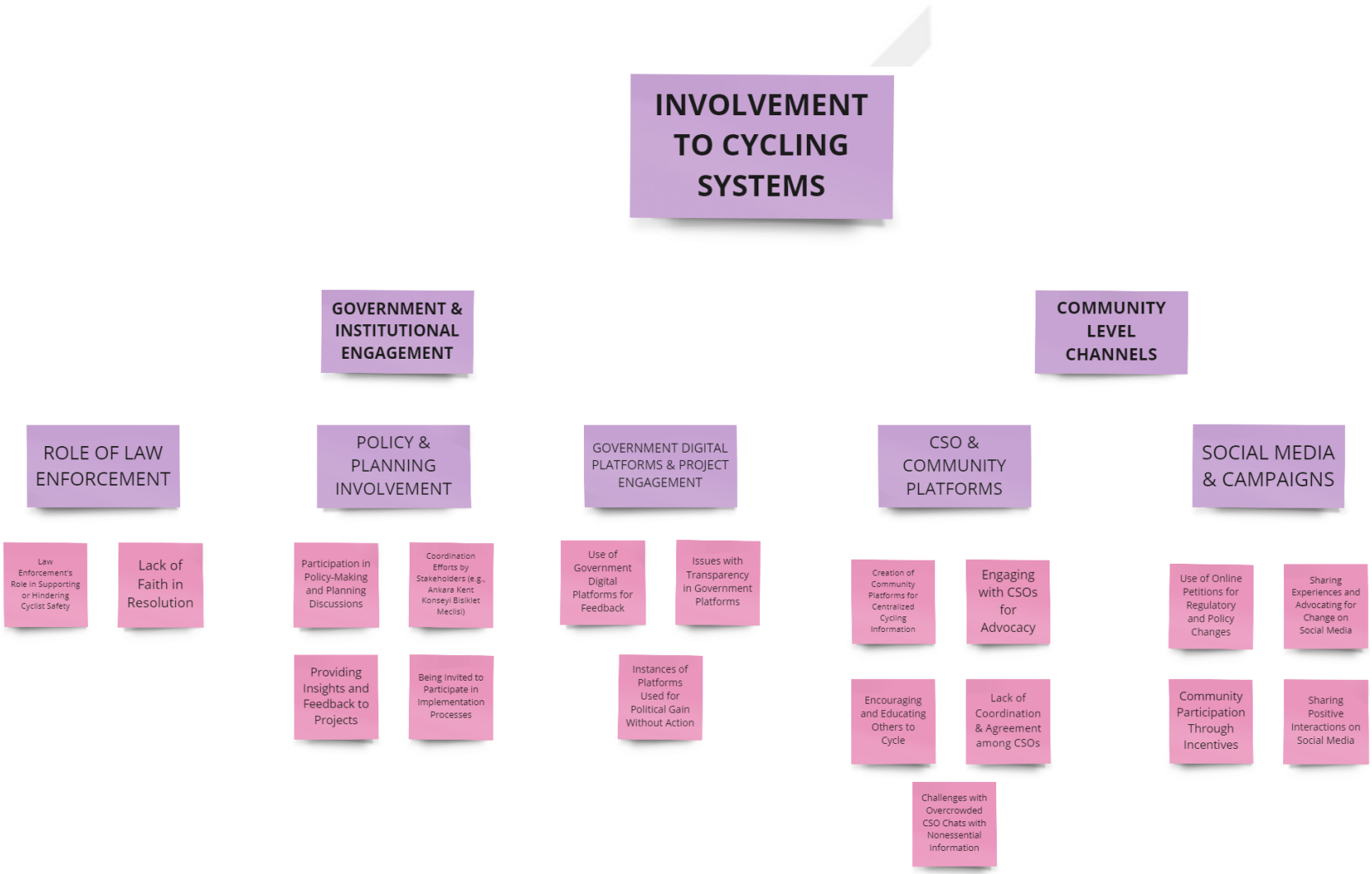



BEHAVIOR
ADAPTIVE STRATEGIES
TECHNOLOGY UTILIZATION
PROACTIVE ACTIONS
ROUTE & TIMING ADJUSTMENTS
RISK-AVOIDENCE & RISK-MANAGEMENT
COMMUNITY SUPPORT
DIGITAL TOOLS FOR CYCLING
SOCIAL SHARING
ADVOCACY & RIGHTS
EDUCATIONAL INITIATIVES
COMMUNITY ENGAGEMENT
Using Sidewalks to Avoid Mixed Traffic
Planning Routes to Avoid Main Roads & Slopes
Adjusting Speed to Accommodate Pedestrians
Avoiding Cycling During Specific Unsafe Times
Traffic-cautious cycling
Group Cycling for Safety
Memorizing Routes for Risk Management
Equipping Safety Accessories (e.g., Helmets, Lights)
Teaching Risk-Avoidence in Community
Using Tandem Bicycles for Inclusivity
Participating in Group Rides for Safety & Community
Passing Knowledge Within the Community
Using Cycling/Fitness Tracking Apps
Using Phone Holders for Navigation
Filming During Cycling (Phones, Action Cameras)
Sharing Cycling Experiences on Social Media
Advocacy Efforts for Inclusivity
Advocacy Efforts for Standars Complience & Enforcements
Requests for Infrastructure Improvements
Training and Awareness Programs
Encouraging New Cyclists to Join
Participating in Cycling Events
Maintaining a Positive Public Image


USER PERCEPTIONS OF CYCLING ENVIRONMENT
BUILT ENVIRONMENT
SOCIAL INTERACTIONS & ATTITUDES
INFASTRUCTURE QUALITY
SAFETY PERCEPTIONS
ACCESSIBILITY
CAR DRIVER RELATIONS
INTERACTIONS WITH PEDESTRIANS
COMMUNITY & PUBLIC ATTITUDES
Insufficient or Inadequate Bike Lanes
Unsafe Infrastructure Elements (e.g., Water Drains)
Lack of Secure Bike Parking
Issues with Poor Lighting on Routes
Safety Perceptions While Cycling In Mixed Traffic
Concerns About Mixed-Use Paths Shared with Pedestrians and Cars
Accidents Due to Stray Animals
Accidents Due to Car-Driver Behaviors
Difficulty Accessing Bike-Friendly Infrastructure
Poor Integration with Public Transportation
Existing Bus Systems Not Cyclist-Friendly
Bike Lanes Often Occupied by Vehicles or Pedestrians
Lack of Empathy and Awareness Among Car Drivers
Instances of Harassment from Drivers
Perceptions of Car-Dominant Culture
Pedestrians Creating Hazards on Bike Paths
Sidewalk and Bike Path Conflicts
Cycling Viewed as Recreational Rather Than Practical Transportation
Gender-Specific Vulnerabilities and Lack of Representation

SYSTEMATIC CHALLENGES




INVOLVEMENT TO CYCLING SYSTEMS
GOVERNMENT & INSTITUTIONAL ENGAGEMENT
COMMUNITY LEVEL CHANNELS
ROLE OF LAW ENFORCEMENT
POLICY & PLANNING INVOLVEMENT
GOVERNMENT DIGITAL PLATFORMS & PROJECT ENGAGEMENT
CSO & COMMUNITY PLATFORMS
SOCIAL MEDIA & CAMPAIGNS
Law Enforcement's Role in Supporting or Hindering Cyclist Safety
Lack of Faith in Resolution
Participation in Policy-Making and Planning Discussions
Coordination Efforts by Stakeholders (e.g., Ankara Kent Konseyi Bisiklet Meclisi)
Providing Insights and Feedback to Projects
Being Invited to Participate in Implementation Processes
Use of Government Digital Platforms for Feedback
Issues with Transparency in Government Platforms
Instances of Platforms Used for Political Gain Without Action
Creation of Community Platforms for Centralized Cycling Information
Engaging with CSOs for Advocacy
Encouraging and Educating Others to Cycle
Lack of Coordination & Agreement among CSOs
Challenges with Overcrowded CSO Chats with Nonessential Information
Use of Online Petitions for Regulatory and Policy Changes
Sharing Experiences and Advocating for Change on Social Media
Community Participation Through Incentives
Sharing Positive Interactions on Social Media