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Future of Household Waste

A Case Study of Influences on Follo
Ren IKS and Miljøbilen's Viability as a
Mainstream Service

Helene Tannæs

Masters of Science
Global Development Studies

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Abstract

Massive amounts of waste are generated globally, requiring improved sorting and collection methods to reduce waste and increase recycling and reuse. Global efforts are being initiated to address this increasing waste and its subsequent consequences. Norway is a country that contributes to these efforts and has implemented strong national policies to handle its own waste. In Norway, each municipality is responsible for managing household waste, with most of them coming together to establish an intercommunal company (IKS) to manage this work. This study focuses on the implementation of a waste collection service called Miljøbilen by Follo Ren, a waste management company responsible for waste management in Frogn, Nesodden, Nordre Follo and Ås. The aim of Miljøbilen is to reduce the number of visitors to the recycling centres, decreasing emissions from cars, and provide a beneficial service for individuals who cannot access these centres due not owning a car, have limited waste to dispose of, or have reduced physical capabilities. The research conducted an EGS (Environmental Governance Systems) Framework analysis. This analysis identified key factors influencing the implementation of a waste collection service, including the company and its policies, the services provided to households, and the potential outcomes in terms of financial, environmental, and social results. A discussion on the advantages and disadvantages of Miljøbilen revealed that while there are financial costs associated with running the service, the overall financial, environmental, and social benefits make it socio-economically profitable. A survey was conducted as part of the evaluation of Miljøbilen, indicating that users of the service are generally satisfied. For non-users, the survey responses suggest that providing more information about the service can potentially increase its usage. The implementation of Miljøbilen supports the need for individually tailored and streamlined waste management services due to an increasing focus on reducing household car usage. Miljøbilen offers one perspective on the effectiveness of such services.

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1. Introduction

1.1 The waste problem

In our growing world of 7.98 billion people, the amount of generated waste is a pressing issue. Estimated waste generation in 2016 was 22.01 billion tonnes, a figure which is expected to rise to 30.40 billion tonnes by 2050 under current production and consumption patterns (Hoornweg & Bhada-Tata, 2012). This problem is exacerbated by the fact that only 13.5% of global waste is currently being recycled, with the majority (33%) ending up in sanitary landfills and another 25% in unspecified landfills (ibid.). These trends are concerning because untreated waste both directly and indirectly impacts the climate. Some countries are showing an ability to recycle up to 60-70% of domestic household waste, but despite this, global recycling rates remain low (Recycling Bins, s.a.). Although landfilling provides an immediate and efficient solution to places without proper infrastructure, it still releases CO₂ and methane, contributing to greenhouse gas emissions and, subsequently, to climate change (EEA, 2014).

Landfilling is a traditional waste management method, but its negative environmental impact has become evident in recent decades, emphasising the importance of implementing proper waste management practices to mitigate the environmental and human consequences (Collect my clothes, s.a.). Furthermore, improper waste management can contaminate water and soil, harming human and animal health (EU, s.a.b). Thus, the need for infrastructure and resources to manage waste exacerbates the problem and results in developed countries exporting their waste to developing countries, with pre-existing resource struggles and even worse waste management systems. This practice contributes to the prevalent use of landfills in many importing countries. Even in developed nations, landfills are still employed, albeit in a more controlled and sanitary manner (Amasuomo & Baird, 2016; Hoornweg & Bhada-Tata, 2012). To effectively address the current waste problem, various management methods must be implemented to cope with the increasing amounts of waste generated.

Global waste management systems face significant challenges due to increasing levels of production and consumption patterns. As a result, the quantities and complexity of waste have also increased (EEA, 2014). Additionally, current waste management structures struggle to effectively process and treat these diverse and intricate types of waste, which hampers the ability to manage waste in a sustainable and environmentally responsible manner (ibid.). Furthermore, the definition of waste is also being challenged in modern society and waste management. Historically, waste was considered a by-product and discarded without much

thought. However, waste should only be considered waste when labelled as such, as it may still have value or reuse potential (Amasuomo & Baird, 2016). Defining waste depends on the viewpoint of the definer, making it a subjective notion that influences waste management on different societal levels (Khan et al., 2022). Therefore, in recognition of current processes of re-evaluating waste and its uses, this paper adopts the understanding that waste is a by-product of human and production activities that can be repurposed and reused. It is important to note that the waste management challenges also include waste treatment and the associated obstacles.

Solid waste management refers to the collection, treatment, and recycling of solid wastes. Choosing a waste management strategy involves decision-makers constantly revisiting the question of cost-effectiveness due to the increasing options. It is important to consider waste management's economic, ecological, and societal aspects (Allesch & Brunner, 2014). Viewing waste management as a “throughput economy” facilitates considerations for the inputs and outputs to the market and the environment, thus placing market activities within the physical environment and helping to ensure a sustainable system (Allesch & Brunner, 2014; Vatn, 2015). This can be achieved by using multi-criteria decision-making tools incorporating economic, environmental, energy, sociological, and legal factors to guide waste management decisions (Jovanovic et al., 2016). However, household waste management also depends on household engagement with the resulting waste policy measures.

The collection phase of waste management plays a crucial role in the overall waste management process, which involves engaging households in adhering to proper waste sorting and disposal practices. A major concern, especially for countries and regions with limited resources, is the cost implication of improper waste management (Sewak et al., 2021). Increasing household engagement with proper waste sorting and disposal can help address this issue (ibid.). Achieving this requires not only the availability of necessary infrastructure and waste services but also involves raising public awareness and fostering a sense of personal value and meaning in these activities. It is also crucial to implement policies that reduce environmental risks associated with waste management (Brotosusilo & Nabila, 2020). Furthermore, apart from increasing household engagement with recycling, it is important to establish producer responsibility, where producers contribute additional services alongside regular household waste management efforts (ibid.). This approach recognises that waste management is a collective effort involving both consumers and producers.

Household recycling behaviour plays a vital role in the shaping of waste management and recycling programs (Yau, 2012). This is because waste recovery is most effectively achieved through active public participation at the local level of society. However, this requires understanding the factors that motivate or discourage individuals from recycling, which is identified as the first step in waste management, as policymakers need this knowledge to design effective initiatives (ibid.). Overall, proper engagement of households, supported by infrastructure, awareness campaigns, and collaboration between consumers and producers, is also key to improving waste management and achieving sustainable outcomes.

1.2 Context and purpose of the thesis

Due to the significant environmental and societal consequences of poor waste management practices, it is crucial to implement effective waste collection and management methods. Maximising resource utilisation can help mitigate climate change and environmental impacts, alongside reducing the demand for virgin materials involving exploitative labour practices. This can help reduce waste management costs and support the transition to a Circular Economy (CE) by promoting the continuous flow and reuse of materials. The relationship between ongoing changes within waste management and CE will be discussed in the next chapter.

In Norway, each municipality has the responsibility of managing local household waste. Therefore, most household waste is collected by public waste management companies. Local waste management companies receive funding from budget allocations and household fees. Waste management strategies consider both financial and environmental costs, aiming to ensure cost-effectiveness while efficiently collecting the various waste types generated within local community households. The waste management companies provide each household with bins for specified waste categories, collected at regular intervals. However, the sorting and collection practices vary across municipalities, with some of the commonly included categories being food waste; paper and cardboard; general waste; plastics; tin and metals; and glass. The rest of the household waste, like e-waste, textiles, etc., must be taken to local recycling centres for proper processing.

Even so, some individuals face challenges accessing these recycling centres, such as the elderly, students, carless households, and disabled individuals. Providing alternative disposal methods for waste not collected through regular municipal services is therefore essential. This ensures the proper disposal of such wastes, reducing the miss-sorting of waste that can disrupt waste treatment operations. It also promotes the efficient utilisation of waste by reintroducing it into

the economy. Additionally, offering such services reduces the number of individual trips made to recycling centres, decreasing emissions from private cars, and potentially replacing a collection truck with a fixed route of collection points.

Follo Ren, serving four municipalities in south-eastern Norway (Frogn, Nesodden, Nordre Follo, and Ås), initiated a project in 2018 to address waste that is not covered by standard household waste collection services. This waste would otherwise need to be taken to recycling centres or disposed of as residual waste, the latter option being unwanted. The project involved a dedicated truck travelling to specific locations throughout the municipalities at set times to collect this specific waste. The aim was to offer individuals without means of transportation an opportunity to dispose of these additional waste categories properly. The results indicated that this waste collection service increased the sorting rate of electronic and hazardous waste, which would have otherwise been improperly discarded or left at home. Providing households with more accessible means of disposing of such waste not only enhances disposal rates but also ensures proper sorting for recycling and subsequent reuse.

While the current waste collection system covers a range of household waste categories, a considerable amount of waste is still missorted each year, primarily in categories not covered by the standard collection service. Given the environmental impacts associated with these waste categories, it is essential to establish effective waste management measures that enable proper disposal. Follo Ren has introduced Miljøbilen to address this issue.

To better understand the factors influencing the implementation of Miljøbilen, an analysis of Follo Ren's governance system is needed. This analysis will serve as a basis for evaluating the viability of Miljøbilen as a collection service for additional household wastes. The evaluation consists of a discussion on the advantages and disadvantages of this service.

1.3 Objectives and research questions

The first objective is to utilise the Environmental Governance Systems Framework (EGS Framework), developed by Arild Vatn, to analyse the factors that impact the implementation of Miljøbilen. This analysis focuses on the governance structure, actors, and institutions involved in adopting this waste management approach. The aim is to gain insights into the considerations necessary for the successful implementation of such waste management methods. The following research questions have been formulated to facilitate this analysis:

RQ 1: How do the elements internal to the governance structure affect Follo Ren's implementation of Miljøbilen?

RQ 2: How do the elements external to the governance structure affect Follo Ren's implementation of Miljøbilen?

The second objective is to evaluate the viability of Miljøbilen as a mainstream activity. This assessment involves an examination of the advantages and disadvantages of operating this service. The analysis will consider the current usage and scope of Miljøbilen amongst various target groups, as well as the knowledge, interest, and need for this service. By considering these aspects, this study aims to identify existing limitations and explore areas of improvement to enhance Miljøbilen's benefits and usage. The following questions have been formulated to assist the discussion of Miljøbilen. Questions 1-3 are intended to be questions from Follo Ren's perspective, while questions 5-6 are from the households. Questions 4 and 7 are a mix of these two perspectives:

RQ 1: What is the purpose of Miljøbilen, and to what extent has this been achieved?

RQ 2: What are the advantages and disadvantages of launching Miljøbilen?

RQ 3: What economic, environmental, and social outcomes have been achieved: are there municipal variations?

RQ 4: What are Miljøbilen target groups, and to what extent do people know about Miljøbilen: are there municipal variations?

RQ 5: What are the impressions of Miljøbilen amongst users and non-users?

RQ 6: How can knowledge, use and impressions of Miljøbilen be increased for users and non-users?

RQ 7: What can be learned in terms of developing streamlined and individually adapted measures for the future?

2. Background

2.1 Shifting values: Waste and the Circular Economy

Changes in waste's perceived value and usefulness can drive system changes within the waste management industry. Evolving compositions and complexities in products pose significant challenges to the collection and treatment of waste (Singh et al., 2014). As more policies target the incorporation of material reuse and recycling as part of manufacturing take-back systems, the approach to waste is taking more of a Circular Economy (CE) approach to waste management (Ilankoon et al., 2018). In fact, scaling up the collection of mixed-material products, for instance, through Extended Producer Responsibility programmes, can help preserve the value of recovered materials (ibid.). Waste management can also play a more substantial role in material recirculation if the recovery model is revised. However, the value of such work is affected by the challenges associated with product composition and size and the recovered materials' size (ibid.).

Nevertheless, as awareness of the issues associated with the existing linear production-consumption model grows, so do the calls for a shift to a CE model. The current model consists of frequent and rapid production and consumption, followed by quick and often thoughtless disposal of products. CE aims to address the global challenges of the linear model by promoting the circulation of materials, products, and services for as long as possible, thereby reducing waste and its environmental impacts (EEA, 2014; EPA, 2022). Reusing waste through product and material reuse is a key aspect of CE, helping to reduce the need for virgin resource extraction and minimise production processes (EEA, 2014).

In a CE model, waste management plays an important role in sorting, treating, and reintroducing waste into the economy, though several challenges are associated with this work (Sing et al., 2014). These challenges include how waste is to be sorted and treated, which methods of collection and processing is to be used and determining the usage of waste as a resource. Adequate financing and infrastructure are necessary to support needed waste management methods (Allesch & Brunner, 2014; Singh & Ordoñez, 2016). This results in balancing the costs of implementing sufficient waste management methods with the potential for increased recycling and material reuse. It is also important to consider the human labour involved in waste management in terms of costs and the potential for increased job creation within the industry (EPA, 2022).

Overcoming the challenges associated with waste generation and implementation of waste management strategies is crucial if the waste problem is to be effectively dealt with. The global efforts, more on this later, indicate a shift in the perceived value and usefulness of waste and involve implementing waste policies that align with key aspects of CE, such as increased recycling and material reuse. Though some of these do not explicitly address the commonalities with CE, acknowledging the similarities highlights the importance of recognising the changing values of waste as a resource.

2.2 Global efforts

The importance of improved waste management was reasserted at the 2002 World Summit on Sustainable Development (United Nations, s.a.). At this summit, governments were urged to act on waste management. Organisations such as the World Bank and the European Commission have released reports addressing the current state of waste management. These reports highlighted the challenges of current waste generation and the diverse waste management methods being utilised. There is a need to improve management efficiencies while considering the broader impacts of waste and its treatment (Hoornweg & Bhada-Tata, 2012). Efforts are underway to enhance waste management practices to reduce waste's economic and environmental consequences while promoting the continued utilisation of pre-waste products and their material components (EEA, 2014).

2.2.1 UN Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) were adopted in 2015 as part of the 2030 Agenda to achieve peace and prosperity for both the planet and its people. Comprised of 17 goals and their respective subgoals, the SDGs emphasise the need for action from both developed and developing countries. Building upon the work of the Millennium Development Goals, the SDGs have expanded the scope to incorporate additional goals aimed at tackling climate change and environmental degradation (SDGF, s.a). This expansion reflects an increased awareness of the impacts of human activities on the environment. Unlike the Millennium Development Goals, the SDGs recognise the role of the public and private sectors, particularly large national and international companies, in working towards these goals (ibid.).

Chapter 21 of Agenda 21, a document within the United Nations Conference on Environment and Development (UNCED) framework, guides the management of solid waste and sewage-related issues in alignment with SDG 12. In this chapter, solid waste includes domestic refuse, non-hazardous wastes such as commercial and institutional waste, street sweepings, and

construction debris (UNCED, 1992, p. 254). It also acknowledges that certain countries include some types of human waste in this definition. SDG 12 emphasises the importance of waste prevention, minimisation, reuse, and recycling, with governments also stressing the need to develop environmentally sound disposal facilities and technologies allowing waste to be converted into energy (United Nations, s.a).

2.2.2 The World Bank's reports on waste

The World Bank (WB), established in 1944, is an international financial institution offering loans and grants to low- and middle-income countries for capital projects. Over the years, it has funded around 12,000 development projects through grants, interest-free credits, and traditional loans. The WB operates across multiple development sectors, providing financial products and technical assistance to help countries address their specific challenges (World Bank, s.a.b). Its work covers areas including debt, environment, food security, and health. Within the environmental realm, the WB emphasises the significance of well-managed and clean environments in facilitating sustained and inclusive growth, promoting food security, enhancing human well-being, and reducing poverty. Recognising the regulatory influence of ecosystems on air, water, and soil, the World Bank underscores the global need for better natural resource management, effective waste management programs, environmentally friendly fiscal policies, and greener financial markets to achieve sustainable development and growth (World Bank, 2022). Therefore, the World Bank provides financial resources, knowledge products, and technical assistance to support the integration of waste management (World Bank, s.a.a).

The What a Waste 2.0 report (World Bank, 2018) builds upon previous publications on the same topic in 1999 and 2012. This report thoroughly analyses global, regional, and urban trends in solid waste management, incorporating updated and expanded data encompassing 367 cities in 217 countries and economies. It also provides insights into various metrics, including waste generation, disposal, management costs, revenues, tariffs, regulations, and more (Kaza et al., 2018). The reported data can be foundational for formulating waste policies and local waste strategies. According to the report, Europe and Central Asia generated 392 million tonnes of waste in 2016, most concentrated around major economic hubs in Western Europe and tourist destinations (World Bank, 2018). The report also presents the waste composition for each region, with Europe and Central Asia having the most significant compositions consisting of "food and green" waste at 36%, followed by "other" waste at 21% and "paper and cardboard" waste at 18.6%. Understanding local waste compositions and generation levels enables governments to

allocate resources, design systems, and select appropriate management methods to handle local waste challenges effectively.

2.2.3 European Waste Management Framework

The European Union (EU) has a longstanding commitment to waste management, dating back to the establishment of the European Commission (EC) in 1958. Despite progress, the EU still faces challenges, with only 38% of waste being recycled and more than 60% ending up in landfills in certain European countries (EU, s.a.c). To transition towards a Circular Economy (CE), the EU has implemented various policies as part of its overarching environmental agenda, with the European Green Deal serving as a foundation for this transformative process. The Waste Framework Directive (WFD) is a key component of the Green Deal, providing a legal framework for waste treatment and management (EU, s.a.c). The WFD aims to establish principles for effective waste management and specify the requirements that waste management policies must consider (EU, s.a.a). The directive recognises that different waste categories require specific approaches to ensure appropriate management, thereby facilitating the processing and treatment of diverse waste streams (EU, s.a.c). Moreover, the WFD defines waste and other by-products and offers guidelines for their management (EU, s.a.a). The WDF includes a Waste Hierarchy (Figure 1) established by the EU to support the definition and management of waste.



Figure 1: European Waste Hierarchy (EU, s.a.a)

The EU established a Waste Hierarchy under the WDF as a foundational element of the overall EU waste management. This hierarchy provides a structured approach consisting of five steps, outlining the preferred order for managing and disposing of waste within the EU. This order is

based on the EU’s definitions of waste, recycling and recovery outlined in the overarching Waste Framework Directive (EU, s.a.a). Table 1 includes some of the targets to be achieved by implementing this framework.

Table 1: EU Waste Hierarchy Targets (EU, s.a.a)

Year	Tier	Type of waste	% by weight
2020	Preparing for re-use and recycling	Household waste	Minimum 50%
2020	Preparing for reuse, recycling, and other material recovery	Non-hazardous construction and demolition waste	Minimum 70%
2025	Preparing for re-use and recycling	Municipal waste	Minimum 55%
2030	Preparing for re-use and recycling	Municipal waste	Minimum 60%
2035	Preparing for re-use and recycling	Municipal waste	Minimum 65%

2.3 Norwegian waste management policies and regulations

Norway actively engages in international cooperation regarding waste management, and changes in global or international waste regulations can significantly impact Norway's waste management practices. Through the EEA agreement, Norway incorporates EU regulations, leading to the adoption of stricter rules than the EU in certain areas of waste management (Klima- og miljødepartementet, 2021). Nevertheless, Norway sometimes implements stricter regulations than the EU within this field. Additionally, Norway participates in other international initiatives on waste management, including those under the United Nations umbrella. One notable example is the Basel Convention, governing the handling and disposal of hazardous waste across borders (ibid.).

The Ministry of Climate and Environment oversees waste policies in Norway, while the Norwegian Environment Agency oversees waste regulations and practical guidelines (Klima- og miljødepartementet, 2021). Waste management permits operating under the Pollution Act can be granted by a state administrator responsible for supervising municipal waste

management. The state administrator liaises between central authorities and municipalities and manages the implementation of parliamentary decisions, government targets, and guidelines (Statsforvalteren, 2023b). Waste management responsibilities in Norway are divided between public and private entities. Municipalities monopolise collecting and treating household waste but can hire private waste management companies for these services or establish a company themselves. Private businesses are solely responsible for managing their waste and must implement appropriate measures for its collection and treatment in compliance with the producer responsibility scheme outlined in national laws (Miljødirektoratet, 2022; Emballasjeforeningen, n.d.).

An inter-municipal company (IKS), or "interkommunalt selskap" in Norwegian, is a legally established company that municipalities, counties, or other IKS entities can form. The owners of an IKS have unlimited political liability for their share in the company. The representative council, comprising representatives from each owner, serves as the highest authority within the IKS and convenes a few times a year (Avfall Norge, s.a.a). IKS entities are commonly established to provide specific services. They can encompass various sectors such as waste management, real estate operations and sales, electricity, gas, hot water, steam suppliers, and social and health services (SSB, 2012). They play a crucial role in the practical implementation of waste management in Norway, with approximately 100 IKS entities in existence and around 90% of municipalities being members of one (Avfall Norge, s.a.a). When establishing an IKS, a company agreement must be drafted, specifying the company's purpose, the financial obligations and benefits of each participant, the ownership share and resulting liability, if different from the ownership share (IKS-loven, 1999). The company agreement sets the framework for the operation and governance of the IKS.

2.4 Follo Ren IKS

Follo Ren IKS is an inter-municipal company owned by the municipalities of Frogn, Nesodden, Nordre Follo, and Ås, originally established in 1995 and later reorganised into an IKS in 2004 (Follo Ren, s.a.a). There are several levels of authority in Follo Ren with the Board of Representatives being the highest power, followed by the Company Board, Election Board, and finally the daily administration. These will be discussed further in chapter 5.

Follo Ren's responsibility is to ensure that waste collection, transportation, and treatment align with current regulations stipulated in the Pollution Act and other provisions issued by central authorities. These regulations are based on guidelines and framework conditions set by various

international and national bodies. The UN SDGs 11, 12, and 13 are relevant to Follo Ren's work, EC regulations, national and municipal laws and regulations, and national and local climate and energy plans (Follo Ren, s.a.a).

There is an upper limit on the fees that municipalities can set, ensuring that the total fees collected do not exceed the cost of delivering the service. As an IKS, Follo Ren generally maintains a stable financial situation and has the flexibility to adjust fees accordingly. However, like all IKS entities, Follo Ren operates on the self-cost principle, meaning that residents finance the company's services through regular fee payments (Miljødirektoratet, 2021).

Follo Ren's vision is to elevate waste management to a new level while minimising environmental impacts. They aim to achieve this by focusing on citizens, sustainability, and the economy (Follo Ren, s.a.b). These three pillars form the foundation of the company's sustainability objectives, each with its own set of goals to drive progress. Moreover, Follo Ren considers the perspectives of a group of influencers during the decision-making and implementation processes of waste management measures and methods (ibid.).

2.5 Miljøbilen

Follo Ren's services encompasses household waste collection and providing recycling stations for household to come and drop-off waste that is not included in the regular waste collection service, creating a dichotomy.

Follo Ren introduced Miljøbilen as an additional service aimed at providing a waste disposal option for individuals with difficulties in travelling to the recycling centres and reducing the number of trips made to the centres to dispose of smaller quantities. This service falls between the collection and household drop-offs, consisting of a combination of both. The initiative aims to enhance the sorting and proper disposal of specific types of waste, especially electronic and electric waste (e-waste) and hazardous waste. By offering this service, Follo Ren adapts to policymakers' goals of reducing car usage, consequently decreasing the number of visitors to recycling centres. Similar services are run by MOVAR and ROAF, also located in south-eastern Norway, servicing other municipalities; however, these focus only on hazardous and e-waste (MOVAR, 2021; ROAF, s.a).

The project involves a dedicated truck travelling to specific locations on a biweekly basis, remaining at each location for approximately 30 minutes before moving on. The specific times and locations for the truck's visits were determined before the project's launch. Individuals

living near these locations can bring their waste within the categories outlined in Table 2. Certain waste categories are accepted without additional costs, while there is a fixed fee of 40 NOK for others.

Table 2: Miljøbilens waste categories and associated costs (Follo Ren, s.a.c)

Free delivery	40 NOK per delivery	Miljøbilens does not take
Hazardous waste	Wood	Impregnated wood
Paint	Crystal and porcelain	Plaster
E-waste (smaller items)	Ovenproof dishes	Asbestos
Metal	Plastics	Car tires
Glass and metal packaging	Tiles	Windowpanes
Textiles	Residual waste-type	Excavation and demolition
Cardboard, paper, and cartons	materials	materials
		Food waste
		Garden waste
		Large appliances

Current results indicate that “Miljøbilens” helps increase the sorting rate of electronic and hazardous waste, which would have otherwise been improperly discarded or left at home. To date, “Miljøbilens” has received over 84 tonnes of waste, the majority comprising these two waste categories. Providing households with more accessible means of disposing of such waste enhances disposal rates and ensures proper sorting for recycling and subsequent reuse. Furthermore, “Miljøbilens” is the only service that experienced increased visitors during 2021. These results indicate some of the benefits of the “Miljøbilens” as a potentially mainstreamed waste collection service.

3. Theory

This chapter presents the theoretical framework for analysing Follo Ren’s decision-making process in implementing Miljøbilen, which will be used to answer this study’s first objective. The focus of this analysis will be on Follo Ren as a political company seeking to establish Miljøbilen. This framework analysis establishes a basis for the subsequent discussion on the advantages and disadvantages of the service. Evaluating Miljøbilen necessitates examining both users' and non-users' motivations and behaviours. To gain insights into these dynamics, the behavioural theories ‘theories of motivation and human behaviour’, ‘the theory of planned behaviour’ and ‘the low-cost hypothesis’, are utilised to shed light on why individuals engage, or choose not to, with the service. This will help answer the second objective of this study.

3.2 Environmental Governance Systems (EGS) Framework by Arild Vatn

Arild Vatn developed the Environmental Governance System (EGS) Framework, drawing inspiration from Ostrom’s institutional analysis and development framework (Vatn, 2015). The EGS framework was designed to facilitate an interdisciplinary analytical approach to environmental governance across societal scales. Its purpose is to assess the effectiveness of the governance of environmental resources and processes. To conduct a specific analysis using the framework, it is necessary to provide a detailed elaboration where applicable. The framework illustrates the complex interconnections within environmental governance, highlighting key actors and institutions, objectives, and types of interactions.

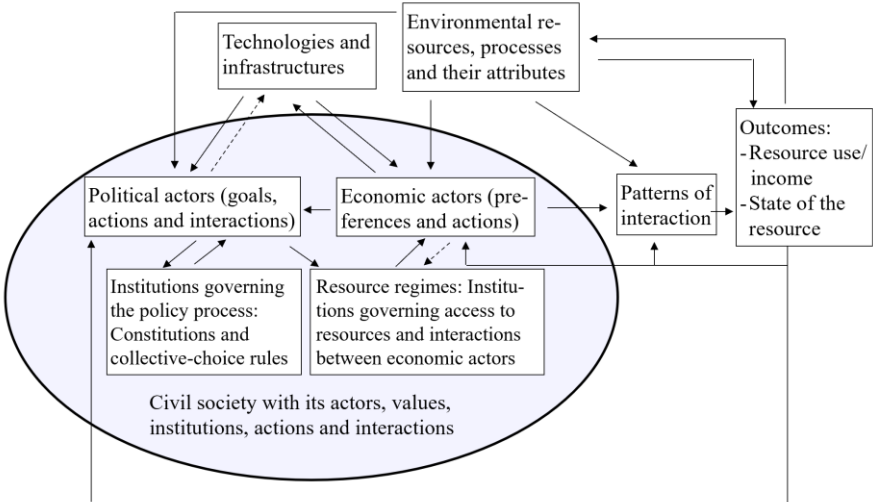


Figure 2: The EGS Framework (Vatn, 2015, p.154.)

The EGS Framework (Figure 2) shows the governance structure encompassing actors and institutions, each with goals, motivations, rights, and responsibilities. Three types of actors are

identified: political actors who establish rules for the economic process, economic actors who possess rights to productive resources, and civil society actors who grant legitimacy to political actors and define the normative basis of society. Institutions are comprised of the rules governing the political process (constitutional and collective-choice rules), the rules governing the economic process (operational rules of resource regimes), and civil society institutions.

The framework also considers variables such as environmental resources and processes, technology and infrastructure, patterns of interaction, and resource outcomes, all of which impact environmental governance. This consideration enables a comprehensive understanding of environmental governance, capturing the complex dynamics and interdependencies among actors, institutions, and various environmental factors.

3.2.1 Elements inside the governance structure

Figure 2 shows the governance structure comprised of actors, institutions, and resource regimes embedded within civil society (Vatn, 2015). This positioning highlights the multiple channels of influence between the entities and civil society, where societal norms are created. (ibid.). Each of these has its functions, subsequently affecting their influence on each other.

Resource regimes are formulated to manage environmental resources, which form the basis of its governance (Vatn, 2015). They are essentially the institutional structures that distribute access to and regulate the use of environmental resources (ibid.). In other words, resource regimes establish and are established by property rights and rules for interaction (ibid.).

Property rights entail having the rights to use and manage an environmental resource and giving access to its benefit streams (Vatn, 2015). Such rights specify actors' positions in relation to the resource, meaning that the property rights can be private, state, common or open access, defined by a third party, such as public authorities (ibid.). The rules of interaction are formed to guide the interactions among the different types of actors that access such resources and are influenced by resource regimes' environmental resource decisions (ibid.).

In addition to facilitating interactions through the formation of resource regimes, institutions also enable this by determining constitutional and collective-choice rules and supporting civil society institutions (Vatn, 2015). However, institutions also set interaction rules for the political and civil society arenas, targeting the interactions between political actors and bodies themselves and civil society (ibid.). Constitutional and collective-choice rules form the basis for political actors' interaction rules (ibid.).

Economic actors are often grouped as producers and consumers, making them entities that can be based on private, state and community-based systems (Vatn, 2015). There are many types of economic actors. Public economic ones take the shape of a firm or public management company, while private ones can be firms and households (ibid.). These actors all work towards achieving specific goals, though the goals differ between the actors, especially for the public and private firms (ibid.).

Private firms' goals are often aimed mainly at profit-making, whereas the goals of public firms can also include other elements (ibid.). For this reason, some environmental resources are governed publicly, enabling the internalisation of side effects associated with managing such resources (ibid.). Additionally, within public management, funding is based mainly on tax-based budget allocations (ibid.), enabling a non-profit-oriented approach to the governance of environmental resources.

Political actors are the public authorities, ranging from local ones to the state at the top, and international governmental organisations (IGOs), which are based on the participation of national governments (Vatn, 2015). How these actors' functions differ, public authorities work on issues relating to constitutional and collective-choice rules (ibid.). This gives them the power to devise resource systems and act as the third party in conflicts between and within the different types of actors (ibid.). IGOs are founded by national governments to increase international cooperation on issues such as development, trade, production, and waste (ibid.).

Civil society actors include various entities, ranging from individuals and households to political parties and non-governmental organisations (Vatn, 2015). Essentially, these actors can be understood as those expressing the interests and will of citizens, individually, collectively, or communally (ibid.). Like public actors, civil society actors can engage with various causes through which they facilitate and contribute to open public debates about these issues (ibid.). Through these processes, civil society actors can grant and influence the legitimacy of political processes, making this an important area for engagement when seeking to implement or alter political policies (ibid.).

3.2.2 Elements outside the governance structure

Environmental resources are what is being governed and have their channels of influence (Vatn, 2015). The resources influence which resource regime is chosen, the actions taken by economic actors, and the patterns of interactions (ibid.). Civil society and research can impact resource perception, influencing resource regimes and economic actors (ibid.). Additionally, the

economic actor's perceptions and subsequent actions can change the patterns of interaction, which is also impacted by the resource's characteristics and the number of involved actors (ibid.). Lastly, environmental resources can directly impact outcomes, which are the states of the resource, subsequently influencing the economic and political actors (ibid.). If the resource outcomes are deemed unacceptable, economic, and civil society actors may attempt to influence the policy process to address this (ibid.).

Technologies and infrastructure impact the different actors' choices as the accessibility and development of technologies affect the availability of options (Vatn, 2015). However, the different actors can influence these by, for example, making changes to the resource regime achieved through political processes (ibid.). This can result in the increased development of technologies, enabling better management of the environmental resource.

Finally, patterns of interactions. Though the framework indicates these patterns, using arrows, it presents them as a separate variable for economic actors. This emphasises that the state and attributes of the environmental resources also influence this specific pattern.

3.3 Household engagement with waste management: Behavioural theories

3.3.1 Vatn: Theories of motivation and human action

Vatn (2015) utilises behavioural theories to provide an understanding of how human behaviour can shape the governance of environmental resources. He does this by exploring different theories of motivation and human action with a dedicated chapter in his book on environmental governance. He starts by delving into different types of rationalities.

Rationality refers to a process where a decision-maker ranks options and chooses the one resulting in the highest utility, which is the benefits or good feelings associated with a choice or an action (Burns & Roszkowska, 2016). This falls under rational choice theory, which, simply put, suggests that people are individually in control of their decisions (Burns & Roszkowska, 2016). Vatn (2015) mainly explores individual and social rationality.

Individual rationality aims at maximising one's utility (Vatn, 2015). This is achieved by ranking different options according to their utility, which is followed by choosing the option with the highest utility (ibid.). This process expects that a person can do these two things and do them well according to their preferences. However, it is argued that this isolates the individual and places them separate from the wider society, with preferences uninfluenced by external factors such as culture and social conventions (ibid.). Vatn (2015) argues against that because societies

and cultures develop in response to issues we face, resulting in, for example, wearing different clothes made up of different textiles and eating different food made from different ingredients. Culture is also where social conventions and certain patterns of interaction are started (ibid.).

According to individual rationality, people will, for the most part, prefer to act in an individually rational manner (Vatn, 2015). While this is the case for many daily situations, such as grocery shopping, there are also cases where people help others, which can occur with or without any expectations of “payback” (ibid.). In such cases, it is still possible to experience internal ones through the good feelings obtained simply by helping others, also known as a “warm glow” (ibid.). Although viewed as seemingly altruistic, it is argued that these actions are motivated by maximising individual utility, which expands its meaning (ibid.). This indicates that there is an intrinsic motivation for actions and suggests that actions themselves increase utility (ibid.).

Social rationality is presented as an alternative view of human behaviour, where the focus is more on what is the normatively appropriate behaviour (Vatn, 2015). In other words, it is about identifying the norms and social conventions that dictate appropriate actions. This highlights what is right to do in situations involving others’ interests and can be understood to mean that our behaviour is dictated by the social context of our situations (ibid.).

Furthermore, social rationality can be divided into ‘we’ rationality and ‘they’ rationality (Vatn, 2015). “We” rationality indicates that we are part of a group, which often aligns our behaviour with what is right or appropriate for the group rather than ourselves (ibid.). This focuses on cooperation and communication of the group’s rules and norms about proper actions (ibid.). “They” rationality, on the other hand, indicates that we are concerned with what is right to do for others, resulting in various forms of altruistic actions (ibid.). Though here, arguments are also made that some selfishness can be involved with this rationality, suggesting that we sometimes act altruistically to gain something in return, such as the mentioned “warm glow”.

Habits develop because of a consistent and automatic occurrence of action, meaning that it is done without much thought (Vatn, 2015). Individual and social processes influence the creation of habits (ibid.). Cultures and social conventions can play a significant role in forming habits because, as mentioned, they develop in response to a problem. This can make it harder to make or break habits based on individually reasoned action, regardless of the desire to do so.

Bounded rationality indicates that a decision-maker makes decisions based on limited information (Vatn, 2015). This is because information-gathering can often be costly and time-consuming, and therefore, result in satisficing. Satisficing suggests that a target or procedure is

set with the aim of producing the most satisfactory results (ibid.). Thus, there is no need to find all information to handle a problem, but rather find enough of it to achieve a satisfactory result.

3.3.2 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) was developed by Icek Ajzen in 1985 and built upon the earlier Theory of Reasoned Action created by Ajzen and Fishbein in 1975 (Ajzen, 2020). Since then, the TPB has been used to explain and predict behaviour across various domains, including waste recycling, technology adoption, and consumer behaviour (ibid.). It is based on ideas from rational choice theory and uses cognitive determinants to explain how people act according to their rationalised intentions towards a specific behaviour (ibid.). According to the TPB (Figure 2), behaviour is influenced by an individual’s intention to engage in a specific action. This intention, in turn, is shaped by three factors: attitudes towards the behaviour, subjective norms, and perceived behavioural control (ibid.).

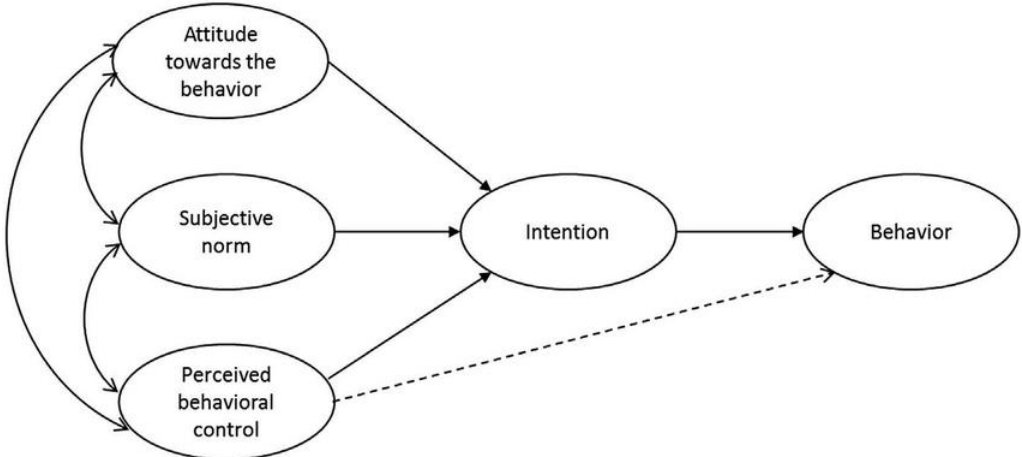


Figure 3: Theory of Planned Behaviour (Ajzen, 1991)

Attitudes towards the behaviour are based on an individual’s beliefs about the anticipated consequences of performing the behaviour, meaning the likelihood of engaging in the behaviour is influenced by the belief that it will lead to a desired outcome (Ajzen, 1991). Subjective norms derive from the perceived social support or pressure from people close to the individual regarding the behaviour (ibid.). Perceived behavioural control reflects the individual’s subjective belief in their ability to perform the behaviour, considering factors such as the availability of resources, time constraints, skills, and abilities (ibid.). While attitudes and subjective norms contribute to the motivation to engage in a behaviour, the strength of perceived behavioural control determines the formation of a concrete intention to act (ibid.). In other words, the individual must perceive sufficient control over the behaviour to develop a solid intention to carry it out.

3.3.3 Low-Cost Hypothesis (LCH)

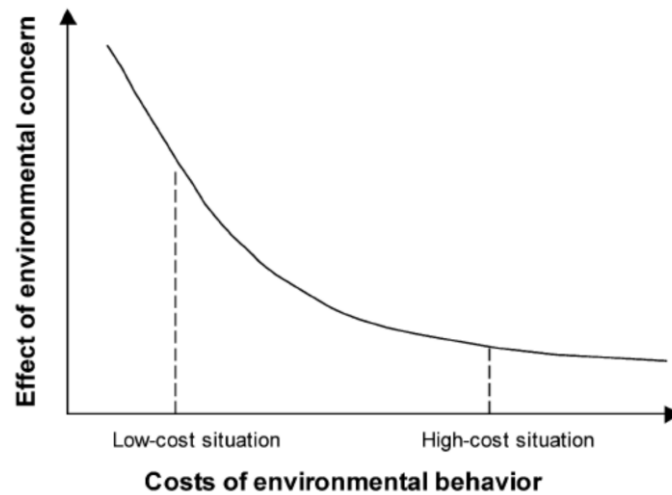


Figure 4: The low-cost hypothesis of environmental behaviour (Diekmann & Preisendörfer, 2003)

Acknowledging the impact of economic incentives on environmental behaviour is crucial as it can influence the likelihood of a specific behaviour. However, economic incentives are not limited to financial costs and benefits; they can also include considerations for time spent performing a behaviour. The low-cost hypothesis (LCH), developed by Diekmann and Preisendörfer, explains the correlation between environmental concern and recycling behaviour (Best & Kneip, 2011). The idea is that environmental concern influences environmental behaviour when individuals' behaviours have little to no associated costs (Diekmann & Preisendörfer, 2003). This means that despite individuals' environmental concerns, they are more likely to engage in specific behaviours when their costs and efforts remain low. Therefore, the hypothesis suggests that behaviour predictions cannot be based solely on individuals' environmental concerns, indicating that perceived costs and practical constraints play a significant role. Diekmann and Preisendörfer (2003) argue the limits to attitude research and rational-choice theory, claiming that they are more suitable for explaining collective rather than individual behaviour. They also suggest that the cost associated with certain actions can affect the utility of environmentally friendly behaviour.

3.4 Application of theory

The EGS framework will be used to identify the elements inside and outside the governance structure and analyse how these influence Follo Ren's decision-making process, focusing on Miljøbilen. This analysis will explore how the elements influence Follo Ren and which ones

are most impactful in implementing Miljøbilen. The analysis will form a basis for the discussion of the advantages and disadvantages of the service.

While the EGS framework highlights the variables involved in the governance of an environmental resource, it does not explain the motivations behind human behaviour. To evaluate peoples' engagement with Miljøbilen, it is necessary to examine the factors influencing their actions and motivations towards waste management and, subsequently Miljøbilen.

By using the theories of motivation and human action explored by Vatn, a foundation will be set regarding the collective attitudes and behaviours towards Miljøbilen. However, this might be sufficient to explain the factors behind individual people's engagement, or lack thereof, with the service. To do this, the TPB and the LCH will be used to elaborate on the survey responses used to support the discussion on the advantages and disadvantages of Miljøbilen. The TPB explores the intentions behind a behaviour and how well people feel they can go through with an action, which can be used to explain why some people, while intending to do so, ends up not using Miljøbilen. LCH, on the other hand, can be used to link motivation with the behavioural costs (time and effort) of an action. It can give an understanding of why individuals choose not to use Miljøbilen, even though they care about the environment. However, while LCH is mostly used in connection to environmental concern, I argue that it can be used in instances where there is a desire or intention to do something, but the associated costs with that action might be detrimental.

4. Methodology

This chapter outlines the methodology applied in the research process. The chapter is divided into five sections, beginning with a description of the study area, followed by an overview of the methodology. The third section details the research design, explaining the methods used for data collection and the subsequent analysis. After this, a section is dedicated to ethical considerations relevant to the study. Lastly, this chapter discusses the limitations of this study, including a study assessment.

4.1 Study area

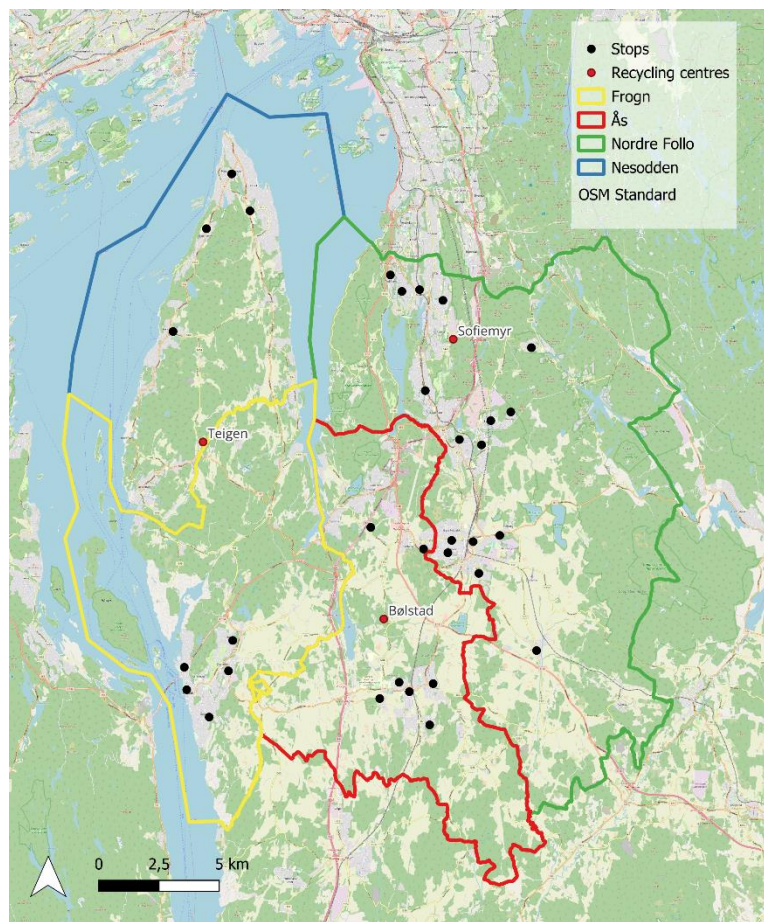


Figure 5: Overview of Follo Ren's municipalities with pinpointed recycling centres and Miljøbilen's stops. (Geonorge, 2023; Ordnance survey, 2023)

The study area consists of Follo Ren's four municipalities, Frogn, Nesodden, Nordre Follo and Ås, wherein the company operates. A map (Figure 5) has been created using QGIS to illustrate the area within which Follo Ren operates, including municipal boundaries, the recycling stations, and Miljøbilen's stops. As seen in Figure 5, these municipalities vary in terms of areal, population size, and population density, as indicated in Table 3.

Table 3: 2021 Municipal Overview (SSB, s.a.a, s.a.b, s.a.c, s.a.d)

Municipality	Frogn	Nesodden	Nordre Follo	Ås	Total
Area	85 km ²	61 km ²	203 km ²	102 km ²	451 km ²
Population	16 106	20 322	62 245	21 305	119 978
Population density	189 pop./km ²	327 pop./km ²	311 pop./km ²	206 pop./km ²	266 pop./km ²
Number of Households	7 282	8 505	25 559	10 447	122 713

According to Follo Ren's 2021 Annual Report, about 45 500 subscriptions (117.000 inhabitants) were serviced throughout these municipalities, resulting in more than 54.000 tons of household waste collected this year. The methods through which this waste was collected can be seen in Table 4 below.

Table 4: Household Waste Collection Methods 2021 (Follo Ren, 2022)

Collection method	Visitors	Amounts (Tonnes)
All Recycling Centres	129 404	26 441
<i>Bølstad</i>	49 562	15 329
<i>Oppegård</i>	25 600	9 069
<i>Teigen</i>	54 242	5316
Miljøpunkt	130 locations	3 284
Household Collections	117 033 people serviced	24 313
Miljøbilen	2 943	24,7

In Follo Ren's 2022 Annual Report, about 47 174 subscriptions (118.626 inhabitants) were serviced throughout these municipalities, resulting in over 48.500 tons of household waste collected. The methods through which this waste was collected can be seen in Table 5 below.

Table 5: Household Waste Collection Methods 2022 (Follo Ren, 2022)

Collection method	Visitors	Amounts (Tonnes)
All Recycling Centres	132 325	21 384
<i>Bølstad</i>	52 382	11 737
<i>Oppegård</i>	55 354	7 683
<i>Teigen</i>	24 589	4 937
Miljøpunkt	140 locations	3 162
Household Collections	118 626 people serviced	24 037
Miljøbilen	3 244 (32 stops)	25,4

Follo Ren provides effective services to subscribed households through the utilisation of recycling centres and household collection services. When compared to the recycling centres, Miljøbilen is visited less by households and therefore receives a significantly smaller amount of waste. This makes it important to value the viability of this service due to the associated costs and benefits of managing it.

4.2 Methodology overview

Methodology refers to the overarching approach adopted in a research project and includes the rationale behind the chosen approach and methods utilised (Clark et. al, 2021). This study uses a mixed-methods approach to sufficiently answer the study objectives and their respective research questions. Combining quantitative and qualitative research strategies can provide a more comprehensive understanding of the topic as data from multiple perspectives are incorporated into the study. Furthermore, integrating different methods is believed to complement each other and enhance the research's overall value (ibid.).

In Clark et. al (2021), the different benefits of mixed-methods research are explored, focusing on the most relevant ones for students, such as triangulation, completeness, sampling, and enhancement. Triangulation involves cross-checking the results by using multiple methods or data sources to confirm and support the findings. Completeness refers to how combining quantitative and qualitative research enables researchers to provide a fuller account of their research topics. In mixed-methods research, one of the methods can be used to sample data,

cases, or respondents for the other, also referred to as sampling. Enhancement occurs when one method is used to enhance the findings derived from the other method. Bryman (Clark et. al, 2021) also mentions credibility, which is closely related to enhancement, as incorporating both quantitative and qualitative methods can increase the integrity of the research.

Once the topic of this study was determined, objectives and research questions were formulated. This clarified the required data and methods for the research. The first objective involves examining the factors influencing Follo Ren's decision-making process when they implemented Miljøbilen and employs a framework analysis based on Vatn's (2015) EGS framework. The second objective comprises a discussion on the advantages and disadvantages of Miljøbilen after its implementation, exploring the benefits and limitations associated with the launch and management of this service from both Follo Ren's and the public's perspectives. Therefore, the data for this study is based on text- and survey-based data.

4.3 Epistemological and ontological considerations

Epistemological considerations refer to what is/should be known and how knowledge is to be acquired (Clark et. al, 2021). Two central positions, positivism and interpretivism, offer contrasting perspectives. Positivism argues that knowledge derived from observation and measurement is the only valid form of knowledge and emphasises objectivity without bias or external influences from participants and researchers (ibid.). It views theory as a means of testing hypotheses and typically employs deductive approaches. However, it also incorporates inductive approaches when gathering knowledge for hypothesis testing. On the other hand, interpretivism views knowledge as being derived from the experiences, understandings, and interpretations of social action (ibid.). It employs inductive research to generate theories, recognising that both participants and researchers in a study possess unique perspectives that can influence the research.

In this study, the epistemological position leans more towards a positivist approach. The aim is to explain the gathered observations rather than interpret them.

Ontological considerations concern our understanding of reality and social phenomena, with ontology focusing on the study of being (Clark et. al, 2021). Researchers should acknowledge their ontological position as it shapes their perception of reality and influences their research. There are two debated ontological positions, which are objectivism and constructivism. Objectivism views reality as separate from social phenomena, while constructivism sees reality as continually created by it (ibid.). Although an objective and positivist position is adopted in

the framework analysis and subsequent discussions, a constructivist approach is also employed in this study. This approach recognises that different actors and entities involved in the governance structure may have diverse perceptions and realities. It acknowledges that various conditions must be considered when implementing new waste management methods.

4.4 Research design

The research design for this study was determined based on the formulation of the objectives and research questions. A research design establishes a framework that guides the data collection and analysis process (Clark et. al, 2021). This study employs a case study design involving a detailed analysis of the specific case Miljøbilen. Case studies are commonly used in both quantitative and qualitative research due to their ability to encompass multiple elements within a single case (ibid.).

A common limitation of case studies is the limited generalisability and applicability to other cases. However, in the case of Miljøbilen, it can be argued that these limitations may not apply as similar services are provided by other municipalities in Norway. Therefore, this case can be a starting point to explore these qualities in different settings, as it presents an opportunity to conduct a comparative study.

As part of the research design, specific research methods are chosen. Research methods are the techniques used to collect the necessary data for a study (Clark et. al, 2021). Various methods are available depending on the type of research being conducted. In Clark et. al (2021) Bryman categorises some methods as specific instruments (self-completion questionnaires or structured interview schedules), participant observation (where the researcher observes other's activities), and analysis (where the researcher analyses existing data and documents).

A research design table (Table 6) was created during the research design process. This table provides a visual overview of the study's data requirements, methods of data collection, and the relevant theories to be applied when answering the objectives and their respective questions. This table also ensures that the collected data remains relevant to the research questions and that the questions can be adequately addressed within the scope of this study.

Both primary and secondary data were used to address the study's objectives. Primary data, which refers to first-hand information, was obtained from the user survey about Miljøbilen. The secondary data, which is information obtained from other sources, was collected from Follo

Ren’s publicly available documents (management documents, annual reports, publications, and info magazines) and internal documents accessed with support from Follo Ren.

The EGS framework analysis was performed based on Vatn’s work. To conduct the analysis, a theoretical foundation was first established to identify the required data for this part of the study. The Framework analysis used text-based data primarily obtained from publicly available sources. For data that were not publicly accessible, collaboration with Follo Ren was necessary to collect the relevant information.

Upon completion of the framework analysis, a discussion on the advantages and disadvantages of Miljøbilen was conducted. The discussion incorporated a combination of text-based and survey-based data, both of which were collected with cooperation from Follo Ren. Like the framework analysis, the data requirements were identified, which encompassed the administrative perspective of Follo Ren obtained through document analysis and discussions with the company. Additionally, the public opinion regarding Miljøbilen from the inhabitants of the municipalities was considered during this phase of the study. These were collected through the survey, which required a couple of rounds of edits before being administered.

Table 6: Research design table showing data requirements, collection methods, relevant theories, and sampling approach for each RQ (The author)

RO	RQs	Data Requirements	Collection methods	Relevant Theories	Sampling Approach
1	How do the elements internal to the governance structure affect Follo Ren's implementation of "Miljøbilen"?	Information on the internal management and decision-making policies and regulations	External document search on Follo Ren's website.	Arild Vatn EGS Framework	Research on Follo Ren's website, its publications. Internal documents provided by Follo Ren.
1	How do the elements external to the governance structure affect Follo Ren's implementation of "Miljøbilen"?		Internal document search supported by Follo Ren.		
2	What is the purpose of "Miljøbilen", and to what extent has this been achieved?		External document search on Follo Ren's website.		
2	What are the pros and cons of launching and managing the environmental car?		Internal document search supported by Follo Ren.		
2	What economic, environmental, and social outcomes have been achieved: are there municipal variations?		User survey.		
2	What are "Miljøbilen's" target groups, and to what extent do people know about the service?	"Miljøbilen's" target groups and data on users.			
2	What are the impressions of the "Miljøbilen" amongst users and non-users?	People's impressions of "Miljøbilen" and ideas for improvements.	User survey.	Vatn's Theories of Motivation and Human Action.	<u>Context:</u> Online Survey by Sentio.
2	How can knowledge, use and impressions of the "Miljøbilen" be improved amongst users and non-users?			Theory of Planned Behaviour	<u>Units:</u> People aged 18+, residents of relevant municipalities.
2	What can be learned in terms of developing streamlined and individually adapted measures for the future?			Low-Cost Hypothesis.	<u>Sample Size:</u> 5000 people.

4.4.1 Text-based data

Text-based data is a commonly used source of information for social research and can take various forms, such as autobiographies, newspapers, and websites. Documents used for research purposes are characterised by their readability, original purpose as separate from research purposes, preservation and availability for analysis, and relevance to social researchers (Clark et. al, 2021).

Organisational documents are commonly used in social research. These documents, such as annual reports and press releases, are often publicly available, while others, like internal correspondence and meeting minutes, may not be easily accessible (Clark et. al, 2021). The availability of documents can impact the research process, as researchers may be limited to only what is publicly accessible. However, Follo Ren expressed support and provided access to any information necessary to complete this study.

When conducting document analysis, it is crucial to assess the quality of the documents. In Clark et. al (2021) Bryman recommends using Scott's 1990 criteria to do this, which include: authenticity (genuineness and origin), credibility (lack of errors and distortion), representativeness (typicality), and meaning (clarity and comprehensibility). Since the documents used in this study are gathered directly from the published and unpublished files of Follo Ren, establishing the credibility of the information may be challenging as the company, even as a public one, has an agenda based on their own socially constructed view. However, due to its public status, measures are likely in place to ensure the accuracy and reliability of their documents, minimising errors and distortions.

4.4.2 Survey

Conducting a survey was an important component of the discussion on the advantages and disadvantages of Miljøbilen. Surveys is one form of self-completion questionnaires and involve respondents independently completing a questionnaire rather than being interviewed by an interviewer. Surveys can be administered through various methods, with online and email surveys being the most common (Clark et. al, 2021). These methods involve emailing the questionnaire or directing respondents to a website to complete the survey. In social research, surveys have associated advantages and disadvantages that can impact the results of a study.

Advantages of surveys include: 1) cost and time efficiency, 2) clear and easy-to-follow designs, ensuring question and instruction clarity, 3) shorter completion time, reducing respondent

fatigue and non-completion, 4) ease of quitting the survey if the respondent changes their mind, and 5) elimination of interviewer effects and variability, minimising biased responses influenced by interviewer characteristics or question formulation changes. Surveys are beneficial when time and budget constraints exist. However, these advantages can also introduce challenges and limitations to the overall research.

Common disadvantages of surveys include: 1) few open-ended questions, as respondents may be reluctant to provide lengthy responses, 2) lack of researcher prompts or probing for detailed answers when respondents struggle, 3) potential respondent fatigue or disinterest due to irrelevant questions, 4) constraints on the number of questions, necessitating careful formulation for relevant answers, and 5) low response rates, potentially introducing bias into the results.

For this study, the survey questions were formulated with input from Follo Ren (see **Appendix A**). However, the actual survey was conducted by Sentio Research Norge (Sentio), a company specialising in social science surveys. Due to the nature of the survey, it was limited to a maximum of seven questions, excluding demographic ones. The survey consisted mainly of closed-ended questions, with the answers offered in the forms of multiple-choice and Likert-scale. Some questions offered an open-answer option to facilitate alternative and longer answers if the listed answers were irrelevant to the respondent's situation.

Before administering the survey, the questions were further revised by Sentio to ensure clarity and comprehensibility. The survey was then administered by phone, with respondents receiving a link to the survey via text message. The survey was conducted from 15th May to 25th May among 5000 registered residents aged 18 and above in Frogn, Nesodden, Nordre Follo and Ås. Out of 5000 individuals, 954 responded, fully or partially, resulting in a response rate of about 18.9%. Table 7 and 8 provides a breakdown of the respondents based on the different demographic variables used in the survey.

Following the survey, Sentio coded and provided an initial analysis of the survey results. The researcher did not have access to the raw data, and subsequent analysis was based on the results provided by Sentio. While this was convenient, given time limitations, it limited the researcher's ability to review the respondents' answers comprehensively across all questions, potentially affecting the study's conclusions. However, the researcher analysed the open-ended responses and conducted a thematic analysis to identify recurring themes within the data sets.

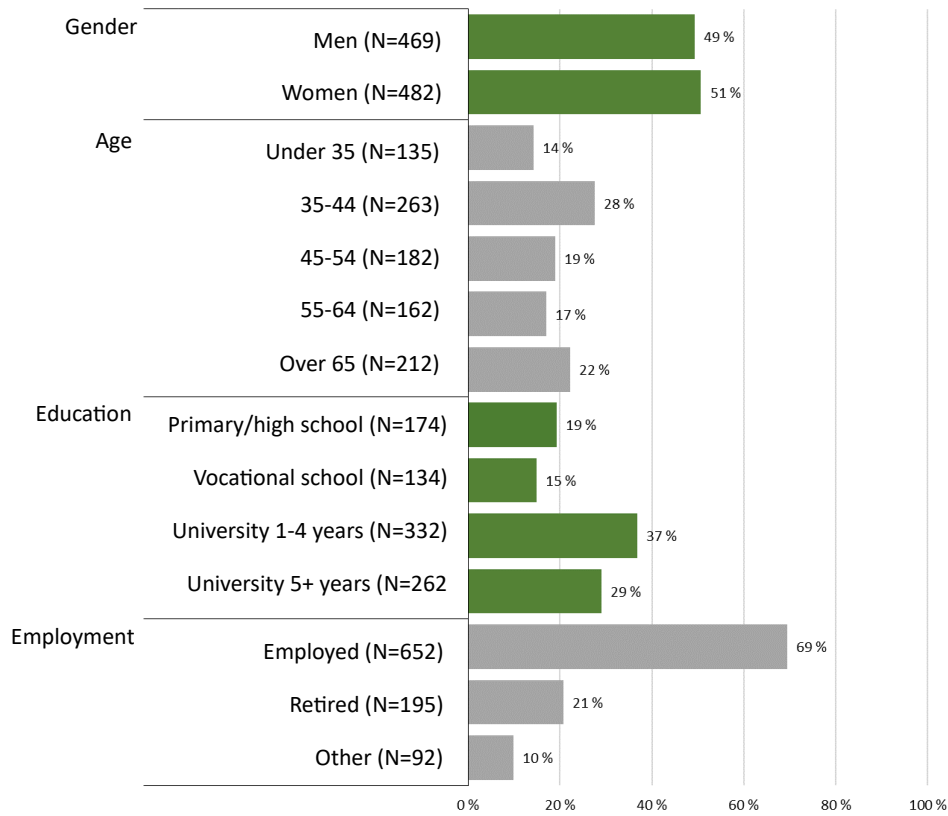


Table 7: Demographics 1

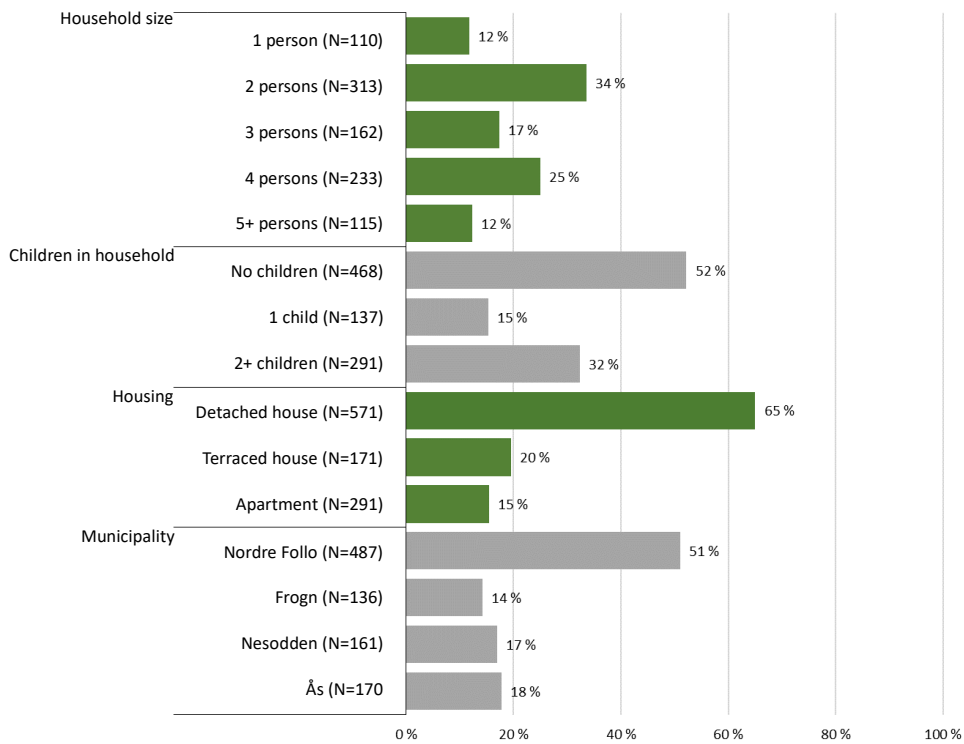


Table 8: Demographics 2

4.5 Ethical Considerations

Ethical considerations play a crucial role in social research. There are four ethical principles identified as essential to social research (Clark et. al, 2021):

1. Harm to participants: Physical or psychological harm, like loss of self-esteem or stress.
2. Informed consent: Participants are provided with enough information to make an informed decision regarding their participation.
3. Privacy protection: The privacy of participants remains protected and anonymised.
4. Deception: The research is not present as something other than what it is.

In the case of this study's survey, a data management plan was not deemed necessary because respondents remained anonymous, even with the inclusion of demographic questions. When data is anonymous, submitting a data management plan is not required, especially when the combination of demographic variables cannot be traced back to identifiable individuals. Additionally, Sentio, the company that administered the survey, has strict policies in place for data handling. Despite sending the survey to 5000 individuals via text message, Sentio does not save or otherwise link phone numbers or other online identifiers, ensuring that individuals cannot be identified at any point during data handling. This further supports the protection of participant privacy.

4.6 Study assessment and imitations

Three concepts are the most important as part of evaluating social research (Clark et. al, 2021).

Reliability refers to whether the study would render the same result if repeated with the same conditions (Clark et. al, 2021). As this study consists of two objectives, the reliability of each should therefore be considered. For objective 1, the EGS Framework analysis, the data gathered is based on Follo Ren's internal and external documents and national laws and regulations. It must therefore be acknowledged that changes to laws and regulations are common as governments and priorities shift. As part of objective 2, the survey gathered data from anonymous and randomly selected participants is reliable as it enhances replicability. An important aspect of reliability is rendering the same results across different samples. While some aspects of this study's data and its collection can alter the reliability, other aspects support it, making it reliable as long as the policies and regulations remain unchanged.

Replicability happens when a study can be replicated (Clark et. al, 2021). This means that exact information about the methods, data, and analysis is known, requiring researchers to write in

detail about every aspect of the thesis. Therefore, I believe that the study is replicable if the data utilised is not changed by external entities, as mentioned above.

Validity concerns the conclusions made from a research study and their integrity (Bryman, 2021). There are many facets to validity, but internal and external validity are considered crucial ones (ibid.). Internal validity refers to causality and the soundness of a proposed causal relationship between variables. In contrast, external validity enables the generalisation of research findings beyond a specific research context, for example, from a sample to a population (ibid.). Regarding internal validity, some of the proposed relationships between the variables lack a clearly identified causality that applies primarily to the survey results and the researcher's conclusions. This is based on the lack of access that the researcher has had to the raw data sets, and while it was offered, the time limitations would have made it more challenging to complete this study if this access had been utilised. This then decreases the potential for important or interesting connections to be made. However, this impacts the application of some of the behavioural theories but does not negate the value of the results and their conclusions. For external validity, it can be argued that the findings of this study are generalisable due to the data selection criteria. The generalisability is further supported by the existence of similar services to Miljøbilien in Bergen, Moss, and Lillestrøm, as these provide additional real-world settings to cross-check the study findings.

Lastly, the following factors have been identified as this study's challenges and limitations:

- The limited number of questions in the survey made it difficult to include questions that were relevant to the theme of environmental governance. The original idea was to have in-depth interviews with some of the survey respondents to bridge this gap, but time limitations made this impossible. Including this in future research may offer a comprehensive understanding of the respondents' perspective on the topic of Miljøbilien.
- Having the survey conducted and analysed by Sentio limited my ability to see how individual respondents answered all the questions, impacting my ability to see the relationship between the answers provided. Some inferences can still be made but are not based on clearly identifiable correlations in the datasets should the researcher have such access.

5. Miljøbilen: An analysis of its implementation

This chapter aims to answer the first objective's research questions, which look at the internal and external factors of the governance structure presented in the EGS Framework. This analysis evaluates the factors and the extent of their influence on Follo Ren's decision-making process before the implementation of Miljøbilen. Figure 6 provides an overall picture of Follo Ren's EGS Framework for Miljøbilen, including the directly and indirectly influencing factors. While section 5.1 focuses on governance structure's internal factors influencing this service, section 5.2 explores the external influencing factors. Each section includes a model variation to clearly illustrate which factors are being discussed and their interconnected relationships.

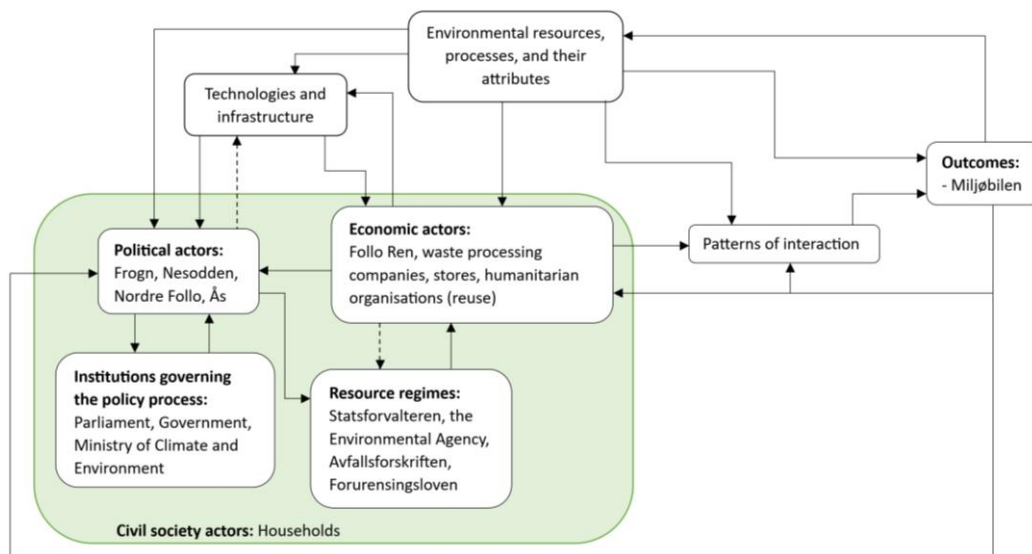


Figure 6: The EGS Framework for implementing Miljøbilen

5.1 The governance structure's influencing elements

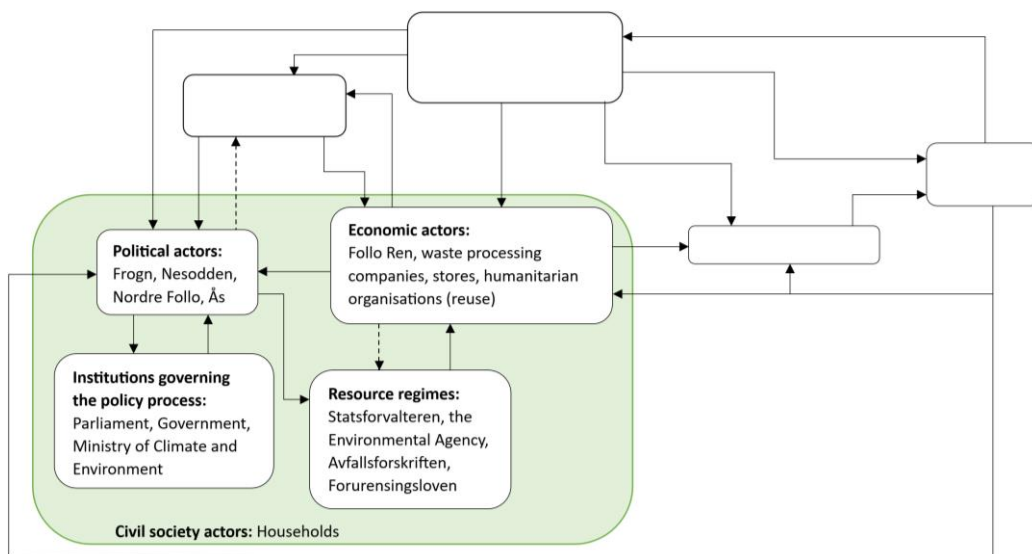


Figure 7: The elements within the governance structure

Waste management is facilitated by a variety of actors and institutions from all levels of society, making it necessary to actively include influencers in the implementation of innovative strategies like Miljøbilen as well as ensuring that such strategies take into account the rules and regulations governing waste management.

5.1.1 Resource regimes

The waste resource regime in Norway is formulated and managed by Statsforvalteren, Miljødirektoratet, The National Waste Regulation “Avfallsforskriften”, and the Pollution Act “Forurensingsloven”. As mentioned in section 3.2.1, it is here that the access to and the use of environmental resources are regulated. Through the institutions establishing this resource regime and the rights and responsibilities provided to municipalities by IKS-loven, Follo Ren was established as the entity in charge of handling the household waste management in the previously five (now four) owner municipalities. The purposes and responsibilities of each of these institutions are outlined below.

Statsforvalteren (State Administrator) is the pollution authority for most of the waste facilities and can grant permission for polluting activities (Statsforvalteren, 2023a). Some of these activities include the reception, sorting and treatment of waste, car wrecks, landfills, composting and incineration. When permission is granted, the business must sometimes initiate measures to reduce the inconvenience for others. The State Administrator is also responsible for inspecting waste facilities to ensure compliance with the permit and its requirements.

Miljødirektoratet (Environmental Agency) manages and develops waste and ground pollution regulations, including return schemes, export and import and hazardous waste (Miljødirektoratet, s.a). As mentioned in section 2.3, the Environmental Agency works under the Ministry of Climate and Environment, which is responsible for national waste policies. The Environmental Agency draws up waste regulations and other instruments, guiding how the rules are applied. They also provide professional advice and analysis as a basis for the continued development of national waste policy.

“Avfallsforskriften” (National Waste Regulation) establishes the waste regulations in charge of the recycling and treatment of waste and implements the EU directives Norway commits to through the EEA agreement (Avfall Norge, s.a.b). This regulation defines and regulates different types of waste, their collection and subsequent treatment, applying to waste such as e-waste, vehicles and tires, packaging waste, hazardous waste, etc. The National Waste Regulation also imposes a membership in a “returselskap” (return company) for producers of e-waste, batteries,

and packaging waste (Miljødirektoratet, 2023b). Moreover, this regulation sets clear rules for the disposal and incineration of waste to ensure that this takes place properly and is controlled, reducing the harmful effects on the environment and human health. It is also within this regulation that the fees associated with municipal waste management are determined. This guarantees waste management financing and ensures that the fee covers no more than the municipality's real costs for household waste management and avoids cross-subsidisation. The determination of this fee is also regulated to ensure alignment with the Pollution Act.

“Forurensingsloven” (Pollution Act) protects the environment from pollution and reduces existing pollution, as well as reducing the amount and promoting better treatment of waste (Miljødirektoratet 2019). The Pollution Act aims to ensure a sound environmental quality to prevent damage to health, interference with the well-being or damage to nature's ability to produce and self-renew.

5.1.2 Institutions

The state, with its legislative (the Parliament) and executive (the Government) branches, establishes and implements waste management laws and policies (Stortinget, 2021). The Government, led by the Prime Minister, is responsible for implementing the laws and policies established in the Parliament. They can also initiate policies and present matters for a Parliamentary review. The Parliament, made up of the Norwegian people's elected representatives, debates and decides on legislative and budgetary items. Additionally, the Parliament supervises the Government's implementation of their decisions. Here, the overarching waste management laws and policies are established, creating a foundation for the Ministry of Climate and Environment work.

The Ministry of Climate and Environment is responsible for the national climate and environmental policy. The ministry's responsibilities are divided into various areas, such as biodiversity, pollution, and climate. It develops and implements policy measures and is a driving force vis-à-vis various sectors and authorities. The ministry coordinates the government's climate and environmental policy goals and ensures that the policy results are monitored. It can also present matters for the parliament to review. Through their work on pollution, the Ministry of Climate and Environment implements measures and strategies for waste management and treatment, influencing the work of the Environmental Agency.

5.1.3 Political actors

The most important political actors are the four municipalities, Frogn, Nesodden, Nordre Follo and Ås, who own Follo Ren. The municipal ownership of the company is managed through the Board of Representatives, made up of the mayor and the deputy mayor of each municipality. This board is the highest governing body of Follo Ren and deals with the overall financial, political, and other company management matters. The company is established as a tool for the owner municipalities and is managed through formal decisions in meetings by the representative board. Only through decisions or guidelines issued by the Board of Representatives can the owners instruct the company board. The Company Board is elected by the Representative Board, which is its most important task, as it is during the periods between representative board meetings that the company board is responsible for the company management and operations. Lastly, the board of representatives elects an Election Committee that is responsible for assessing the company board's competence needs and proposes candidates to ensure that the company board remains competence-based.

5.1.4 Economic actors

As this analysis is of the conditions before the implementation of Miljøbilen, this section also includes the alternative disposal methods for the waste that Miljøbilen now gathers.

As discussed, there are several levels of authority in Follo Ren. Here the company board and the administration will be discussed. The Company Board is the highest manager, with its operational responsibility falling within the framework of the company agreement, the ownership agreement, the company purpose and other decisions and guidelines established in meetings by the Board of Representatives. The overarching task of the Company Board is to develop Follo Ren in the municipality's resident's best interest. Through the IKS law (section 2.3), the board exercises both a supervisory and an administrative function, performing tasks such as determining a strategy, budgets, and guidelines for the business. The administration of Follo Ren is placed under the authority of the Company Board, and oversees the company's day-to-day management, including maintaining current services and developing new ones.

Below are examples of other economic actors that collect, sort, and treat some of the household waste types that Miljøbilen does, though they mainly focus on specific waste types.

For e-waste, residents can return electric and electronic products to companies selling them. This is ensured by the National Waste Regulation (section 5.1) and obligates businesses

importing or producing electric or electronic products to participate in the return scheme for e-waste. For other smaller e-waste, such as batteries and lightbulbs, there is also the option to return them to grocery stores, which are more accessible for individuals. This, too, falls under the National Waste Regulation, as it applies to any store selling electric and electronic products.

When it comes to textile waste, alternative disposal methods consist of donating them or giving them for material reuse, where the textiles are repurposed. This is done by collecting textiles in a bag and dropping it off at containers placed in the local environment of the public, usually close to environmental points, grocery shops, and at recycling stations. Different charity organisations like Fretex, Red Cross and UFF organise the collection of textile waste, some of which is resold, whilst others are sent abroad, and use the profits made from resold textiles to support their humanitarian efforts. However, it should be noted that these organisations have agreements with Follo Ren allowing them to place their containers at the environmental points.

5.1.5 Civil society actors

As part of civil society and communities, households establish social norms and conventions, including waste management, by following sorting and recycling policies. Therefore, the success of implementing new household waste collection measures depends largely on household engagement. How well households engage with waste measures is one of the variables forming the basis for the measures' evaluation. However, some measures, especially those previously unknown to many, can take time to build up. Before implementing Miljøbilen, Follo Ren would have had to evaluate the potential need and desire for the truck's service, which had a basis in household engagement with the then sorting and recycling guidelines, as well as the potential contributions that Miljøbilen could bring to this. The success of Miljøbilen is then evaluated based on the number of visitors, amounts of waste (weight and types) collected.

5.1.6 One element with the most influence?

The elements inside the governance structure affect Follo Ren and its implementation of Miljøbilen in different ways. The resource regime is established to distribute access to and the use of environmental resources, or waste in this case, and are formulated by specific institutions concerned with this. These institutions are often created by other institutions in charge of the constitutional and collective-choice rules, located higher up in the society's political governance. This highlights the multi-level governance of environmental resources. At the same time, there are political actors and municipalities given the direct responsibility of managing the practicalities of managing household waste. These must align with the policies and regulations

implemented by the resource regimes and institutions. As mentioned, municipalities often come together and establish a company in common to take on the everyday handling of waste collection, processing, and treatment of their municipals' wastes. These three combined outline the whats and hows of waste management to which the economic actor, Follo Ren, must comply.

Therefore, the economic actor, Follo Ren, is positioned to balance the financial, political, and administrative conditions set by the political actors with the households' needs. There are also frequent discussions about the balance between offering waste collection services and drop-off services, enabling households to dispose of their waste at recycling stations, environmental points, and shops selling these products. However, statistics show that for waste not sorted and collected, significant amounts end up in residual waste where they do not belong, the disposal of which can have consequences for the later waste processing and treatment. This leads to conflicting priorities, where Follo Ren, on the one hand, must ensure that their provided services are financially and environmentally sound. On the other hand, Follo Ren must also provide services facilitating and supporting easy sorting and disposal of waste types not collected. Miljøbilen falls in the middle ground of this conflict, where it can be an option to increase the safe and proper sorting and disposal of alternative households, but its efficiency is questioned.

Therefore, all except the civil society actors have more of a coercive influence on Miljøbilen as the policies and regulations that they implement must be accommodated, where applicable, by Follo Ren. Nevertheless, households as civil society actors have a persuasive influence as they do not affect the overarching policies and regulations determining the management of Follo Ren and its services. Instead, households influence what Follo Ren can offer as household waste management services, where their non-engagement can essentially make or break a service if not sufficiently utilised, which is the case for Miljøbilen.

5.1 The governance structure's externally influencing elements

Although the governance structure's internal elements define and regulate how environmental resources like waste is managed, considering the external elements are also important. These elements introduce practical everyday considerations in how this should transpire.

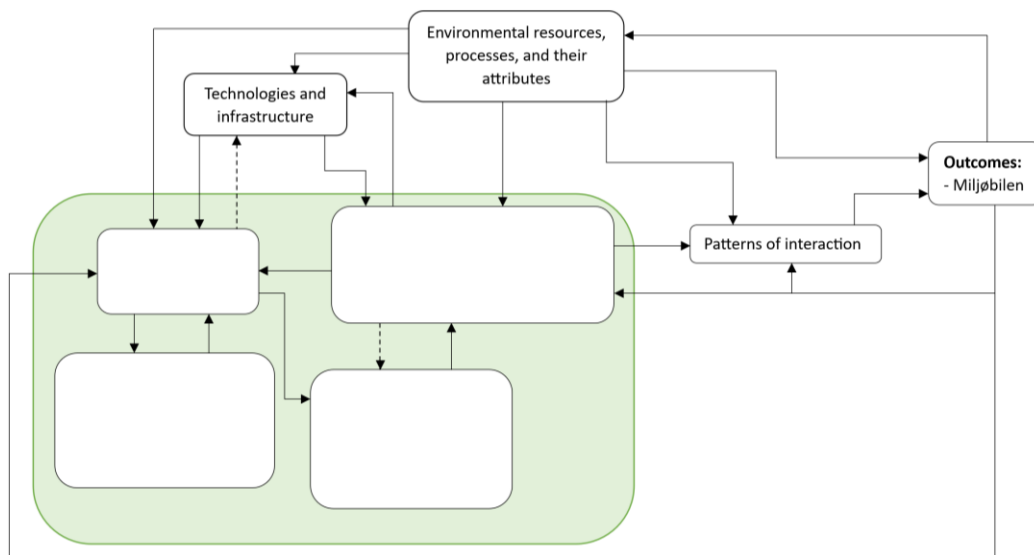


Figure 8: The elements outside the governance structure

5.2.1 Technologies and infrastructures

Implementing or changing current waste management methods necessitates a consideration of the associated technologies and infrastructures required. Miljøbilien involves a truck driving a predetermined route to pick up a range of waste types, thus requiring an evaluation what truck type to use. For regular waste collection services, the trucks are only meant to collect an assortment of waste which does not require more sorting by the waste management company. The collected waste goes straight to processing and further treatment. However, with Miljøbilien, the business idea was that a single truck would collect different waste categories. This means that the truck must be capable of effectively sorting and safely storing this waste as the truck drives around. Having such a system makes the disposal of the waste categories faster and more effective as there is no need for further sorting once the truck reaches the recycling centres. Follo Ren must also consider the costs of running and maintaining this truck, as it needs fuel, drivers, and general upkeep.

While the technologies pertain to the truck, the infrastructure encompasses the facilities required to operate Miljøbilien. Considerations here involve how the addition of this service

affects the current structures and systems for handling the waste categories collected. Nevertheless, instead of adding another stream, the waste collected by Miljøbilen is brought to Teigen recycling centre, where the waste is weighed before being added to the waste gathered from at the recycling centres. Waste treatment companies then collect this waste for further processing. Additionally, Miljøbilen’s route must be carefully planned to ensure the optimality of the driving route and the waiting times.

5.2.2 Environmental resources, processes, and their attributes

Follo Ren annually analyses residual waste containers from households. This illustrates what is disposed of and how much of this waste is missorted and forms a basis for assessing waste management solutions and measures to minimise waste. Table 9 indicates the percentages of missorted waste from 2017, the year before the establishment of Miljøbilen, and until 2022.

Table 9: Missorted household waste 2017-2022 (Follo Ren, 2017, 2018, 2019, 2020, 2021, 2022)

Waste Categories	2017	2018	2019	2020	2021	2022
Hazardous and e-waste	1,1	1,0	1,5	1,7	1,7	1,9
Textiles	2,9	3,0	1,7	2,0	2,0	1,4
Glass and metal packaging	4,9	6,6	3,4	4,2	4,2	4,4
Cardboard, paper, and carton	6,8	6,8	6,2	4,2	4,2	5,7
Metal	NA	NA	NA	1,2	1,2	0,6

The first thing to note is that this overview does include all the waste categories collected by Miljøbilen (section 2.5), as it is originally meant to collect more than the waste that ends up in household residual waste. Secondly, there is nothing to suggest that there has been an overall reduction in the missorting of these waste types. At the same time, a correlation to Miljøbilen would not have been possible to draw even if missorting had been reduced. This is because, especially for the categories included in Table 9, there are other disposal methods available for household waste. Nevertheless, an overview of missorted waste is important as it has financial and practical consequences for its later processing and treatment, to be discussed in Chapter 6.

5.2.3 Outcomes

Outcomes indicate the results of environmental resource management, and it also includes an evaluation of these results’ legitimacy. When discussing outcomes, Vatn (2015) discusses output legitimacy and breaks this down into three criteria:

- 1) Distributive justice: the principles for allocating benefits and burdens across societal activities.
- 2) Effectiveness: the capacity to ensure the achievement of defined goals.
- 3) Efficiency: the ability to reach goals with minimal costs.

Distributive justice and efficiency have the potential to conflict with each other as efficiency often denotes the pricing of values, which is challenging in environmental governance, resulting in the inclusion of lowest costs of both procedures and outcomes in efficiency. Including costs in legitimacy evaluations are crucial as it helps identify high-cost strategies with little gain.

Output legitimacy is linked to the input legitimacy, where the latter pertains to the decision-making procedure and whether it can be considered acceptable and appropriate in principle and regarding various actors' interests. However, a conflict can also arise between these two types of legitimacy, occurring in cases where bad outcomes are produced even if or when the decision-making procedure is considered "good" and vice versa. This means that Follo Ren must consider both the inputs and outputs when implementing new waste management methods.

When implementing Miljøbilen the decision-making procedure's overarching outcome is the service it provides. Still, the decision to establish Miljøbilen is based on the goals and ideas behind this service, indicating some of the desired outcomes of the service, such as improved sorting and collection of alternative waste types resulting in increased processing, treatment, and recycling of them. It provides increased access and ability to sort and dispose of the waste for those who cannot travel to the recycling centres themselves like the elderly, students, and those without cars. Lastly, by implementing Miljøbilen, Follo Ren responds to increased policies targeting reduced car usage, which can be seen with the building of fewer parking spaces for apartment buildings. However, these outcomes incur a variety of different costs (to be discussed in Chapter 6), but it seems that the effectiveness of resource management and distribution is good, while the economic efficiency can be discussed.

5.2.4 Patterns of interaction

The patterns of interaction linking environmental resources and economic actors to outcomes indicate, as mentioned in section 3.2.2, that these patterns are not only influenced by the choices and activities of the economic actors within the governance structure. They also illustrate that the environmental resources themselves can influence interaction patterns due to their attributes and the processes required to effectively handle them. This means that the state of the waste categories managed by Follo Ren also influences the company's decisions.

For example, e-waste has specific qualities that, if left untreated, can cause significant damage to the environment and harm to humans and animals. However, if e-waste is properly sorted and treated, it can be broken down into its material components that can be utilised to reuse and recycle products. Therefore, this is a feature of this waste enabling a processing option that can influence the economic actor's interaction with this waste type and how they decide to sort, collect, process, and treat e-waste.

5.2.5 Practical implications

Elements outside the governance structure can also affect Follo Ren and its implementation of Miljøbilen. Like the elements inside the structure, the outside elements have varying impacts. These elements can be said to have a practical impact on implementing waste collection services like Miljøbilen as they relate more to the tangible aspects of waste management.

While technologies help determine what to consider regarding waste collection, for example, sorting upon or after collection, infrastructure involves the structures and facilities available for the pre-processing, storing, and processing of the collected waste. However, this might not imply substantial changes due to the already established recycling centres. When it comes to environmental resources, or waste in this case, it is important to consider the state and quantities of it, as well as the potential processing and treatment options, to determine how best to handle these waste categories. Outcomes are comprised of the results achieved from the governance of an environmental resource. Like the discussion in section 5.1.6, Follo Ren is expected to balance the input and the output of a decision-making process to ensure that the results are acceptable compared to the costs. This do require an acknowledgement that the ends do not always justify the means. In other words, when Follo Ren is implementing a new service, the costs associated with running this service should not significantly exceed its benefits over time. Finally, interaction patterns reemphasise the influence of the environmental resource on the decisions and choices made by economic actors concerning that resource. This indicates that it is important to know the status of waste generation for the different waste categories, alongside the options for further treatments, as this forms a part of the basis for the decisions on how specific waste types are managed.

5.3 Chapter summary: Bringing together the elements

In this chapter, an EGS analysis was performed to identify the elements with the most influence on Follo Ren's implementation of waste management services, while focusing on Miljøbilen. When it comes to the governance structure, all actors and institutions have a significant impact,

as it is here that the overall laws, regulations, and policies are established for waste management. However, in terms of Miljøbilen, not all of these are directly influential, with Follo Ren as the economic actor and households as the civil society actor being identified as the most impacting ones. Follo Ren is the company responsible for household waste management in Frogn, Nesodden, Nordre Follo, and Ås. It has the authority to implement measures in alignment with the overarching policies, regulations and conditions set by its owner municipalities to collect a range of waste types effectively. How well the company achieves this depends on the involvement of households and how well they engage with the sorting and recycling guidelines introduced. This results in a balancing act between the conditions and expectations set by both the board of representatives and the company board with the needs and desires of households.

Out of the elements located outside Follo Ren's governance structure, the outcomes are the most influential in implementing Miljøbilen. While the overarching outcome is Miljøbilen, it also indicates the underlying outcomes that can result from establishing this service. When considering the outcomes, it is not just the benefits that must be considered but also the resource use involved. This includes the financial, environmental, and social costs and benefits of running this service and necessitates further discussion.

Therefore, out of the elements located inside and outside the governance structure, the most influential elements in the implementation of Miljøbilen are Follo Ren itself, the households, and the outcomes resulting from its establishment. The outcomes of Miljøbilen and the households' impressions of the service will be explored further in the next chapter.

6. Discussing Miljøbilen: Impressions and outcomes

This chapter discusses the advantages and disadvantages of Miljøbilen and the survey results. It aims to answer the second objective and its research questions, each section providing the necessary information to support the findings. The main findings indicate that despite the costs of running Miljøbilen, it still manages to achieve what it was established to do. The survey results indicate the potential for more growth of the service if the public gains more knowledge about it, supporting the previous chapter's conclusion on households' impact on such services.

6.1 Advantages of Miljøbilen

The advantages of Miljøbilen can be divided into three categories, financial, environmental, and social, indicating the beneficial aspects of Miljøbilen.

The largest financial benefit is improved waste sorting, enabling increased material recovery. With proper waste sorting, less is disposed of in the residual waste bin, where it does not belong. Therefore, the processing of residual waste is made more effective as there is less risk of waste clogging up the processing machines. Clogged machines can substantially impact waste recycling, exacerbated by the fact that waste continuously arrives at the processing centres even when the machines stop working (Knezevic et. al,2022). Getting the machines up and running again takes time and manual labour, subsequently increasing the costs of this process. Missorted waste, especially batteries and e-waste containing batteries, carries the risk of fire which can happen at any time from its initial disposal at the location of the household, with cases of waste bins and collection trucks catching fire, increasing the costs. Furthermore, waste management companies usually sell certain waste categories where the inclusion of waste categories due to missorted waste affects the income from these sales. One waste category this applies to is glass and metal packaging, where ceramics and porcelain are sometimes disposed of as well, which reduces the pureness of the glass and metal. Moreover, Miljøbilen does not only benefit Follo Ren financially but also households. By opting for using Miljøbilen instead of travelling to the recycling centre themselves, households save both time and money, as accessing the centres incurs a fee payment. At the same time, Follo Ren is offering a service to those who cannot access the recycling centres themselves. However, Miljøbilen results in the municipal household waste fee is increased, which also raises the question of whether this fee compared to the costs of driving to the recycling centres themselves is worth it, but this is a subjective evaluation that is hard to determine as each household will have a different perspective on this.

The environmental benefits of Miljøbilen relates mostly to improved sorting and collection of alternative waste categories and the overall quantity increases of these, as Miljøbilen facilitates the proper disposal of waste by people who otherwise might not have been able to do so.

Table 10: Miljøbilen's collected waste in kg 2019-2022

Waste Category	2019*	2020	2021	2022	Total
E-waste	1 355	7 336	6 470	7 464	22 625
Lightbulbs	100	185	132	111	528
Batteries	459	966	1 020	800	3 244
Paint	1 635	2 763	5 352	3 727	13 477
Hazardous waste	798	1 497	1 188	1 576	5 060
Metals	1 176	3 873	3 465	3 621	12 134
Glass- og metal packaging	213	304	294	1 084	1 895
Cardboard/Paper	574	1 675	1 293	1 284	4 825
Wood	807	1 598	1 344	1 060	4 809
Inert/Construction masses	612	1 270	675	809	3 366
Residual waste	1 444	3 403	3 503	3 798	12 147
Textiles	263	282	68	NA	613
Plastics	131	372	11	NA	514
Total	9 172	24 869	24 737	25 333	84 110

** Applies only to fall 2019*

Table 10 illustrates the yearly developments of Miljøbilen's collections since the first data was collected in the fall of 2019. Overall, there is a continuous increase in the tonnage collected, with e-waste and paint being amongst the categories comprising this. By offering Miljøbilen, Follo Ren is also contributing to reducing emissions from household cars, as there is potential for fewer visitors at recycling centres, especially from those only bringing small quantities of waste, reducing the overall environmental impacts of these cars.

The social benefits associated with Miljøbilen consist of the different ways the service makes it easier to do the right thing concerning household waste management. Not only does Miljøbilen make it easier to for households to sort their waste properly, but it also makes it simpler to dispose of smaller quantities of it.

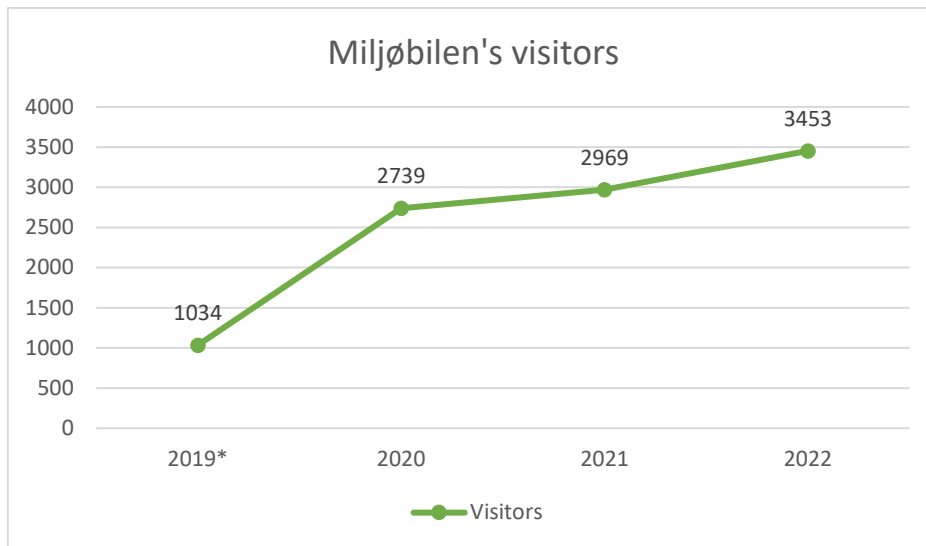


Figure 9: Miljøbilens visitors 2019-2022 (Follo Ren, 2020, 2021, 2022, 2023)

* Applies only fall 2019.

Figure 9 shows that the visitor number of Miljøbilens continues to increase, indicating the service's potential for more growth as people get to know it. Increased knowledge about Miljøbilens can help spread awareness about waste sorting, with people wanting to learn more about the service when they see it. This makes Miljøbilens a service that helps encourage people to engage more with proper sorting and waste disposal methods, which can also result from the time and energy saved due to its proximity to home. In other words, some may feel that it takes less effort to use Miljøbilens than using other disposal methods for these alternative waste categories. Not to mention that this proximity makes waste disposal more accessible as some do not have the means of utilising the preestablished methods, such as travelling to recycling centres due to a lack of a car or physical capabilities.

6.2 Disadvantages of Miljøbilens

Like the advantages of Miljøbilens, the disadvantages are divided into three categories, financial, environmental, and social, illustrating the Miljøbilens's drawbacks in these same areas and establishing a contrast for comparison. The financial costs are those related mostly to maintaining the service as it needs not only personnel to drive it around but fuel and other forms of upkeep to keep it running. An increase in household fees covers the costs of Miljøbilens.

The costs incur when filling and emptying Miljøbilens as it requires personnel to receive, empty, sort and weigh the collected waste. However, this work varies from the usual work done at the recycling centre and comes on top on normal issues, but it improves the sorting rate compared

to when households do it themselves at home and the recycling stations. Although, the recycling stations have the personnel to help visitors sort their waste properly.

Furthermore, Miljøbilen also incur costs from both the administrative work and the marketing required to advertise the service. It is a service that demands substantial and consistent marketing to ensure that people remember it. However, Follo Ren is in the process of developing a notification option in the app allowing people to turn on notifications when Miljøbilen stops in their neighbourhood. This can help people remember to use it and increase the number of visitors as it will also be possible to learn more about Miljøbilen.

Table 11: Miljøbilen's costs per collected waste (tons) and costs per visitor

	Collected waste (kg)	Yearly Costs	Costs per tons	Yearly Visitors	Costs per visitor
2019*	9,2	650 000kr	70,8kr	1 034	628kr
2020	24,9	612 000kr	24,6kr	2 739	223kr
2021	24,7	601 000kr	24,2kr	2 969	202kr
2022	25,3	536 000kr	21,1kr	3 453	155kr

**Applies only fall 2019.*

Table 12: Cost's per collected waste (tons) and costs per visitor for all recycling stations

	Collected waste (tons)	Yearly Costs	Costs per tons	Yearly visitors	Costs per visitors
2019	29 306	24 523 000	837kr	172 096	142kr
2020	27 405	26 550 000	969kr	149 180	178kr
2021	26 441	24 164 000	914kr	129 404	187kr
2022	21 384	25 457 000	1190kr	132 325	192kr

Table 11 and 12 indicate the costs per tonne and per visitor collected by Miljøbilen and the recycling centres. There are concerns that the service costs more than its worth, connecting to Vatn's outcome legitimacy, specifically cost efficiency. This brings about the discussion regarding the pricing of values, where it can be argued that Miljøbilen is not profitable from a financial standpoint. Still, from a household perspective, it might be considered valuable. Therefore, judging the actual value of Miljøbilen requires a consideration of the alternatives, but this can also be challenging. Comparing the financial net value of Miljøbilen to the recycling centres will emphasise the contrasting costs and tonnage collected.

However, it can be seen in table 11 and 12 that the overall costs of Miljøbilen have been decreasing since 2019 compared to the recycling stations which varies between KR 24-26 million. The costs per tonne collected is significantly lower for Miljøbilen than for the recycling stations. This is due to the higher infrastructural, technological and resource demands that recycling stations has compared to Miljøbilen. Additionally, the costs per visitor have been consistently declining for Miljøbilen and reached a sum in 2022 that is lower than the costs per visitor for the recycling stations for 2020-2022.

Nevertheless, comparing Miljøbilen and the recycling centres ignores the other purposes of the service. Miljøbilen was implemented to offer an alternative method of disposing of waste to those who cannot access the recycling centres and as a measure to reduce the number of small trips taken there. This necessitates comparing Miljøbilen to alternatives with a similar purpose to Miljøbilen, offering a waste disposal method closer to home, of which there are none for all the types of waste that Miljøbilen collects.

There are not many environmental costs resulting from Miljøbilen. The largest cost here is from the emissions of Miljøbilen driving around and the fuels it uses. Originally, Miljøbilen ran on biofuels generated from food waste, but this had to be changed because of the availability of this fuel. The Environmental Agency has implemented requirements for the use of biofuels, which says that a certain proportion of fossil fuels must be replaced with biofuels within a year (Miljødirektoratet, 2023a). This has resulted in the use of biofuels being assessed as having a limited climate effect (DFØ, 2023).

Miljøbilen also has the environmental costs associated with the wear down of roads that this activity entails. However, when comparing these costs with the ones associated with the number of cars that would have otherwise driven to the recycling centres, it can be argued that the environmental costs of Miljøbilen are worth it.

Not many social costs are associated with Miljøbilen, with the largest one being the waiting time required for Miljøbilen's arrival. This can be detrimental for those who want to quickly dispose of smaller waste quantities. Although, it can be argued that this is somewhat negated by the time Miljøbilen spends at each stop. However, it is hard to gauge when the best periods are as work and have other household-related responsibilities can impact peoples' availability. This also feeds into the issue of Miljøbilen's limited number of stops, with not all being a walkable distance for everyone, thus requiring people to drive to the stops. Miljøhus (section 6.3) might answer this problem, but as it has not been tested, it is hard to conclude on its efficacy.

6.3 Comparing Miljøbilen's advantages and disadvantages

To evaluate Miljøbilen's overall impacts it is important to consider both the advantages and disadvantages of the service. When comparing the advantages and disadvantages of the service the following three conclusions can be drawn:

- 1) Miljøbilen facilitates improved waste sorting, enabling increased material recovery and more effective residual waste processing. It also saves households' time and money by providing a convenient alternative to driving to the recycling centres, as well as offering a service to those who cannot access these centres themselves. At the same time, maintaining Miljøbilen requires personnel, fuel, and other forms of upkeep, all of which incur financial costs. Costs are also associated with the filling, emptying, sorting, and weighing of the collected waste. The costs of the service are covered by an increase of household fees.
- 2) Miljøbilen supports the proper disposal of alternative waste categories, some of which would have ended up in residual waste. It helps reduce emissions from household cars through a potential decrease in the number of visitors to the recycling centres. However, Miljøbilen generates emissions and requires fuel to operate, and it contributes to the wear and tear of roads, though to a lesser degree compared to the overall number of cars that would have otherwise driven to the recycling centres.
- 3) Miljøbilen makes it easier for households to sort and dispose of their waste. It can also encourage people to engage more with the methods of sorting and disposing of waste. As mentioned, Miljøbilen increasing the accessibility of waste disposal for those without cars or the physical capabilities to otherwise handle the waste. Nonetheless, the waiting time for Miljøbilen's arrival may be detrimental, especially for those wanting to quickly dispose of smaller quantities of waste. Additionally, the limited number of stops can be inconvenient as people may be required to drive to the stops.

It is important to also consider the alternative services of Miljøbilen. Current alternatives are bringing smaller e-waste to shops selling these products, utilising the environmental points located throughout the municipalities, and using Miljøskap (environmental sheds). Most of these only apply to specific waste types and are therefore not entirely comparable to Miljøbilen. However, Follo Ren is working on building Miljøhus (environmental houses), which has a similar concept to Miljøbilen but will be a permanently located service accessible through the Follo Ren app in areas where Miljøbilen does not stop. The waste placed in these houses will then be collected regularly, like the case of the regular household waste collection service.

6.4 Survey results discussion

This section discusses the survey results, focusing on the responses with the most significance. As mentioned in Chapter 4, the survey was sent out to 5000 people and ended up with 954 responses. The demographic breakdown of the respondents can be seen in section 4.4.2.

Questions 1 and 2 establish people's sorting and recycling behaviour and ask whether they have used Miljøbilen. The survey included two sets of questions following the second survey questions, one set for those who have used Miljøbilen and the other set for non-users of the service. Questions 3-5 were for non-users, aiming to understand why they have not used Miljøbilen to discover how they can be turned into users and how they otherwise deal with the waste. The last four questions were for users of Miljøbilen to understand their experience and impression of the service and provide them with an opportunity to suggest areas of improvement.

6.4.1. Why do you sort and recycle your waste?

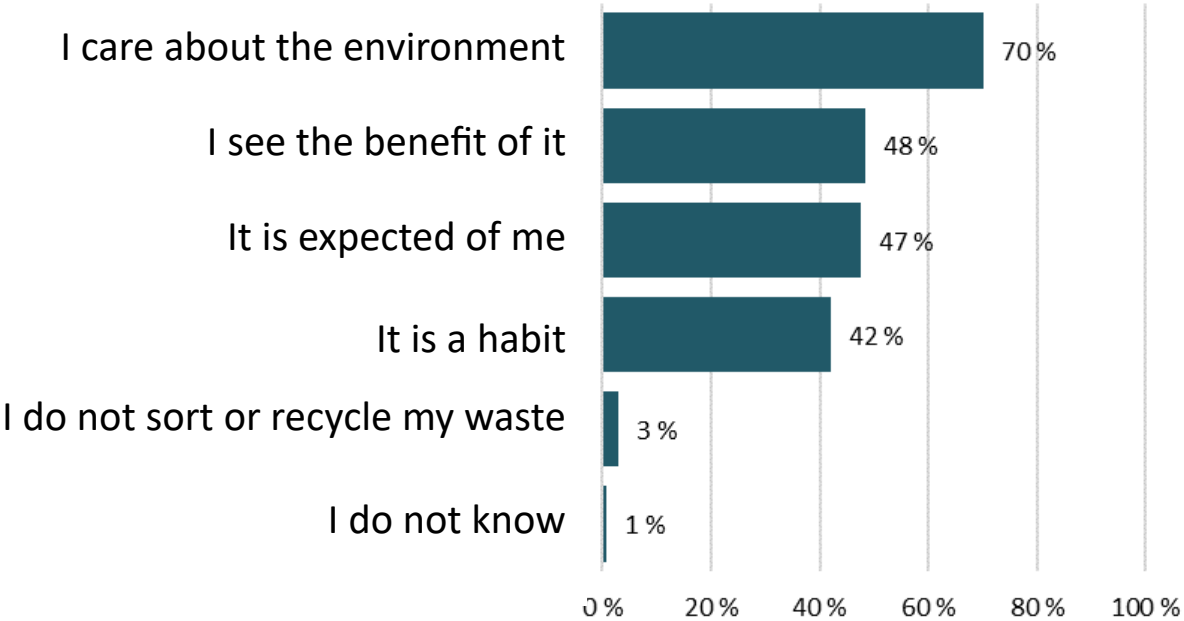


Figure 10: Reasons for sorting and recycling waste

The first question establishes the sorting behaviour of the respondents and what motivates this (see Appendix B for the demographic breakdown). This question was framed to enable more than one answer. Among the responses, environmental concern was the most reported reason for engaging with waste sorting and recycling, with 668 (70%) out of 954 survey participants choosing this. This response was chosen the most among women and those older than 35.

Men responded more that they sort and recycle waste because they see the benefits of it and because it is expected of them, at 462 (48%) and 453 (47%) choosing these responses. These responses were also common for highly educated people, suggesting that knowledge influences this activity. Age and being employed or otherwise active also affect this, with young (under 35 years) and working people also choosing these reasons to explain their sorting behaviour.

402 (42%) people sort and recycle waste because it is a habit, with employed people responding this more than pensioners and people doing something else than being employed. Additionally, 35 (4%) responses indicate that they either do not do this or they do not know why they do this. Lastly, the residents in Frogn sort and recycle their waste less because of their environmental concerns (58%), the perceived usefulness of it (35%), and because it is a habit (29%), compared to those living in the other municipalities (respectively 68-80%, 46-52% and 37-51%).

These responses provide the rationalities and motivations for waste sorting and recycling behaviour. Sorting because of environmental concerns can be supported by both individual and social rationality and could have been further clarified in an in-depth interview. Nevertheless, for individual rationality, this can result in a “warm glow”, making people feel good about themselves due to their actions. At the same time, regarding social rationality, environmental concerns can also relate to a “we” rationality, where behaviour is informed by what is considered appropriate or right for the group.

Finally, turning sorting behaviour into a habitual activity makes this something that is done automatically and without much thought. This can be why some people respond that they do not know why they sort and recycle their waste, as they might not have really thought about it before. Thus, they might have felt that saying they do not know is more appropriate than responding that it is a habit.

6.4.2. Have you ever used Miljøbilien?

745 (80%) out of 954 people responded that they have not used this service (see **Appendix C** for demographic breakdown). Amongst those who have used Miljøbilien, the responses indicate that the use increases with the age of the respondents. This can be due to old age and potentially deteriorating health, making it harder for some to travel to the recycling centre. However, as with the first question, an in-depth interview could have clarified this. Furthermore, the use of Miljøbilien by those with one child is significantly higher than amongst those with two or more children. This can be explained by the additional time and work associated with raising more than one child at a time.

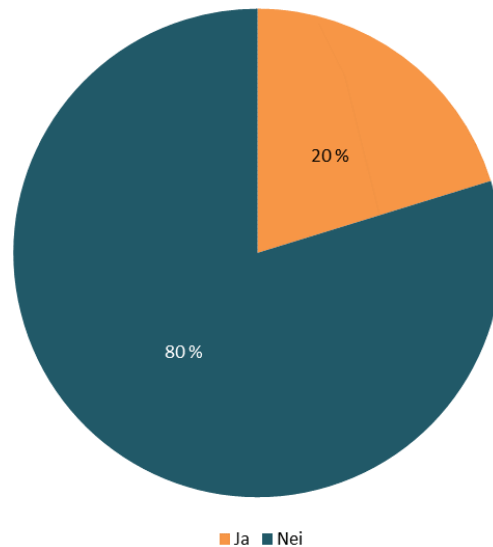


Figure 11: Use of Miljøbilen

For this question, there is also a significant spread in the use of Miljøbilen amongst the municipalities. Those living in Ås report that they have used the service the least at 10% compared with Frogn having the most users at 31%. Nordre Follo and Nesodden has 19 and 26 percent usage. This can be linked to the household's proximity to the recycling centres and the differing advertisement levels of Miljøbilen throughout these municipalities.

6.4.3. Why have you not used Miljøbilen?

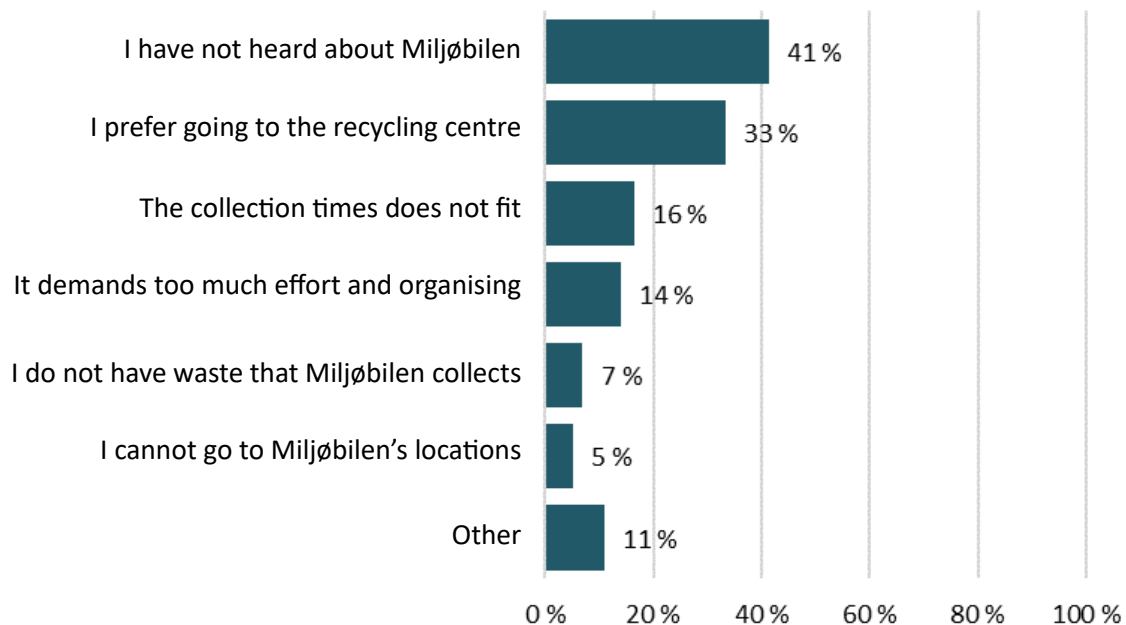


Figure 12: Reasons for not using Miljøbilen

Based on the total responses of 954 people, the 745 (80%) people who answered that they had not used the service, 308 (41%) people said it was because they had not heard about it before,

followed by 249 people (33%) responding that they prefer driving to the recycling stations. 104 (14%) and 122 (16%) respectively respond that using the service requires too much effort and/or organising and that the timeslots for the service do not fit. Feeling like the service takes too much time and/or effort links to the Low-cost hypothesis (LCH) in that the associated costs of going through with the activity negate the desire to perform an activity. While this hypothesis was originally framed about environmental concerns, it can still be argued to be applicable. A deeper look into the response data could have highlighted how many of those who reported sorting and recycling their waste have chosen this alternative as an answer to why they have not used Miljøbilen, thus creating stronger support for the LCH.

Relatively few responses, 38-51 (5-7%), indicate an inability to access the pick-up locations and that they do not have waste that can be picked up (see **Appendix D** for demographic breakdown). 81 (11%) people provide other responses than the options provided, with some of these responses relating to a lack of information about Miljøbilen and its schedule, forgetting about the service, finding it hard to stay updated on the time and location of its stops, and not needing the service. The theory of planned behaviour can explain why some people forget or find it hard to stay updated on Miljøbilen. As this theory explores the underlying motivation behind an intention to behave in a certain way, it can help explain why people experience these issues. Amongst the influencing factors for an intention, the perceived personal control of an action plays a big part. People might feel unable to go through with using Miljøbilen even though there are ways for them to do it, whether by putting on reminders or putting in a bit more effort in learning about the service. This also links to Low-Cost Hypothesis as people might feel that it takes too much time and effort, but instead of saying so, potentially due to how they perceive this to reflect badly on themselves, they provide other answers to justify their reasons.

When broken down with the demographic variables, the responses indicate that knowledge about the service increases with age. Despite this, the preference for driving to the recycling stations themselves is highest amongst people 55+ years old. Many of these people are also retired, which could be argued to be a cause for this preference as they have more time to make the trip. Those aged 35 years and younger report less ability to go to the pick-up locations, which can relate to their employed status and household-related responsibilities, reducing the time they must do this once they get home from work or studies. However, a bigger share of employed or other people reports not knowing about the service, inconvenient time slots, and that it takes too much effort and/or organising. A similar trend can be seen in households with

2 or more children, while childless households report to a higher degree that they do not have the kinds of waste that the Miljøbilen takes.

A larger share of those residing in Nordre Follo reports preferring to drive to the recycling centre themselves, compared to the other municipalities. This is despite the municipal responses indicating that Nordre Follo’s residents have the most knowledge about Miljøbilen. This is explained by these residents' proximity to the recycling station in this municipality. The centre is located in Sofiemyr village (Old Oppegård municipality), making it quicker and easier for these residents to travel here than in other municipalities.

6.4.4. What is needed for you to start using Miljøbilen?

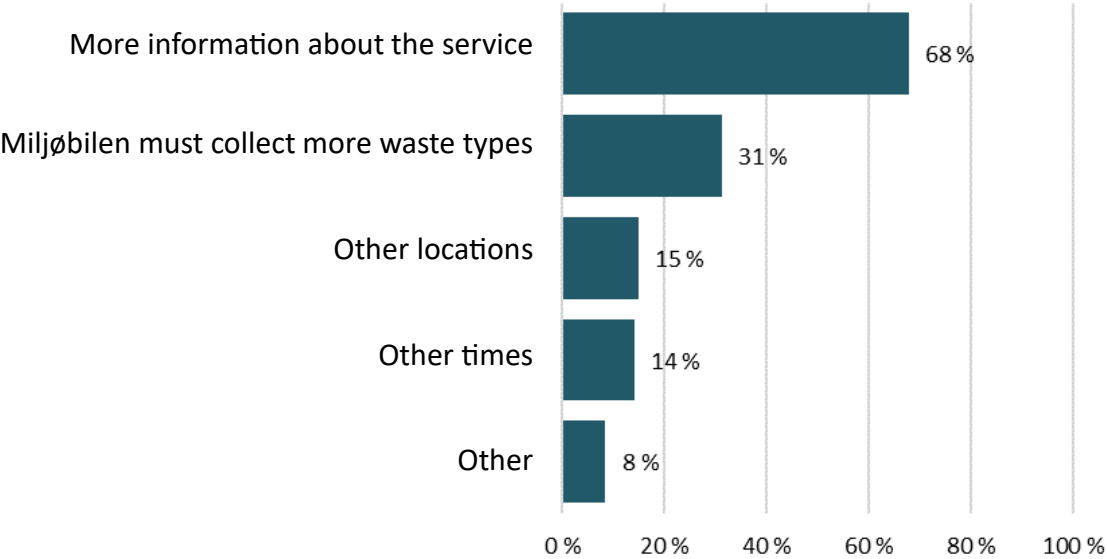


Figure 13: Reasons to start using Miljøbilen

Amongst those who reported not using Miljøbilen, 505 (68%) people responded that more information is needed for them to start using the service, 232 (31%) people responded that Miljøbilen needs to collect more kinds of waste, and 106-111 (14-15%) people reported wanting different locations and time slots. An additional 63 (8%) people offer other responses like not using the service. Some of these include wanting a reminder via an app notification or text message beforehand, wanting Miljøbilen to receive larger quantities of waste (might be unclear to the public how much can be brought with one respondent understanding “small quantities” as however much you can carry with one hand). Others also expressed a desire to learn more and to use Miljøbilen, suggesting that the overall use of Miljøbilen might increase if more people knew about the service.

When broken down into demographic variables (see **Appendix E** for demographic breakdown), the responses indicate that more women want to learn more about the service but that the older the women get, the lower this desire is. This can be explained by there being a higher degree of elderly already using Miljøbilen. On the other hand, men want Miljøbilen to collect more kinds of waste. What waste types they mean could have been clarified in an interview or by including such a survey question, but the limitation on the number of questions prevented this. Wanting more information and different time slots is also higher amongst employed and other people than among pensioners.

6.4.5. How do you dispose of waste that should not be disposed of in containers at home?

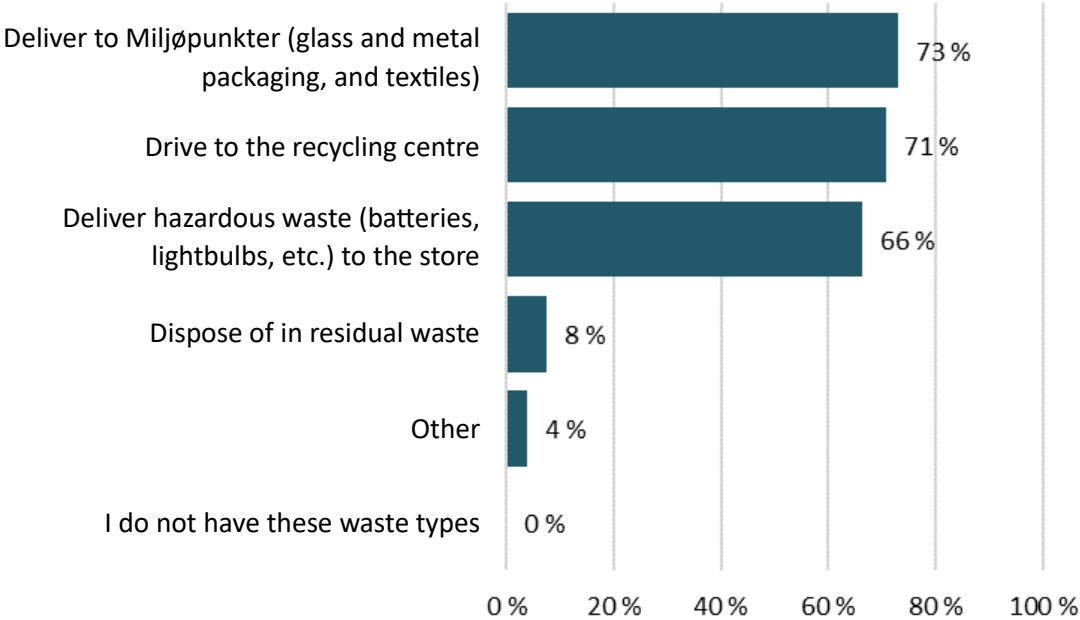


Figure 14: Disposal methods of alternative household waste

In the last question for those who have not used Miljøbilen, the majority 528-544 (71-73%) people answered that they dispose of waste at environmental points (Miljøpunkter) for glass, metals and textiles and drive to the recycling centres themselves. 494 (66%) people deliver hazardous waste (batteries, lightbulbs, etc.) to grocery stores. 56 (8%) people dispose of the waste in the residual waste. There were also 29 (4%) people who offered alternative answers than those provided, such as just leaving it at home, bringing it to dispose of at their workplace, and having environmental containers in their neighbourhoods/housing associations for such disposals.

When broken down into demographic variables (see **Appendix F** for demographic breakdown), the responses indicate that more women deliver the waste to Miljøpunkter. A larger share of young people (under 35 years) uses Miljøpunkter compared to older people who, as mentioned, delivers to the recycling stations. Employed people use Miljøpunkter more than pensioners. Lastly, a larger share of residents in Nordre Follo (76%) drives to the recycling centre compared to Frogn (60%), Nesodden (65% and Ås (69%). This is, as mentioned, due to the resident's proximity to the recycling station located in Oppegård, Nordre Follo.

6.4.6. Miljøbilen arrives every 14th day. Roughly how many times a year have you used Miljøbilen?

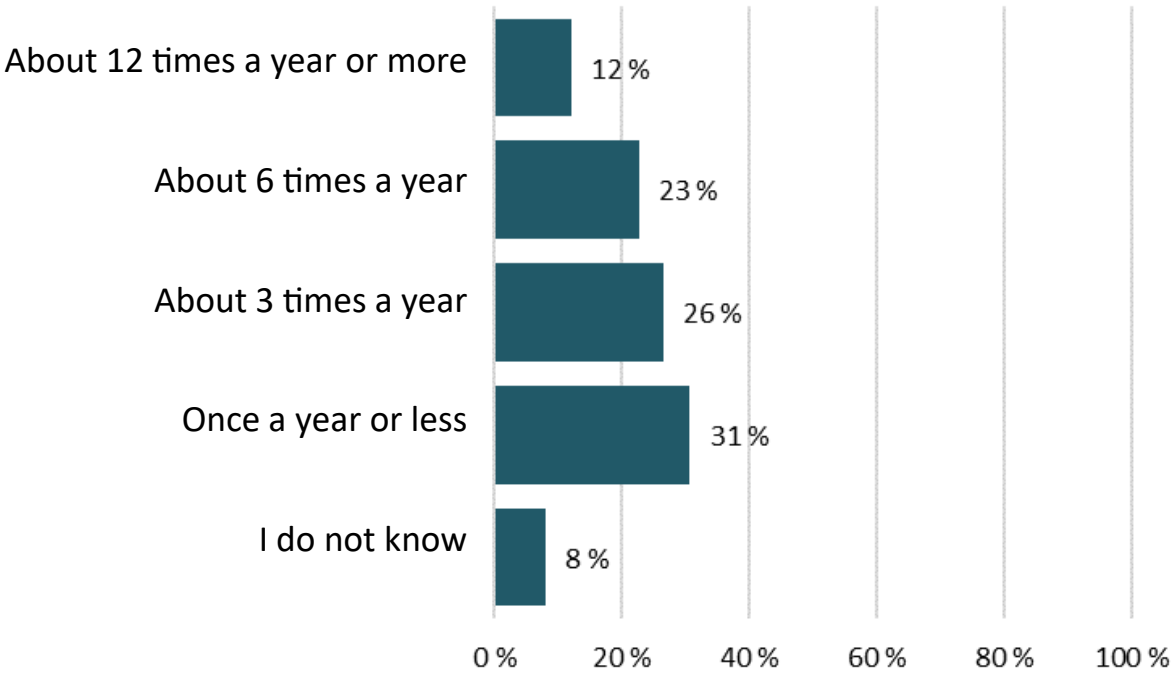


Figure 15: Uses per year of Miljøbilen

Out of the total 954 survey respondents, 189 (20%) report having used it. Amongst the users of Miljøbilen 58 (31%) people respond having used it once a year or less, compared to 23 (12%) who have used the service about 12 times a year or more (see **Appendix G** for demographic breakdown). Households with five or more people report using Miljøbilen 12 times a year or more than households with fewer people, potentially due to an increased waste generation among these households. 50 (26%) people use Miljøbilen about 3 times a year, and 43 (23%) about 6 times a year. The latter response is more common amongst 3-person households and those having only one child. The responses broken down into the demographic variables also show that younger people use Miljøbilen more than older people, with 79% of people under 35

years reporting using it 12 times a year or more. This can again be because of the preference amongst older people to travel to the recycling centres themselves, as found in the previous survey questions.

6.4.7. What kinds of waste do you bring to Miljøbilen?

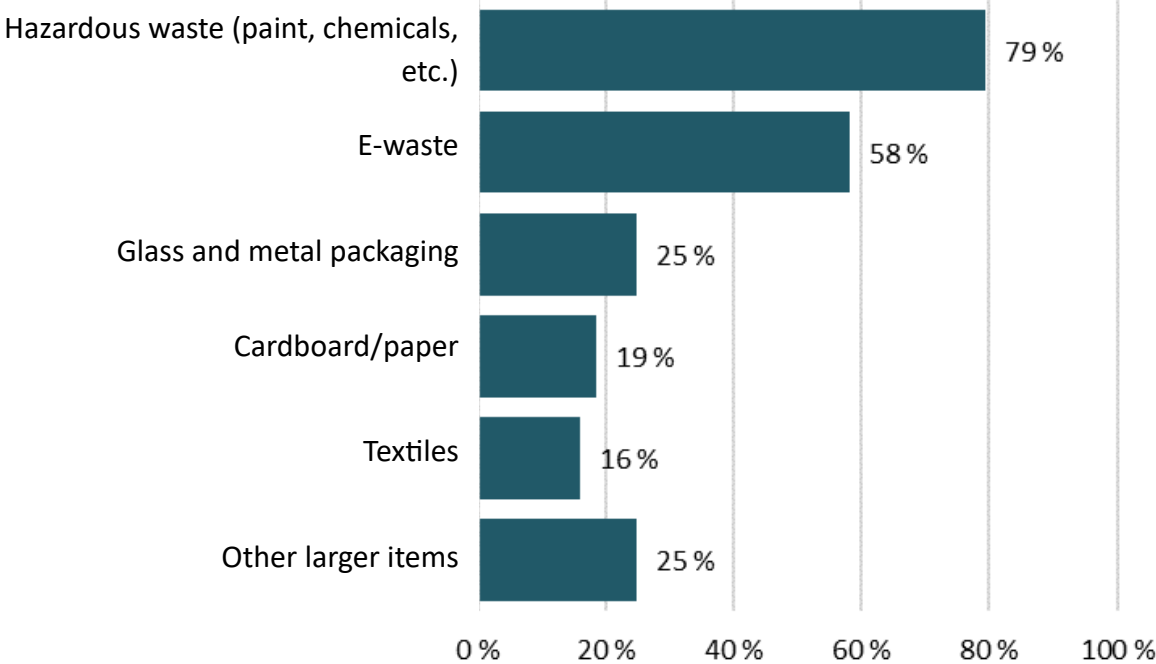


Figure 16: Waste types brought to Miljøbilen

According to the responses, 150 (79%) report bringing hazardous waste (paint, chemicals, etc.), followed by e-waste at 110 (58%), with no significant demographic variables (see **Appendix H** for demographic breakdown). This both indicates that there is a need for disposal methods of these waste types and suggests that, regardless of personal characteristics, people know to sort these out. 47 (25%) people say they bring glass, metals, and other larger items. Lastly, 30-35 (16-19%) people report bringing textiles and cardboard/paper, with a larger share of those aged under 35 reporting bringing cardboard/paper and textiles at 100% and 47%, respectively. This may be because of a higher trend in online shopping amongst this age group compared to older generations, thus, generating more of these kinds of waste.

6.4.8. How satisfied are you with the information you receive about Miljøbilen?

Out of the 183 people who answered this question 58 (32%) people report being satisfied with the information they receive about Miljøbilen and its scheduled route (Figure 20). This is surpassed by 82 (45%) responding that they are satisfied. When broken down into demographic

variables, the responses indicate that people under 35 are overall more satisfied with this than older people (see **Appendix I** for demographic breakdown). A reason for this might be the ease with which younger people navigate technology and the internet, thus finding information about Miljøbilen being much quicker and easier for this group of people.

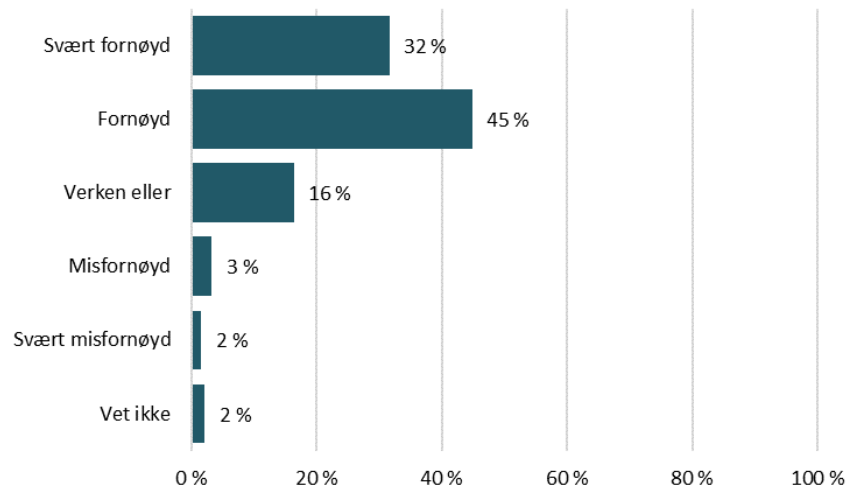


Figure 17: Level of satisfaction with the information about Miljøbilen

6.4.9. Do you have any suggestions for how Miljøbilen can be improved?

This final survey question generated many responses, many of which are thematically similar. Most of the responses were based on a need for more information, such as general information and notification about the location and times, with some suggesting having daytime slots. Some people are also missing more clarifying information about what some waste types mean, for example, electronics, as well as how some wastes are to be dealt with, applying mostly to textile waste as people do not want to give textiles that are pure trash to the charities working with donated items. Lastly, a suggestion is to provide more information about Miljøbilen schedule in local newspapers, on posters and via emails. This can help spread awareness of Miljøbilen and remind people of the times and places for its stops, thus functioning as a notification. Leading to suggestions of having the option to be notified about Miljøbilen's schedule, like the regular household waste collection, with some suggesting app reminders and text notifications as potential options.

The second largest group of suggestions relates to the frequency, times, and locations of Miljøbilen's stops. Some people want more specific locations added, some of which were previously included, but there were so few visitors that they were removed. Others want more frequent collections and not just every two weeks. It was also suggested to have more time slots

during the day or expand some of the earlier ones, as Miljøbilien starts its route before everyone has come home and makes it harder for people to utilise the service. The last suggestion here is having Miljøbilien remain at certain stops for a couple of days each month to allow people to see, react and act.

The rest of the suggestions are 1) Waste categories and quantities, where people want larger quantities and waste categories also to be collected by Miljøbilien, with some even suggesting having the possibility to bring larger quantities a couple of times a year for those without cars; 2) Storage solutions, both suggesting a smaller bin to store waste in before bringing it to Miljøbilien, especially for batteries and spray cans, and an option to leave waste at the locations for Miljøbilien stops on a specific day to be picked up, which would be helpful for those with long workdays, and 3) Alternative disposal methods for those who still have a distance to travel to reach the Miljøbilien locations, which, as mentioned, is being worked on.

6.5 Summarising the discussions

Miljøbilien is a service consisting of financial, environmental, and social advantages and disadvantages. The most notable of Miljøbilien's advantages are the increased sorting and collection of alternative waste categories due to their non-inclusion in the regular household waste collection services. Increased use of Miljøbilien also reduces the emissions and costs related to missorted waste and the reduction in cars travelling to the recycling centres. Furthermore, this service makes it easier to dispose of alternative waste types, especially for those who otherwise cannot access the pre-established disposal methods.

Most of Miljøbilien disadvantages are financial, resulting from the costs arising from the maintenance of the service. It is also here where a consideration of the costs associated with Miljøbilien is set against its benefits, particularly regarding the waste quantities collected. Such an evaluation necessitates comparing the alternative methods provided for disposal of the waste categories that Miljøbilien collects. However, such a comparison is limited due to the non-existence of methods of similar purpose that collects these waste types. This is why Vatn (2015) suggests using lowest costs in the cost-efficiency analysis, as some values cannot be accurately priced. Such a judgment depends on the evaluators' perspective, where the financial values can be contrasted with the social values.

According to the survey responses, Miljøbilien can potentially increase the number of visitors and subsequently increase the quantities of collected waste. Based on the responses from those who have not used the service, the biggest barrier is the general knowledge about Miljøbilien's

existence, followed by a lack of information about what quantities and waste types it collects. Most non-users are elderly and prefer to travel to the recycling centres themselves to dispose of their waste. At the same time, the users of Miljøbilen report clear satisfaction with the service. However, there is also a desire for clearer information about the waste types and quantities collected. This group also wants to be notified about the Miljøbilen's schedule, making it easier to remember and prepare for its nearby stop. Lastly, there are suggestions for an alternative waste collection method in the areas where Miljøbilen does not stop, as it can still be hard to access the service from these locations. This is something that Follo Ren is already working on and hope to provide during this year, along with an in-app notification of Miljøbilen's schedule.

Miljøbilen is a pilot and demonstration measure, where info and documentation are important to include. Thus, it is essential to see this as a learning opportunity to get a better understanding of collection measures that will be necessary for the future.

7. Conclusion

The world has a considerable waste problem which is set to worsen with increased population. An effort is being taken globally to address the problems caused by current levels of waste generation, efforts in which Norway participates. Nationally, Norway grants the authority to deal with household waste to municipalities, who often come together to establish an IKS as a tool to handle this work. Households are provided with a set of bins to dispose of specific kinds of waste, the common categories being food waste, plastics, cardboard and paper, glass and metal packaging and residual waste. The other types of waste generated by households must either be brought to environmental points, shops that sell certain products, applies mostly to batteries, lightbulbs, or be brought to recycling centres.

However, there remain good reasons for providing other household waste disposal methods. On the one hand, such a provision can aid those who cannot otherwise access the preestablished disposal methods. On the other hand, provided such methods can help reduce the number of cars driving to the recycling stations. This can help households save time and money and reduce the overall emissions from this activity. Follo Ren, the company servicing households in Frogn, Nesodden, Nordre Follo and ÅS, initiated Miljøbilen in 2018 for these reasons, in addition to responding to policies targeting reduced car usage in general seen through the construction of fewer parking spaces in apartment buildings and housing associations.

This study aimed to evaluate the viability of Miljøbilen and to understand the factors influencing its success. The study was divided into two objectives with their research questions and had a theoretical background in Arild Vatn's EGS Framework and behavioural and utility theories.

When answering the first objective, an EGS Framework analysis was conducted, highlighting the most influential elements affecting Follo Ren's implementation of Miljøbilen. The results indicate that while there are many interplaying factors, the most important ones are the company itself, with a basis in the policies, regulations and conditions set forth by the company and owner agreements, as well as laws and regulations, and the households, as they are the ones who utilise the waste collection methods and can therefore significantly influence the company and its methods' successes. This results in a balancing act between the conditions and expectations set by both the board of representatives and the company board with the needs and desires of households.

Another element impacting Follo Ren's implementation of Miljøbilien is its outcomes. While the implementation process has Miljøbilien as the overarching outcome, this process is also influenced by the subsequent outcomes resulting from this service. Evaluating this service's viability requires considering its pros and cons, including the financial, environmental, and social costs and benefits.

To answer the second objective, this study conducted a pros and cons discussion, focusing on the financial, environmental, and social aspects of Miljøbilien. The results from this discussion indicate that the value of Miljøbilien lies in the environmental, social and some financial benefits that it brings due to increased access to waste disposal services, improved sorting resulting in less being thrown in the residual waste and reduced emissions and costs from private cars travelling to the recycling centres.

The discussion was supported by a survey aimed at both the users and non-users of Miljøbilien to better understand their experience, knowledge, and usage of the service. The results indicate that Miljøbilien can reach people of all ages and genders, whether they are occupationally active or not. Responses also show that there is some knowledge about the car, though most of the respondents have either no knowledge or little information about the service. The survey highlights the municipal differences in sorting and recycling behaviour as well as their use of Miljøbilien.

The overarching impression by those who have used it indicates high satisfaction with the service as it is, with most of the suggestions for improvements related to clarifying the information about Miljøbilien, providing notification options in the app, and the addition or changing of locations and times, indicating a desire to use this service. The impression offered by the many who have not used the car is that they either know nothing or have too little information about the service. Some respondents prefer to travel to the recycling stations themselves, most of whom are elderly and pensioners. Others respond that using it requires too much effort and organising, which travelling to the recycling centres also do. However, there is a difference between the effort and organising required during the weekday and on the weekend, the latter one being when most people travel to the centres, outside of the summer holiday.

The use of Miljøbilien can increase as more people learn about it, as most of the survey respondents have little to no knowledge about the service. However, this question could have been better answered if a question focusing on this had been included in the survey. Also, being able to ask why people prefer to drive to the recycling centres themselves could provide more

insight into the motivations behind this, which could potentially be used to improve the service. This also applies to the respondents that answer that it takes too much time and organising. Expanding the quantities and types of waste collected could also help increase the use of Miljøbilen. For the suggestions of more/different locations and time slots, adding these or providing alternative services (Miljøhus) can help address this in areas that Miljøbilen does not travel to.

During meetings before this study, Follo Ren gave the impression of having a good understanding of the households' needs and seemed eager to provide effective waste measures to address these. Most of the uncertainties with this research process relate to the conclusions drawn from the survey results. Due to the limitations set on the survey, and the time restrictions preventing a deep dive, some of the findings might have an unclear basis. Originally, the idea was to follow up the survey with in-depth interviews to provide more context and a deeper understanding, which could have strengthened these conclusions. Including in-depth interviews in future research is recommended to clarify individuals' motivations and impressions of current waste management methods and their preferences for more streamlined and individually adapted measures. This can help identify what future waste collection methods are needed.

With the increased focus on reducing car use in general but also related to the disposal of waste at recycling stations, it is necessary to be able to provide effective alternatives. Miljøbilen is a service showcasing the potential of developing such streamlined and individually adapted measures for the future, where future research can support its continued development. Performing a comparative analysis of this service with similar ones provided in other municipalities in Norway can establish a clearer picture of future waste management measures.

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Appendix A

9.1 Survey questions

Demographic variables

Gender

Man

Woman

Age

Under 35

35-44

45-54

55-64

Over 65

Education

Primary/High school

Vocational school

University 1-4 years

University 5+ years

Employment status

Work full time

Work part time

Student

Retired

Jobseeker

Other

Household size

1 person

2 persons

3 persons

4 persons

5+ persons

Children in household

No children

1 child

2 children

Housing

Detached housing

Terraced housing

Apartment

Municipality

Nordre Follo

Frogn

Nesodden

Ås

Other municipality → End survey

Topic questions

1. Why do you sort and recycle your rubbish? (multiple choices possible)

- a) It is expected of me
- b) It is a habit
- c) I care about the environment
- d) I see the benefit of it
- e) I do not sort or recycle my waste
- f) I do not know

2. Have you ever used Miljøbilen?

- a) Yes
- b) No

If no:

3. Why haven't you used Miljøbilen?

- a) I haven't heard about it
- b) I prefer to drive to the recycling station
- c) The times does not fit
- d) It requires too much effort or organization

- e) I don't have waste that can be brought to Miljøbilen
- f) I don't have the opportunity to go to the stop location
- g) Other...

4. What does it take for you to start using the Miljøbilen?

- a) More information
- b) That Miljøbilen collects more waste types
- c) Different locations
- d) Different times
- e) Other...

5. How do you dispose of waste that should not be disposed of in containers at home?

- a) Delivers used batteries, light bulbs etc. to shops
- b) Drives to the recycling station
- c) Delivered to Environmental points (glass and metal packaging and textiles)
- d) Throw in residual waste at home
- e) Does not have such waste
- f) Other..

If yes:

6. Miljøbilen arrives every 14th day. About how many times have you used Miljøbilen?

- a) About 12 times a year or more
- b) About 6 times a year
- c) About 3 times a year
- d) Once a year or less
- e) I don't know

7. What type of waste do you deliver to Miljøbilen? (multiple choices possible)

- a) Hazardous waste (paint, solvents, etc.)
- b) EE waste
- c) Glass and metal packaging
- d) Textiles
- e) Cardboard/paper
- f) Other larger objects

8. How satisfied are you with the information you receive about Miljøbilen and its route?

- a) Very satisfied
- b) Satisfied
- c) Neither
- d) Dissatisfied
- e) Very dissatisfied
- f) Do not know

9. Do you have suggestions on how the Ecocar service can be improved?

Note:

Appendix B

Question: Why do you sort and recycle your waste?

Multiple answers possible.

Broken down into demographic variables.

		↑ Significantly higher							
		↓ Significantly lower							
			I care about the environment	I see the benefit of it	It is expected of me	It is a habit	I do not sort or recycle my waste	I do not know	Valid N
Gender	Men	▼ 64%	▲ 53%	51%	45%	▲ 5%	1%	(n=469)	
	Women	▲ 76%	▼ 44%	45%	40%	▼ 1%	1%	(n=482)	
Age	Under 35 years	▼ 48%	47%	▲ 58%	51%	7%	▼ 0%	(n=135)	
	35-44 years	72%	44%	▲ 55%	48%	4%	1%	(n=263)	
	45-55 years	▲ 80%	53%	52%	43%	1%	1%	(n=182)	
	55-64 years	77%	51%	41%	38%	2%	1%	(n=162)	
	65+ years	67%	49%	▼ 33%	▼ 32%	▼ 0%	0%	(n=212)	
Education	Primary/high school	▼ 61%	▼ 40%	47%	36%	3%	3%	(n=174)	
	Vocational school	62%	45%	▼ 37%	40%	4%	1%	(n=134)	
	University 1-4 years	74%	52%	▲ 55%	▲ 50%	▼ 0%	▼ 0%	(n=332)	
	University 5+ years	▲ 79%	56%	47%	41%	5%	0%	(n=262)	
Employment status	Employed	71%	49%	▲ 52%	▲ 46%	4%	1%	(n=652)	
	Retired	69%	48%	▼ 34%	▼ 33%	▼ 1%	1%	(n=195)	
	Other	70%	52%	48%	43%	4%	▼ 0%	(n=92)	
Household size	1 person	71%	45%	▼ 34%	34%	▼ 0%	2%	(n=110)	
	2 persons	70%	53%	46%	41%	1%	0%	(n=313)	
	3 persons	65%	47%	54%	42%	4%	1%	(n=162)	
	4 persons	76%	50%	45%	▲ 52%	▲ 7%	▼ 0%	(n=233)	
	5+ persons	73%	46%	▲ 63%	40%	▼ 0%	3%	(n=115)	
Children in household	No children	70%	51%	44%	40%	▼ 1%	1%	(n=468)	
	1 child	64%	50%	54%	42%	▲ 8%	▼ 0%	(n=137)	
	2 children	75%	48%	53%	49%	4%	1%	(n=291)	
Housing	Detached house	▲ 75%	51%	47%	40%	4%	0%	(n=571)	
	Terraced house	70%	52%	51%	48%	4%	2%	(n=171)	
	Apartment	▼ 60%	▼ 38%	48%	43%	▼ 0%	1%	(n=136)	
Municipality	Nordre Follo	71%	52%	48%	45%	2%	1%	(n=487)	
	Frogn	▼ 58%	▼ 35%	38%	▼ 29%	▲ 10%	1%	(n=136)	
	Nesodden	▲ 80%	46%	39%	37%	▼ 0%	1%	(n=161)	
	Ås	68%	51%	▲ 61%	51%	2%	1%	(n=170)	
Total		70%	48%	47%	42%	3%	1%	(n=954)	

Appendix C

Question: Have you ever used Miljøbilen waste?

Broken down into demographic variables.

		↑ Significantly higher		
		↓ Significantly lower		
			Yes	No
				Valid N
Gender	Men		19%	81% (n=461)
	Women		22%	78% (n=473)
Age	Under 35 years	▼ 12%	▲ 88%	(n=129)
	35-44 years		19%	81% (n=261)
	45-55 years		19%	81% (n=179)
	55-64 years		23%	77% (n=159)
	65+ years		27%	73% (n=207)
Education	Primary/high school		20%	80% (n=174)
	Vocational school		18%	82% (n=131)
	University 1-4 years		22%	78% (n=325)
	University 5+ years		18%	82% (n=262)
Employment status	Employed		19%	81% (n=645)
	Retired		27%	73% (n=192)
	Other		16%	84% (n=89)
Household size	1 person		24%	76% (n=108)
	2 persons		20%	80% (n=308)
	3 persons	▲ 30%	▼ 70%	(n=159)
	4 persons	▼ 12%	▲ 88%	(n=233)
	5+ persons		16%	84% (n=115)
Children in household	No children		21%	79% (n=460)
	1 child	▲ 28%	▼ 72%	(n=137)
	2 children	▼ 13%	▲ 87%	(n=291)
Housing	Detached house		18%	82% (n=564)
	Terraced house		23%	77% (n=171)
	Apartment		25%	75% (n=134)
Municipality	Nordre Follo		19%	81% (n=482)
	Frogn	▲ 31%	▼ 69%	(n=128)
	Nesodden		26%	74% (n=159)
	Ås	▼ 10%	▲ 90%	(n=165)
Total			20%	80% (n=934)

Appendix D

Question: Why have you not used Miljøbilen?

Multiple answers possible.

Broken down into demographic variables.

		↑ Significantly higher	↓ Significantly lower						
		I have not heard about Miljøbilen	I prefer going to the recycling centre	The collection times does not fit	It demands too much effort and organising	I do not have waste that Miljøbilen collects	I cannot go to Miljøbilen's locations	Other	Valid N
Gender	Men	39%	38%	17%	16%	7%	6%	12%	(n=375)
	Women	44%	29%	15%	12%	6%	4%	10%	(n=370)
Age	Under 35 years	▲ 68%	▼ 14%	21%	12%	4%	▲ 14%	11%	(n=114)
	35-44 years	46%	▼ 23%	21%	17%	8%	4%	12%	(n=212)
	45-55 years	48%	26%	17%	19%	3%	2%	14%	(n=145)
	55-64 years	▼ 31%	▲ 53%	12%	11%	7%	3%	7%	(n=123)
	65+ years	▼ 17%	▲ 55%	▼ 9%	9%	12%	4%	9%	(n=151)
Educatio	Primary/high school	48%	31%	▼ 6%	▼ 4%	8%	4%	13%	(n=140)
	Vocational school	36%	42%	18%	12%	9%	▼ 1%	11%	(n=107)
	University 1-4 years	39%	36%	21%	17%	5%	4%	11%	(n=253)
	University 5+ years	45%	28%	18%	18%	7%	9%	9%	(n=215)
Employment status	Employed	▲ 47%	▼ 28%	▲ 19%	▲ 16%	6%	5%	11%	(n=524)
	Retired	▼ 16%	▲ 58%	▼ 8%	▼ 8%	13%	4%	9%	(n=141)
	Other	49%	23%	12%	12%	3%	9%	13%	(n=75)
Household size	1 person	40%	30%	▼ 7%	▼ 6%	▲ 21%	5%	7%	(n=82)
	2 persons	▼ 34%	▲ 45%	▼ 11%	▼ 9%	8%	4%	9%	(n=247)
	3 persons	▲ 56%	27%	15%	10%	▼ 1%	4%	14%	(n=111)
	4 persons	40%	▼ 25%	▲ 26%	▲ 25%	4%	▲ 10%	14%	(n=204)
	5+ persons	51%	32%	16%	14%	6%	▼ 1%	10%	(n=97)
Children in household	No children	▼ 36%	▲ 41%	▼ 10%	▼ 9%	▲ 10%	4%	8%	(n=362)
	1 child	▲ 54%	24%	17%	15%	▼ 2%	3%	17%	(n=98)
	2 children	45%	▼ 26%	▲ 26%	▲ 22%	4%	7%	13%	(n=253)
Housing	Detached house	39%	▲ 36%	15%	15%	5%	4%	12%	(n=463)
	Terraced house	45%	29%	18%	17%	5%	6%	11%	(n=132)
	Apartment	52%	▼ 20%	10%	▼ 5%	▲ 15%	6%	8%	(n=101)
Municipality	Nordre Follo	▼ 35%	▲ 39%	18%	16%	6%	4%	▲ 15%	(n=390)
	Frogn	51%	26%	19%	15%	10%	10%	6%	(n=88)
	Nesodden	48%	28%	9%	8%	5%	6%	7%	(n=118)
	Ås	48%	28%	15%	13%	10%	5%	6%	(n=149)
Total		41%	33%	16%	14%	7%	5%	11%	(n=745)

Appendix E

Question: What does it take for you to start using Miljøbilen?

Multiple answers possible.

Broken down into demographic variables.

		↑ Significantly higher					
		↓ Significantly lower					
		More information about the service	Miljøbilen must collect more waste types	Other locations	Other times	Other	Valid N
Gender	Men	▼ 63%	▲ 36%	15%	16%	9%	(n=375)
	Women	▲ 73%	▼ 26%	15%	12%	8%	(n=370)
Age	Under 35 years	▲ 79%	22%	18%	14%	▼ 2%	(n=114)
	35-44 years	▲ 76%	36%	17%	▲ 22%	7%	(n=212)
	45-55 years	70%	28%	12%	17%	10%	(n=145)
	55-64 years	63%	32%	11%	9%	11%	(n=123)
	65+ years	▼ 49%	34%	15%	▼ 5%	12%	(n=151)
Education	Primary/high school	69%	32%	14%	9%	5%	(n=140)
	Vocational school	64%	27%	▼ 7%	11%	7%	(n=107)
	University 1-4 years	67%	33%	17%	19%	8%	(n=253)
	University 5+ years	71%	31%	19%	16%	12%	(n=215)
Employment status	Employed	▲ 73%	30%	15%	▲ 16%	8%	(n=524)
	Retired	▼ 50%	35%	13%	▼ 6%	11%	(n=141)
	Other	67%	31%	19%	16%	11%	(n=75)
Household size	1 person	61%	35%	12%	9%	6%	(n=82)
	2 persons	63%	30%	13%	▼ 9%	10%	(n=247)
	3 persons	75%	32%	14%	12%	8%	(n=111)
	4 persons	69%	30%	21%	20%	8%	(n=204)
	5+ persons	78%	32%	12%	23%	9%	(n=97)
Children in household	No children	64%	30%	13%	▼ 8%	9%	(n=362)
	1 child	67%	28%	15%	14%	8%	(n=98)
	2 children	▲ 75%	34%	19%	▲ 24%	8%	(n=253)
Housing	Detached house	66%	31%	15%	14%	10%	(n=463)
	Terraced house	70%	30%	17%	14%	6%	(n=132)
	Apartment	78%	28%	12%	11%	4%	(n=101)
Municipality	Nordre Follo	64%	31%	15%	15%	9%	(n=390)
	Frogn	76%	28%	15%	16%	5%	(n=88)
	Nesodden	70%	24%	8%	▼ 4%	11%	(n=118)
	Ås	71%	40%	21%	18%	7%	(n=149)
Total		68%	31%	15%	14%	8%	(n=745)

Appendix F

Question: How do you dispose of waste that should not be disposed of in containers at home?

Multiple answers possible.

Broken down into demographic variables.

		↑ Significantly higher							
		↓ Significantly lower							
			Deliver to Miljøpunkt	Drive to the recycling centre	Deliver hazardous waste to the store	Dispose of in residual waste	Other	I do not have these waste types	Valid N
Gender	Men	▼ 68%	70%	64%	7%	5%	0%	(n=375)	
	Women	▲ 78%	72%	69%	8%	3%	0%	(n=370)	
Age	Under 35 years	71%	▼ 47%	65%	10%	▲ 10%	0%	(n=114)	
	35-44 years	77%	71%	▲ 74%	7%	4%	0%	(n=212)	
	45-55 years	▲ 82%	▲ 82%	67%	9%	3%	0%	(n=145)	
	55-64 years	69%	80%	57%	9%	2%	0%	(n=123)	
	65+ years	▼ 64%	71%	64%	5%	2%	0%	(n=151)	
Education	Primary/high school	66%	▼ 61%	64%	4%	▲ 10%	0%	(n=140)	
	Vocational school	▼ 62%	62%	67%	6%	2%	0%	(n=107)	
	University 1-4 years	75%	74%	69%	7%	3%	0%	(n=253)	
	University 5+ years	▲ 81%	▲ 80%	65%	12%	3%	0%	(n=215)	
Employment status	Employed	▲ 77%	72%	68%	8%	4%	0%	(n=524)	
	Retired	▼ 63%	70%	63%	5%	3%	0%	(n=141)	
	Other	67%	64%	61%	8%	9%	0%	(n=75)	
Household size	1 person	74%	▼ 40%	65%	9%	2%	0%	(n=82)	
	2 persons	69%	70%	62%	5%	▲ 8%	0%	(n=247)	
	3 persons	81%	77%	68%	6%	2%	0%	(n=111)	
	4 persons	75%	73%	71%	11%	3%	0%	(n=204)	
	5+ persons	71%	▲ 90%	67%	8%	▼ 0%	0%	(n=97)	
Children in household	No children	71%	▼ 66%	62%	7%	5%	0%	(n=362)	
	1 child	80%	78%	64%	4%	3%	0%	(n=98)	
	2 children	75%	77%	▲ 74%	9%	2%	0%	(n=253)	
Housing	Detached house	74%	▲ 77%	63%	7%	▼ 3%	0%	(n=463)	
	Terraced house	70%	77%	70%	8%	2%	0%	(n=132)	
	Apartment	72%	▼ 41%	71%	9%	▲ 15%	0%	(n=101)	
Municipality	Nordre Follo	76%	▲ 76%	69%	6%	3%	0%	(n=390)	
	Frogn	66%	60%	55%	13%	8%	0%	(n=88)	
	Nesodden	73%	65%	59%	8%	2%	0%	(n=118)	
	Ås	71%	69%	73%	8%	6%	0%	(n=149)	
Total		73%	71%	66%	8%	4%	0%	(n=745)	

Appendix H

Question: What types of waste do you deliver to Miljøbilen?

Multiple answers possible.

Broken down into demographic variables.

		↑ Significantly higher		↓ Significantly lower					
		Hazardous waste	E-waste	Glass and metal packaging	Cardboard/paper	Textiles	Other larger items	Valid N	
Gender	Men	85%	56%	23%	19%	13%	22%	(n=86)	
	Women	74%	60%	26%	18%	18%	27%	(n=103)	
Age	Under 35 years	73%	47%	27%	▲ 100%	▲ 47%	27%	(n=15)	
	35-44 years	80%	43%	22%	22%	12%	29%	(n=49)	
	45-55 years	71%	71%	26%	12%	18%	29%	(n=34)	
	55-64 years	86%	67%	25%	11%	6%	19%	(n=36)	
	65+ years	79%	59%	25%	▼ 4%	14%	23%	(n=56)	
Education	Primary/high school	74%	53%	24%	15%	12%	29%	(n=34)	
	Vocational school	71%	42%	25%	▲ 42%	17%	13%	(n=24)	
	University 1-4 years	85%	67%	29%	17%	15%	29%	(n=72)	
	University 5+ years	85%	68%	23%	11%	19%	26%	(n=47)	
Employment status	Employed	80%	60%	24%	▲ 24%	17%	28%	(n=121)	
	Retired	78%	63%	25%	▼ 4%	14%	24%	(n=51)	
	Other	71%	▼ 29%	29%	29%	▼ 0%	14%	(n=14)	
Household size	1 person	69%	54%	23%	8%	8%	31%	(n=26)	
	2 persons	84%	64%	25%	▼ 5%	8%	23%	(n=61)	
	3 persons	90%	69%	31%	27%	▲ 33%	27%	(n=48)	
	4 persons	▲ 93%	59%	28%	21%	14%	24%	(n=29)	
	5+ persons	▼ 33%	▼ 33%	11%	39%	11%	28%	(n=18)	
Children in household	No children	74%	59%	27%	▼ 7%	11%	22%	(n=98)	
	1 child	▲ 92%	72%	26%	▲ 33%	28%	33%	(n=39)	
	2 children	79%	50%	24%	29%	16%	24%	(n=38)	
Housing	Detached house	77%	58%	25%	22%	21%	28%	(n=101)	
	Terraced house	85%	74%	▼ 8%	▼ 3%	▼ 5%	28%	(n=39)	
	Apartment	70%	45%	36%	27%	15%	18%	(n=33)	
Municipality	Nordre Follo	79%	58%	26%	21%	16%	25%	(n=92)	
	Frogn	90%	65%	20%	▼ 5%	15%	25%	(n=40)	
	Nesodden	73%	59%	29%	20%	20%	24%	(n=41)	
	Ås	63%	50%	13%	38%	13%	31%	(n=16)	
Total		79%	58%	25%	19%	16%	25%	(n=189)	

Appendix I

Question: How satisfied are you with the information you receive about Miljøbilen and its route?

Broken down into demographic variables.

		↑ Significantly higher		↓ Significantly lower				
		Very satisfied	Satisfied	Neither	Dissatisfied	Very dissatisfied	Do not know	Valid N
Gender	Men	26%	47%	21%	2%	1%	2%	(n=85)
	Women	38%	43%	11%	4%	3%	1%	(n=98)
Age	Under 35 years	50%	50%	▼0%	▼0%	0%	▼0%	(n=14)
	35-44 years	31%	38%	27%	4%	0%	▼0%	(n=45)
	45-55 years	19%	50%	19%	6%	6%	▼0%	(n=32)
	55-64 years	41%	38%	15%	3%	0%	3%	(n=34)
	65+ years	31%	53%	11%	▼0%	2%	4%	(n=55)
Education	Primary/high school	47%	41%	9%	3%	0%	0%	(n=32)
	Vocational school	21%	54%	13%	▼0%	4%	8%	(n=24)
	University 1-4 years	31%	48%	14%	7%	0%	0%	(n=71)
	University 5+ years	26%	43%	26%	2%	2%	2%	(n=47)
Employment status	Employed	30%	43%	19%	▲5%	1%	1%	(n=115)
	Retired	31%	54%	10%	▼0%	2%	4%	(n=52)
	Other	58%	▼17%	25%	▼0%	0%	▼0%	(n=12)
Household size	1 person	38%	50%	12%	▼0%	0%	▼0%	(n=26)
	2 persons	30%	49%	10%	3%	2%	▲7%	(n=61)
	3 persons	36%	31%	27%	4%	2%	▼0%	(n=45)
	4 persons	17%	52%	24%	3%	3%	▼0%	(n=29)
	5+ persons	47%	47%	7%	▼0%	0%	▼0%	(n=15)
Children in household	No children	34%	48%	11%	2%	1%	3%	(n=93)
	1 child	23%	48%	28%	▼0%	3%	0%	(n=40)
	2 children	26%	41%	21%	12%	0%	0%	(n=34)
Housing	Detached house	25%	48%	19%	3%	2%	3%	(n=97)
	Terraced house	34%	45%	21%	▼0%	0%	▼0%	(n=38)
	Apartment	48%	35%	10%	6%	0%	0%	(n=31)
Municipality	Nordre Follo	36%	48%	14%	1%	0%	1%	(n=86)
	Frogn	30%	38%	25%	5%	0%	3%	(n=40)
	Nesodden	26%	45%	14%	5%	7%	2%	(n=42)
	Ås	31%	44%	13%	▼0%	6%	6%	(n=16)
Total		32%	45%	16%	3%	2%	2%	(n=183)



Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitenskapelige universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway