MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Waste Pickers and The Informal Recycling Economy in The Global South"

The Impact of Informal Recycling Systems on Waste Pickers' Livelihoods and the Opportunities of Circular Economy Solutions

verfasst von / submitted by

Matteo Lorenzo Jäckels, B.A.

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Arts (MA)

Wien, 2024 / Vienna 2024

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	UA 066 589
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Internationale Entwicklung
Betreut von / Supervisor:	Mag. Felix Malte Dorn, PhD

Abstract

This study delves into the dynamics of waste picker livelihoods in San Rafael del Sur, Nicaragua. The aim is to obtain a better understanding of their role within the informal recycling sector and the potential of circular economy solutions, in societies where a functioning solid waste management system is absent. What dimensions of poverty are waste pickers exposed to? In what extent are they interlinked? What role does the concept of circular economy, embodying the Global North notion of green capitalism, play in the context of informal recycling economies and waste pickers' livelihoods?

A multi-method approach was employed, conducting qualitative interviews with seven waste pickers and accompanying some of them during their daily working routine, making use of observation protocols and photography. The discussion on circular economy solutions within informal recycling economies is carried by two expert interviews.

The study highlights the multifaceted dimensions of poverty faced by waste pickers, revealing economic insecurity and prevailing system of inequality as the potential root cause driving their engagement in this informal recycling economy. The landfill, paradoxically, serves as both a source of livelihood and a cause of significant environmental and health risks for waste pickers. It can be best described as a double-edged sword. Challenges, including safety concerns, child labor, and limited access to resources, were uncovered. The entrapment of individuals is perpetuated by deeply rooted inequalities, particularly affecting women. Circular economy principles are predominantly implemented through bottom-up strategies due to the absence of a functioning waste management system. Although these approaches are recognised as critical and innovative in addressing economic and environmental issues, they may encounter limitations in effectively addressing the profound challenges inherent in the deeply rooted system of social injustice and exploitative practices of the informal recycling economy.

The study emphasises the importance of a comprehensive approach to waste management, highlighting the need for both bottom-up approaches within circular economy solutions and the involvement of central government. Although waste pickers may benefit from innovative bottom-up strategies, achieving long-term solutions requires governance to establish functional and sustainable systems that prioritise public health, as well as structural measures to reduce the dependence of waste pickers on informal waste picking for their survival.

Abstract (Deutsch)

Die Studie beschäftigt sich mit der Dynamik der Existenzsicherung von Müllsammlern*innen in San Rafael del Sur, Nicaragua. Das Ziel dieser Arbeit besteht darin, die Rolle der Müllsammler*innen im informellen Recyclingsektor zu untersuchen und das Potenzial von Kreislaufwirtschaftslösungen in Gesellschaften ohne funktionierendes Abfallwirtschaftssystem aufzuzeigen.

Es wurde ein multimethodischer Ansatz gewählt, bei dem qualitative Interviews mit sieben Müllsammler*innen durchgeführt wurden und zwei von ihnen bei ihrer täglichen Arbeit mit Beobachtungsprotokollen und Fotografien begleitet wurden. Die Diskussion über Ansätze der Kreislaufwirtschaft innerhalb der informellen Recyclingwirtschaft wird durch zwei Experteninterviews unterstützt.

Die Studie deckt die miteinander verknüpften Dimensionen der Armut der Müllsammler*innen auf, die durch wirtschaftliche Unsicherheit und systemische Ungleichheit bedingt sind. Die Mülldeponie, paradoxerweise eine Quelle des Lebensunterhalts, birgt erhebliche Umwelt- und Gesundheitsrisiken, was für die Müllsammler*innen ein zweischneidiges Schwert darstellt. Zu den Herausforderungen gehören Sicherheitsbedenken, Kinderarbeit und begrenzter Zugang zu Ressourcen. In Ermangelung eines funktionierenden Abfallwirtschaftssystems werden die Prinzipien der Kreislaufwirtschaft vor allem durch Bottom-up-Strategien umgesetzt. Diese Ansätze werden zwar als entscheidend und innovativ für die Bewältigung wirtschaftlicher und ökologischer Probleme anerkannt, sind aber möglicherweise nur begrenzt in der Lage, die tiefgreifenden Herausforderungen des tief verwurzelten Systems der sozialen Ungerechtigkeit und der ausbeuterischen Praktiken der informellen Recyclingwirtschaft wirksam anzugehen.

Die Studie unterstreicht die Bedeutung eines ganzheitlichen Ansatzes in der Abfallwirtschaft und betont die Notwendigkeit von Bottom-up-Ansätzen im Rahmen von Kreislaufwirtschaftskonzepten sowie die Einbeziehung der Zentralregierung. Während Müllsammler*innen von innovativen Bottom-up-Strategien profitieren, erfordert das Erreichen langfristiger Lösungen eine Governance, die funktionale und nachhaltige Kreislaufwirtschaftssysteme einrichtet. Diese Systeme sollten die öffentliche Gesundheit priorisieren, und Maßnahmen beinhalten, um die Abhängigkeit der Müllsammler*innen vom informellen Recyclingsystem als Hauptquelle ihres Lebensunterhalts zu verringern.

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List of Abbreviations

Cases

AQI: Air Quality Index

FSLN : Frente Sandinista de Liberación Nacional.....

HDI : Human Development Index .....

IRS: Informal Recycling Sector

MPI : Multidimensional Poverty Index.....

PES: Payment for Environmental Services

SWM : Solid Waste Management.....

UNDP : United Nation Development Programme.....

UNEP: United Nations Environment Programme

WP : Waste Picker.....

Acknowledgment

In finalising this academic work, I am thankful for those who directly and indirectly contributed to this master thesis and my academic journey. Their input was crucial in shaping the direction of my research. My sincere thanks to Mr Felix Dorn, for his guidance and willingness to take on the role of my supervisor, along with his interest for the subject matter.

Furthermore, the warm embrace extended by the community of “La Chureca” in San Rafael del Sur, Nicaragua has been a cornerstone of this research. I want to express my gratitude to the seven waste pickers and their families for their participation in this study. Their cooperation has been instrumental in obtaining academic knowledge. I am acutely aware that such collaboration is not to be taken for granted. I extend my thanks to Katherin Tatyana Moraga Carcache, whose pivotal role in facilitating initial contact to the community which laid the foundation for this study in its present form. I also want to thank Gissiel Azucena Moraga Carcache who hosted me during my entire stay in Nicaragua in January 2023.

I reserve special appreciation for the two experts, Ms. Simonetta Tunesi and Mr. Pietro Luppi who graciously dedicated their time and expertise, significantly enhancing the discourse surrounding circular economy and solid waste management within informal recycling economies in the Global South.

I extend my thanks to Mr. Mario Sunseri for his counsel, support, and for facilitating contact with the esteemed experts who generously contributed their insights.

It's important to recognize the obstacles faced in this pursuit. The journey had difficulties and setbacks, starting with collecting data in January 2023 and concluding with expert interviews in April. The combination of several research methods has posed challenges in the field. And although not everything went according to plan, the educational experience proved to be highly beneficial.

To all those mentioned here, I express my sincere gratitude for their combined efforts in making this master thesis a reality.

Foreword

This study describes the harsh realities of waste pickers, involving child labor and ethical constraints. Due to the qualitative nature of this study, with oral interviews and observations, and my time in the field with the families of the waste pickers, the whole process had a very personal touch. It was not uncommon to be confronted with difficult images. The conditions that this community and especially the children are exposed to reflect the failure of state authorities to allow people to live and survive alongside an unregulated landfill without any waste segregation. It is the failure of a system that does not priorities the health of its own people when it comes to solid waste management (SWM). And it's the failure of an economic system that forces people to make their living out of picking up waste from a hazardous landfill because they have no other option.

Although this study portrays poverty and misery, I want to tell an episode the moment I left the community of waste pickers in San Rafael del Sur. On my last visit to the neighborhood, I met a waste picker's daughter who had just come back from school. We greeted each other warmly and walked towards the landfill together. I asked her if working there bothered her. She shook her head, revealing her contentment in assisting her mother and little sister. As the conversation turned to her future ambitions, her eyes shone with conviction: she wants to become a doctor in order to cure sick individuals." I nodded in admiration saying indeed that this is the best reason to become a doctor. It was heartening to see how she perceived the situation; she finds herself in, differently of what will be described in the coming pages. This encounter highlighted that waste pickers, at least their children, have distinct narratives, proving that there is no single story. Above all, it showed that there is always space for hopes and ambitions for a brighter future.

1 Introduction

1.1 Background and Context

The World Bank estimates that 2.24 billion tons of waste is generated worldwide every year (Kaza et al., 2018). Ten years ago, the value was estimated at 1.3 billion tons. The World Bank warns: "With rapid population growth and urbanization, annual waste generation is expected to increase by 73% from 2020 levels to 3.88 billion tones in 2050"[1] (World Bank, 2022).

The impact of increased waste generation differs between countries of the Global South and Global North. Specifically, those living in urban poverty in the Global South bear a disproportionate burden due to poorly managed waste. In low-income countries, it is common to dispose of over 90% of waste in unregulated dumps or through open burning (ibid.). Open burning releases toxic pollutants into the air, which can cause respiratory ailments and pose a direct health hazard. Unregulated dumps without regulatory oversight can lead to the uncontrolled release of hazardous substances, potentially contaminating soil and water sources. These practices have far-reaching consequences for the well-being of individuals, communities, and the ecological integrity of the environment (Cassemiro et al., 2021; Kaza et al., 2018). Poorly managed waste serves as a breeding ground for vector born disease, public health impacts such as respiratory ailments and diarrheal, as also contributes to global climate change through methane generation (Bogner et al., 2007). Recycling is an essential component of waste management, as it reduces the demand for virgin materials, conserves natural resources, and contributes to the circular economy. However, recycling in the Global South faces several challenges, including low recycling rates, inadequate infrastructure, and limited markets for recycled materials (Kaza et al., 2018).

Poor road networks, inadequate financial resources and low levels of political will mean that many countries of the Global South struggle with solid waste management (SWM) and proper recycling systems (S. M. Dias & Samson, 2016; Morais et al., 2022). As a result, the informal recycling economy has become an important part of waste management systems in many countries in the Global South. In these cases, individuals often step in to keep the municipal waste disposal and recycling system alive. As silent protagonists, they find themselves at the

[1] Statement From: https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management

lowest level of the informal recycling economy: the so-called waste pickers (Barford & Ahmad, 2021; Morais et al., 2022).

Figure 1. Informal Recycling System Value Chain
Source: (Barford & Ahmad, 2021)

From a global perspective, waste pickers collect, transport, and process waste as a means of livelihood. In the absence of a formal waste management system, it's these individuals who play a key role in substantially mitigating the carbon footprint within communities, effecting resource recovery, enhancing environmental quality and residents' health, and fostering employment and income generation within the economically disadvantaged segments of urban society (Morais et al., 2022; Viljoen et al., 2016, 2018; Wittmer, 2021). Today, informal recycling economies are an important part of waste management systems in the Global South, providing a source of income for many low-income households while contributing to the reduction of waste and environmental pollution (Kaza et al., 2018; Morais et al., 2022).

Despite the social, economic and environmental benefits that informal waste pickers provide, they often face low social status, poor living and working conditions, and little support from local governments. They work outside formal waste management systems and often operate without any legal recognition or protection. As a result, they are stigmatised and marginalised

and face significant social and economic barriers. Due to the nature of the informal recycling economy, they are often forced to live below the poverty line. (S. M. Dias & Samson, 2016; Kain et al., 2022; Michael et al., 2019; Morais et al., 2022).

In other words, waste pickers find themselves surrounded by multiple challenges: economic insecurity, health issues, social exclusion. At the same time, the global need for sustainable waste management and circular economy systems puts them in a new spotlight (Barford & Ahmad, 2021). This has led to an increased focus on circular economy solutions, which aim to reduce waste, promote recycling, and optimize resource use. As a critical part of the waste management system in many countries of the Global South, waste pickers have been recognized as key contributors to the circular economy. In some cases, they were also referred to as key entrepreneurs contributing to the circular economy by recovering and reusing valuable materials (Velis et al., 2022).

1.2 Content and Aim

Giving more weight to bottom-up circular economy solutions can not only have a positive impact on the living conditions of waste pickers, but can also lead to better municipal waste management and symbolise important steps towards a functioning waste management system. (Navarrete-Hernandez, P. & Navarrete-Hernandez, N., 2018). The question, however, is whether these approaches can respond to the deep deprivations faced by waste pickers. Or are they more part of fashionable 'green capitalism' narratives that romanticise making a living from waste, while ignoring the structural issues of the informal recycling economy and general consumerism?

This case study from the district of “La Chureca” in San Rafael del Sur, Nicaragua, seeks to answer this question. A qualitative research endeavour was carried out by interviewing and accompanying people living in the area who make their living by collecting recyclable materials. The fieldwork lasted for a period of five days. Two days were spent visiting the neighbourhood, during which I engaged in informal discussions to establish trust and plan the data collection process. The data was collected on the following three occasions. Based on the data collected, the study delves into the lives of these people. It aims to identify whether and how the phenomena of informal waste management and recycling systems affects their livelihoods. From their point of view, what does it mean to live from waste picking and how does it contribute to a circular economy? Guided by the insights taken from this livelihood analysis, the study delves into the viability of bottom-up circular economy approaches by

making use of expert interviews. What are the possibilities and where do they end? It aims to explore the multiple dimensions of poverty experienced by waste pickers in Nicaragua and the potential of bottom-up circular economy solutions.

Thus, the central research questions are:

- How does the informal recycling system in Nicaragua affect the life of waste pickers and their families?
- What precarious conditions do individuals/ families, who make their living from the informal recycling sector, face?
- What dimensions of poverty are waste pickers exposed to? In what extent are they interlinked? To what extent can one speak of a poverty trap?
- What role does the concept of the circular economy play in the debate on waste picking and the informal recycling economy? How might identified circular economy solutions effectively tackle the specific dimensions of poverty faced by waste pickers, leading to tangible enhancements of their socio-economic status? What can they influence, and more importantly, what can they not influence?

1.3 Structure

The study's conceptual framework is founded on the approach of multiple dimensions of poverty and the concept of a circular economy. This thesis is composed of three primary components:

Firstly, a collection and analysis of the most recent publications and papers on the field of the informal recycling economy in the Global South, waste pickers livelihood and coping strategies, as also the potential of circular economy solution in the context of informal recycling economies has been developed. This detailed analysis focused on current research published in reputable journals like "Resources, Conservation & Recycling." The investigation examined a range of case studies from various regions, including India, South Africa, and Latin American nations such as Chile. Macroeconomic data was taken from the World Bank's 2018 "What a Waste 2.0" report.

Secondly, I conducted fieldwork comprising interviews with seven waste pickers and an in-depth observation of two families of waste pickers throughout the day. The field stay consisted of a total of five days wherein, three days were entirely for data collection. Data was obtained during my stay in Nicaragua in January 2023. A qualitative approach was adopted, comprising

of narrative interviews, participant observation, and walking interviews, in order to obtain qualitative data and provide insight on waste pickers' livelihoods and their experiences of poverty and marginalization within the informal recycling economy in San Rafael del Sur, Nicaragua. This leads to a thorough assessment of the livelihoods of waste pickers in this particular context, outlining the multiple facets of poverty they encounter. The perception of poverty in this scenario, considered as a constraint on individual freedoms, is considerably shaped by the capability approach advocated by Amartya Sen and Martha Nussbaum.

Finally, analysis of livelihood is used to identify the existing strategies for introducing circular economy elements into informal recycling systems. The focus is on understanding the potential impact on the livelihoods of waste pickers. This segment of the study incorporates expert interviews to delve into both the scientific and social aspects. The two interviewed experts, Ms. Simonetta Tunesi and Mr Pietro Luppi, were chosen based on their knowledge and experiences of SWM projects in the Global South. The ultimate outcome is a nuanced presentation of circular economy narratives intertwined with the lived experiences of waste pickers in San Rafael del Sur, Nicaragua.

The final section will draw a conclusion on the most important outcomes and provide suggestions and guidance for future research in this area. The research methodology section will present an evaluation of the study's boundaries, weaknesses, and ethical concerns.

1.4 Significance for the field of Development Studies

The study addresses the increasing problem of rising waste production, highlighting the pervasive inequalities between the Global South and North in the discussion on circular economy for development. In a time, characterized by global issues like climate change and plastic pollution, the necessity for sustainable waste disposal has risen and is expected to remain a crucial focus in the forthcoming years and decades to come. However, the impact of this increase in waste generation varies across the globe. It is a particular challenge for the Global South due to its rapid urbanization and industrialization, disproportionately harming vulnerable urban communities. In this context, the notion of a circular economy has become a recurring topic. Therefore, current development cooperation endeavors of the Global North are investing in waste management solutions within these regions.

The notion of "green growth" or "green capitalism" largely originates from the Global North, giving a value to waste. However, countries of the Global South like India and Ghana have long

been the recipients of waste from Western Europe, the USA, and other industrialized economies (Fevrier, 2022).

Secondly, this study explores the complexity of the issue by looking specifically at waste pickers. The individuals least heard within the informal recycling sector. It is often the case that the beneficiaries of development projects are excluded from wider policy and implementation processes. Therefore, it is essential to conduct a thorough analysis of the livelihoods of this group. In the context of the informal recycling economy, narratives of circular economy often hold the promise to improve the socio-economic conditions of waste pickers (Buch et al., 2021; Gall et al., 2020; Velis et al., 2022). Any interventions, whether through circular economy frameworks or efforts to integrate waste pickers into municipal waste management, should therefore be executed with a comprehensive understanding of their interests and needs.

This research aims to trigger a more comprehensive and effective strategy to address this issue by carefully examining both the macro and especially the micro levels of waste management and informal recycling sector (IRS) in the Global South. It focuses on the concept of the circular economy and how these principles can be applied to improve waste management systems, particularly in regions lacking a functioning waste management infrastructure. The research highlights the crucial need for local waste management development, which is influenced by various social, environmental, and public health factors within the informal recycling economy. By understanding these complexities, useful ideas can be generated for crafting policies and plans to intervene in waste management practices in Nicaragua and other regions of the Global South. The recycling economy that operates outside of formal structures is marked by power imbalances and harmful effects on both people and the environment. Integrating circular economy principles, which adopt a bottom-up approach in the models presented, can certainly enhance aspects within an informal structure. However, it is crucial to comprehend the realities of waste pickers' lives to design such models effectively. In reshaping the circular economy discourse, the research seeks to broaden its scope to include bottom-up strategies that authentically respect and address the lived realities of waste pickers within the IRS.

2 Conceptual Framework

2.1 Amartya Sens' and Martha Nussbaums' Capability Approach

Poverty is multidimensional and complex (UNDP, 2023). This statement can be found in the narrative of most policy makers and scholars in the Global South, as also in the Global North.

The idea that poverty is a multidimensional phenomenon was mainly influenced by the development economist and Nobel prize winner Amartya Sen with his creation of the so-called capability approach.

According to Sen's conceptual framework, development should not be narrowly defined as achieving modernisation, industrialisation and economic expansion. Instead, it should be seen as the expansion of individual capabilities and functional capacities. In what contexts are people prevented from doing what they want to do? This can include private, social and professional life. The experience of deprivation in different aspects of life highlights the multidimensional nature of poverty, which challenges a simplistic characterisation based solely on material considerations (Alkire, 2005; Sen, 2001).

Initially independently and later in close collaboration with philosopher Martha Nussbaum, the capabilities approach was developed and continuously advanced in the past years. Most prominently, the capability approach has been central to the development of the notion of human development and the multi-dimensional measures used to evaluate countries' development levels in the annual Report on the Human Development Index (HDI) or the Global Multidimensional Poverty Index (MPI) developed by the UNDP.

As Nussbaum herself states it the capabilities approach is not just a theory about a particular domain of social justice, but a framework for considering human well-being in all its dimensions (Nussbaum, 2013). Rather than a theory on how to achieve development and livelihood improvement of marginalized communities, the capability approach embodies more a lens through which to examine the ways in which social, economic, environmental and political structures can constrain people's capabilities (Alkire, 2005).

2.2 The Multiple Dimensions of Poverty

As already mentioned, there is now a broad consensus among scholars and policy makers in international development that poverty is a multidimensional phenomenon. Amartya Sens' and Martha Nussbaum's idea of the capability underlined the need to understand poverty not only in terms of income and material deprivation, but also in terms of individual deprivations that can prevent people from leading a life they have reason to value (Sen, 2001). Individuals' deprivations can be shaped and influenced by many different dimensions.

While quantitively approaches, like the mentioned HDI and MPI, can illustrate a multidimensional picture of poverty based on numeric data, they do not caption important

dimensions of poverty such as social exclusion, discrimination and vulnerability. Quantitative approaches cannot adequately capture the felt discrimination and structural violence individuals are exposed to. In other words, subjective experience of poverty, like social exclusion, that individuals suffer of cannot be translated into numeric data.

With respect to the conceptual framework of Sen and Nussbaum the following five dimensions of poverty have been selected for the waste pickers livelihood analysis:

- Employment and income/ Economic Insecurity
- Social networks/ Social Exclusion
- Environmental risk and Health:
- Political participation/ Representation in decision making-processes
- Gender aspect/ Gender Inequality

2.2.1 Employment and Income

Even if Sens' criticizes a monetary understanding of poverty, he still sees income and employment as important as they are key resources to provide the access to goods and opportunities that people need in order to achieve other capabilities, such as good quality education, a healthy nutrition, access to health care services and participation in social and political life.

> *"This is not because income and wealth are desirable for their own sake, but because, typically, they are admirable general-purpose means for having more freedom to lead the kind of lives we have reason to value"* (Sen, 2001, p. 14)

For Sen, income and wealth have value as versatile resources that enhance our freedom to pursue lives that align with our goals and aspirations, rather than having value intrinsically. In essence, Sen postulates that economic resources play a vital role in empowering individuals to lead lives they have reason to value. In this sense, the dimension of employment and income should not be seen as an end in itself but rather as a means to achieve other capabilities like health and education (Alkire, 2005; Sen, 2001). Additionally, merely possessing a job and receiving an income does not guarantee individuals' ability to completely engage in society and attain contentment. The working conditions of someone who works extended hours in hazardous and exploitative environments, for instance, may impede their capacity to enjoy good health or partake in social affairs despite their income. In a capitalist society, income cannot be

considered singular, rather, it serves as a crucial component of achieving a fulfilling life and is interconnected with all dimensions of poverty.

2.2.2 Social Exclusion

Social exclusion has emerged as a significant area of focus within the field of social science. Other than economic vision of social phenomenon, it provides a lens through which to understand the livelihoods of certain communities and identify patterns of injustice and inequality. Hence, it can embody many forms, such as limited access to essential services, stigmatization, marginalization and reduced political agency. Social exclusion can ultimately lead to the deprivation of fundamental rights, resources and opportunities (Sen, 2001). As social networks and interactions are crucial for personal and professional development, having a respected position in society can provide numerous opportunities. Conversely, limited social networks can result in closed doors.

Given my research question, this exclusion could embody a dimension of poverty for waste pickers, as they frequently find themselves living on the internal peripheries of society (Morais et al., 2022). Therefore, examining social exclusion in the lives of waste pickers not only complements the analysis of economic insecurity, but also provides a comprehensive understanding of the multiple challenges they face.

2.2.3 Environment and Health

Poverty manifests itself beyond monetary income and social interactions but also from one's physical environment, which can range from natural hazards like floods and earthquakes to long-term threats such as pollution, deforestation or lack of access to clean water (Liu, 2012). In this sense, environmental risks limit individuals' access to clean and safe living conditions, affecting their capability to pursue a life in dignity. The environmental factors directly influence the individuals health. Health can be seen as a central capability, as it enables individuals to function effectively in society and to pursue the other capabilities that are necessary to lead lives, they want to persuade (López Barreda et al., 2019).

Compared to the economic and social dimensions of poverty, environmental risks may appear somewhat abstract. So let me use an example from my personal experience to illustrate this dimension:

The capital of India, Delhi, well known for it's bad air pollution levels. It has often been ranked as one of the most polluted cities according to the internationally renowned Air Quality Index (AQI) – (*World Air Quality Index (AQI) Ranking | IQAir*, 2023). While the situation is well known in international media, it is not so well known that the negative impact of high level of pollution and bad air quality are distributed unequally. Individuals engaged in outdoor-occupation, like street vendors, construction workers, Rikshaw[2] drivers etc are more exposed to these environmental hazard. The severe environmental conditions are inescapable. Although air pollution impacts all sectors of Delhi's society, those who are financially better off can evade the detrimental air quality by working in air-conditioned offices or availing of home-office arrangements.

Consequently, their disadvantageous economic circumstances combined with the physical environment of the urban landscape of Delhi puts them in a position with increased vulnerability to respiratory diseases (Dutta & Jinsart, 2022). This is a clear illustration of the intersection of poverty and the environmental risks to which these people are exposed.

> "*Good health is central to a life of value, as it enables people to engage in activities they value, to pursue their goals and aspirations, and to participate fully in society*" - (Sen, 2001, p. 38)

2.2.4 Political Participation

Political neglect as a dimension of poverty involves the systematic/ intentioned marginalisation and exclusion of certain communities or individuals from meaningful participation in political processes. This exclusion often takes the form of limited access to decision-making mechanisms, lack of representation and reduced influence over policies that directly affect their lives (Sen, 2001).

This means that those affected by political neglect find themselves without a voice in critical matters that affect their well-being and prospects for the future. Sen notes that they often experience discrimination and a sense of being left behind, as their interests and concerns are often overlooked or disregarded by those in positions of power (ibid.).

[2] A three-wheeled bicycle for public hire with a covered passenger seat behind the rider. Widely used in South-Asia

According to the literature people affected by political neglect as dimension of poverty can be observed in marginalised communities with limited access to basic services and infrastructure (Lawless & Fox, 2001). Communities with poor critical infrastructure are often overlooked by local authorities and government officials (ibid.). This lack of response and action reflects a form of political neglect, as the community is denied the resources and attention necessary to meet its basic needs and improve its overall well-being.

In light of the capability approach, political neglect embodies deprivation of the essential capability to participate fully in political processes and decision-making that ultimately affect the individual livelihood. This perspective emphasises that people experiencing political neglect lack the necessary freedoms and opportunities to participate in shaping the policies and governance structures that directly affect their lives.

2.2.5 Gender Aspect

The dimension of gender inequality was taken at a later stage of the analysis into consideration. The links between poverty and gender inequality are by no means a new issue and have already been integrated into the capacity approach by Martha Nussbaum. She further developed Sen's idea and brought into the context of gender justice and women's rights (Nussbaum, 2013).

In her year 2000 published book "Women and Human Development: The Capabilities Approach" Nussbaum argues that women rights and gender equality are essential components for any theory about development that is based on capabilities. Therefore, gender inequality can play a significant role to the lack of capabilities. In patriarchy societies women are more vulnerable to poverty than men. The vulnerability to poverty manifests itself not just because of the fewer economic opportunity's women have, but more because of the limits women experience in the access to education, healthcare and their exposure to structural discrimination and violence (Nussbaum, 2013). The prevailing societal gender inequalities prevent women from developing their full range of capabilities and consequently suffer deprivation on multiple dimensions.

In this sense, gender injustice as a dimension of poverty encompasses the systematic discrimination, unequal access to resources and limited opportunities that individuals face because of their gender. This inequality extends to various aspects of life, including economic participation, education, health care and political representation.

2.3 Circular Economy Solutions

Global economic consumption and production are not isolated, but rather depend on our Earth System's resource stocks and flows, which impose growth limits. Adopting a linear approach of "take-make-waste" will eventually lead to crossing planetary boundaries, if it has not already happened. To achieve global sustainability, experts and policymakers concur that the economic system can no longer depend on linear economic systems in global supply chains that squander resources and incentivise waste creation. Hence, circular economy solutions have become a prominent feature in many international, national, and regional strategies.

Despite the current emphasis on the circular economy, there is still no universally accepted definition of what constitutes a circular economy.

The United Nations Environment Programme (UNEP) understands circular economy as “one of the current sustainable economic models, in which products and materials are designed in such a way that they can be reused, remanufactured, recycled or recovered (4-R) and thus maintained in the economy for as long as possible, along with the resources of which they are made, and the generation of waste, especially hazardous waste, is avoided or minimized, and greenhouse gas emissions are prevented or reduced” (UNEP, 2022, p. 1).

Interestingly, the concept is not as straightforward as people might assume at first glance. It has numerous origins interwoven with various parallel ideologies, including ecological economy, general systems theory, industrial ecology, as also regenerative design. Within the waste management framework, adherence to the principles involves strategically eliminating waste and pollution through design, continuously re-utilizing products and materials, and restoring natural systems. This embodies a commitment to sustainable practices (Gall et al., 2020). Efficient use and re-use of materials is required, which would prolong their lifespan and reduce the demand for primary resources by bringing secondary materials back to the market. This would result in fewer waste items being sent to landfills or incineration facilities, promoting more sustainable practices that show respect for the world's natural resources and their capacities. A key part of the circular economy is hence to build “feedback loops”.

The understanding to this concept is mostly influenced by industrialized societies and therefore often portrays a Global North perspective. The idea of circular economy aligns with the fundamental principle that waste holds a value, thereby creating the possibility for socio-economic and environmental improvements within the existing system that is characterized by consumerism and high waste generation. Moreover, this narrative reflects the core philosophy

of green capitalism. Green capitalism is based on using market mechanisms to mitigate the harmful effects of anthropogenic climate change (Scales, 2017). Supporters of this approach claim that market dynamics provide the most effective impetus for the development of innovative solutions capable of replacing existing, environmentally damaging practices.

It's important to acknowledge that circular economy methods, in the context of waste management and recycling, have different understandings between an industrialized country with a functioning and formal SWM and a non-industrialized country where recycling lies in the hand of an informal sector. In this sense, in the contexts of countries in the Global North circular economy methods aim to improve the engineering and governance structure of resource loops. It's about innovation that give an environmental component to prevailing high consumption rates within a capitalist system. In many parts of the Global South, circular economy is more designed to accommodate the informal nature of the circular economy, while recognising the monetary value of waste materials (Anantharaman, 2021; Morais et al., 2022). However, informal recycling economies possess inherent characteristics that present significant challenges to the effective implementation of circular economy principles. These characteristics include an opaque supply chain and lack of organizational structure. This is particularly evident in the difficulty of establishing sustainability principles, such as Extended Producer Responsibility (EPR) schemes, due to the lack of a centralised actor capable of coordinating such initiatives within the informal recycling system. In addition, another issue becomes key that is not that prevailing in the Global North: the social inclusion of informal waste pickers They play a central role in informal waste management systems and therefore also adapting circular economy principles. Their significant contribution stems from a rich history of of exemplifying a sustainable and resource-efficient approach to waste recovery and reuse, driven by their socio-economic needs (Fevrier, 2022).

This study focuses on the analysis of circular economy concepts implemented in informal recycling economies. Given the grassroots nature of these initiatives, they can be categorised as bottom-up circular economy solutions. In particular, even traditional waste picking, which is characterised by the collection and sale of recyclable materials from local landfills, inherently embodies elements of the circular economy. By maintaining the recycling system, waste pickers help to extend the life of materials, thereby minimising waste and reducing the need to extract and process fresh raw materials. This practice allows materials to re-enter the production cycle, increasing their value and promoting resource conservation and environmental sustainability. As the scholars Doshi and Iyer rightly puts it: "the concept of a circular economy, an economy

in which waste and pollution do not exist by design, products and materials are kept in use, and natural systems are regenerated, also precisely defines the role of an informal waste picker" (Doshi & Iyer, 2019, p. 45). However, existing literature suggests that a more effective integration of these principles can be achieved by exploring specific bottom-up approaches (Buch et al., 2021; Carenzo, 2020; Navarrete-Hernandez, P. & Navarrete-Hernandez, M., 2018), which will be discussed throughout this study.

3 Literature Review

3.1 The Informal Recycling Economy

The issue of global waste is increasing and gained much attention in the last decade. It is estimated that the global community is on course for waste generation to dramatically outpace population growth, more than doubling by 2050 (Kaza et al., 2018). Solid waste management affects the Global North and South, but those most affected by the negative impacts of poorly managed waste tend to be the most vulnerable members of society, mainly in low- and middle-income countries that lack the infrastructure to manage it (Morais et al., 2022).

Higher Waste generation will bring many challenges to the environment and socio-economic wellbeing of these communities and environment. In this context, the informal recycling economy gained more and more interest in academic literature. All over the world it's dynamics, opportunities and challenges have been studied in various different contexts (Morais et al., 2022; Swain & Kambhampati, 2022).

The informal recycling economy refers to a system centred on the collection, sorting and processing of recyclable materials, often carried out by individuals or small groups operating outside formal regulatory frameworks (Swain & Kambhampati, 2022).

According to Swain & Kambhampati the informal recycling economy is a phenomena which emerges as a result to exclusionary policies and lack of formal employment opportunities (Swain & Kambhampati, 2022). Nonetheless, this does not imply that it's non-existing in countries of the Global North. The informing recycling economy is also active in Europe (Morais et al., 2022), but put into a perspective, at a much larger scale than in the Global South.

Many scholars highlight the importance of the informal recycling economy in environments where solid waste management systems are absent (Blaauw et al., 2019; Morais et al., 2022; Swain & Kambhampati, 2022). According to them it plays a crucial role in waste management

and contributes to the sustainability of urban environments, since it mitigates the negative external effects of unregulated landfills by reducing the generation of methane and the conservation of natural resources through recycling. Furthermore, by reintroducing recycled or secondary materials into the market, it also lowers the demand for primary materials (ibid.).

For instance, Velis explored the role of the informal recycling sector in preventing plastic pollution and creating a more inclusive circular economy (Velis et al., 2022). Using the estimate of 11.4 million waste pickers, his calculations show that up to 27.4 million tons of plastic are currently being collected by waste pickers around the world, plastic that would otherwise have ended up in the environment (ibid.). Supply chains within the informal recycling economy are therefore already an important part of the solution to plastic pollution (Kaza et al., 2018).

The informal recycling economy serves not only as an alternative of a formal waste management system but embodies a pillar within overall economies. From a macro-economic point of view, it is a sector of the economy that, depending on the context, represents a percentage of total GDP (Kaza et al., 2018; Morais et al., 2022). In low-income and resource-constrained environments, waste materials offer significant potential for livelihoods and income generation. Although difficult to quantify, many macroeconomic studies of the informal recycling economy highlight its employment opportunities, which involve a wide range of actors from both the informal and formal sectors, including individuals and private sector enterprises. This sector contributes significantly to the income of a proportion of the population in countries where opportunities for quality employment are limited. Some scholars even speak of it's potential to poverty alleviation (Hayami et al., 2006; Morais et al., 2022). In addition, the informal recycling economy is estimated to save municipalities money each year by diverting waste from landfills and reducing the need for formal waste management services (Buch et al., 2021; S. M. Dias & Samson, 2011.; Schenck & Blaauw, 2011).

In order to gain a full understanding of the informal recycling economy, it's essential to delve into its intricacies and operational mechanisms. How does it work and what activities does it encompass?

In his 2022 published report "Global review of human waste-picking and its contribution to poverty alleviation and a circular economy" Jandira Morais gathers together a total of 45 papers written from 1994 to 2022, covering case studies on the informal recycling economy and it's dynamics from 27 different countries. Based on his findings he draws a simplified picture (s. figure 2) where certain individuals or organised groups collect recyclable materials, such as

aluminium cans, steel, cooper, carton or/ and plastic from households, open dumpsites, bins and landfills. These recovered materials are sold at trading points to middleman, who subsequently transport these secondary recyclable materials to companies or directly to formal recycling industries for use as raw materials in local sectors, such as construction and infrastructures (Morais et al., 2022).

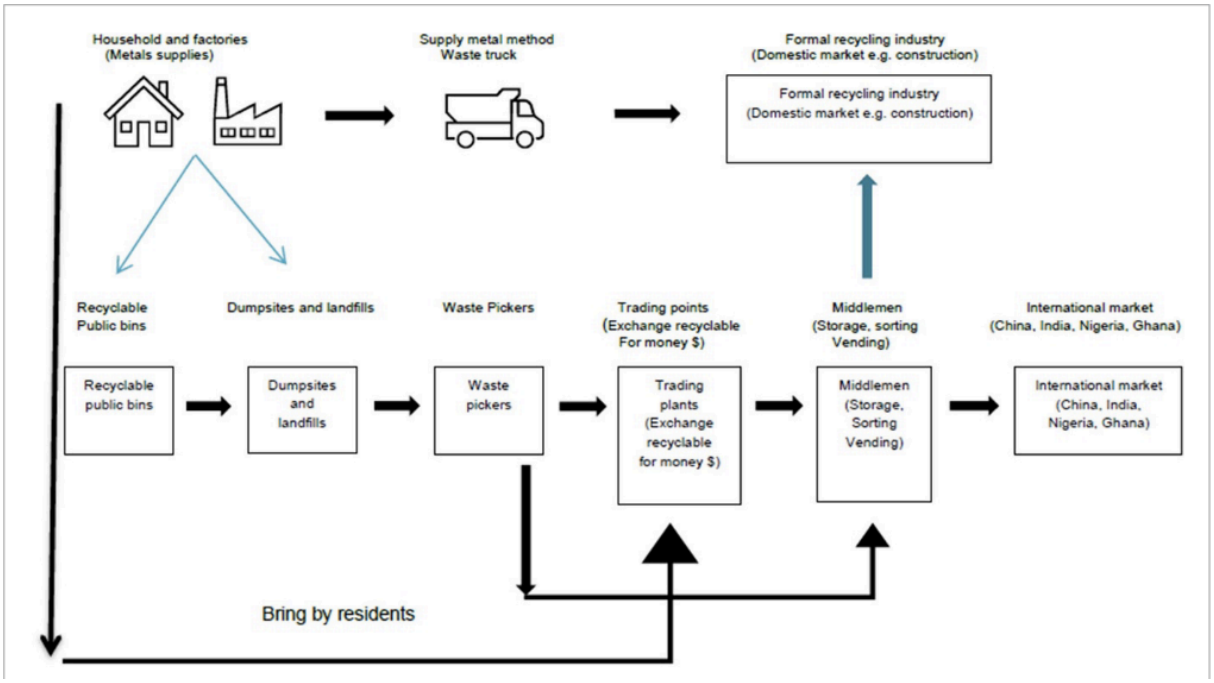

Figure 2. Diagram of value chain into informal sector through waste picking
Source: Morais et al. 2022

Jandira Morais (2022) underlines that this picture illustrates cases in Brazil, India, Nigeria and similar other structure occur worldwide (ibid.). Nonetheless, how the systems works in detail and which stakeholder are mainly involved remains highly context specific. What can be taken from all reviewed studies and scientific developed value chain models is that waste pickers find themselves at the bottom of the pyramid. They are working within a system of many other stakeholder ranging from waste collectors (middleman's), municipal authorities, intermediaries and recycling companies (Barford & Ahmad, 2021; Morais et al., 2022). In this context, in the following we will explore the micro-level perspective of this system by examining the involvement of waste pickers.

3.2 Waste Pickers Contribution within the informal Recycling Economy

Waste pickers earn a livelihood by salvaging, vending, or utilizing recyclable materials discovered in exposed landfills, roads, canals, and rivers where municipal solid waste has been disposed of (Morais et al., 2022). Waste picking varies considerably between countries, cities,

and even within the same city. Ethnographic studies have well-documented the daily activities of waste pickers, including the collection, sorting, and selling of materials.

Interestingly there are many terms that describe this position, in some cases they are referred as “scavengers”, “waste recyclers”, or/ and “garbage pickers”. The term "Waste Picker" was adopted during the first World Conference of waste pickers in Bogota, Colombia in 2008 (S. M. Dias & Samson, 2016). Kotie Viljoen argues that alone the used terminology influences perceptions and form community attitudes towards these people (Viljoen et al., 2018). In the context of this thesis, we will continue with the term waste picker as it describes best their occupation.

3.2.1 Waste Picking – Where it thrives

According to Coletto & Bisschop (2017) waste pickers are present in an informal economy sector where no solid waste management system is functioning. The two researchers identify three preconditions that lead to the circumstance that waste picking is occurring as an economic activity. Firstly, solid waste materials should have some residual monetised value. In addition, this value is highly fluctuating because of the informal nature of this economy. Secondly, waste is physically accessible to waste pickers. In other words, waste and recyclable materials are not locked in a container or a fenced landfill. Lastly, participation in these activities, which are typically seen as physically unpleasant and socially stigmatized, is often dependent on the urban population segment's poverty or social marginalization, highlighting the socioeconomic factors that influence engagement in these practices. Waste picking can be considered a harsh reality, and it is unlikely that individuals would choose to undertake such tasks voluntarily (Coletto & Bisschop, 2017).

Individuals who are active as waste collectors in the informal recycling economy are thus, confronted with poverty and social exclusion. Ultimately, their involvement in this field is a consequence of their initial circumstances living in an environment which is signed by poverty and social inequality. These individuals are compelled to work as waste pickers in order to sustain their livelihoods and generate income through the sale of recyclable materials. Interestingly, Coletto observes that social inequality and exclusion are long-standing issues that predate waste picking as an economic activity. In light of this, it is not the occupation of waste picking itself that leads to poverty and exclusion, but rather the social conditions and structural inequalities that create a space for waste pickers to exist. Those who have alternative employment opportunities with the potential for a sustainable income would not be active this

sector. In this sense, waste picking is a symptom of social conditions that perpetuate poverty and exclusion, rather than the cause (Coletto & Bisschop, 2017).

3.2.2 Waste Picking as an Employment Opportunity

Jandira Morais (2022) provides an overview of waste picking as an informal sector activity and its role in poverty alleviation. As already stated, his report includes a review of literature and case studies from various regions of the world, including Asia, Africa, Latin America, and Europe. As his counterparts before him he agrees on the fact that the informal recycling economy and waste picking is an important source of income for millions of people living in the Global South. According to his research it is estimated that worldwide there are multiple millions of people involved as waste pickers, with the majority living in countries of the Global South. The number will even grow in the light of climate change and urbanization (Morais et al., 2022). The revenue comes mainly from the collection and trading of paper and cardboard, as also plastic and metals (ibid.).

For instance, Schenck and Blauuw (2011) identify waste picking as a tangible employment opportunity and significant income source, primarily for individuals who face barriers to traditional employment, such as limited educational attainment, restricted job prospects, and discriminatory hiring practices (R. Schenck & Blaauw, 2011). Seemingly the fact that waste picking provides an income opportunity is underlined in much academic research appears in this field.

3.2.3 Waste Picking as an Environmental Service

While embodying an monetary service for waste pickers it's also acknowledged that waste pickers provide an essential environmental service to affected communities by collecting and diverting waste from landfills (Morais et al., 2022; Viljoen et al., 2016). In the South African context waste pickers play a critical role in supporting the solid waste management duties (R. Schenck & Blaauw, 2011). By diverting waste from landfills, waste pickers reduce the burden on formal waste management services and save financial resources that would otherwise be required for the disposal of waste (Swain & Kambhampati, 2022). This not only saves municipalities money on waste disposal fees, but also reduces the environmental impact of landfills and reduces the negative external effects of waste generation for the affected municipal communities (R. Schenck & Blaauw, 2011).

In conclusion waste pickers reduce the environmental pollution of these materials which would otherwise go to waste in landfills. The revenue generated from selling these materials helps waste pickers in the Global South to earn a livelihood, which in turn helps to alleviate poverty in their communities (S. Dias, 2012; Gill, 2009; Morais et al., 2022; Schenck & Blaauw, 2011).

3.3 Waste Pickers lived deprivations and challenges

3.3.1 Socio-economic vulnerability of Waste Pickers

However, there are two sides of the coin. Despite the positive economic impact waste pickers bring, the sector is marked by significant challenges, including wages below the poverty line, environmental related health risks due to hard working conditions and insufficient recognition and support from government and industry (Morais et al., 2022; R. Schenck & Blaauw, 2011; Viljoen et al., 2016, 2018).

For instance, Kotie Viljoen et al. (2018) highlights the socio-economic vulnerability of waste pickers. She argues that the positive contribution of the informal recycling economy to ensuring certain basic needs must therefore be put into perspective. Waste pickers' incomes vary considerably depending on several factors, including the availability and quality of waste, competition within the waste picking community, and the amount of time devoted to waste picking (Viljoen et al., 2018). Illustratively, in non-industrialized countries such as Nicaragua, individuals who engage in waste picking activities earn daily wages ranging from USD 1.50 to USD 2, which is below the poverty threshold established by the World Bank (Morais et al., 2022). Further challenges include low payments received from the companies or middleman due to power imbalance, lack of social protection, and limited access of formal markets (Navarrete-Hernandez P. & Navarrete-Hernandez N., 2018).

External factors and power dynamics within the system can result in fluctuations in waste pickers' income leading to unstable income and insecurity (Morais et al., 2022). Since waste pickers only mostly generate income from the product they sell their payment rate is on the quality and quantity of waste collected or the market demand for recyclables (Silva et al., 2021).

In addition, waste pickers often face difficulties in accessing waste resources due to restrictive policies by waste management authorities, which subsequently affects their income generation possibilities (R. Schenck & Blaauw, 2011). Although waste picking may serve to cover certain basic needs, a significant proportion of waste pickers earn incomes that fall below the poverty

line, posing significant challenges in maintaining a decent standard of living and escaping the vicious cycle of poverty (Viljoen et al., 2018).

3.3.2 Waste Picking Associated Health Risks

Other related risks and challenges waste pickers face are given with the occupation itself. Individuals engaged as waste pickers in the informal recycling economy often work in unsanitary and hazardous conditions. They are forced to go to landfills or work on the streets to collect valuable materials for living. Health risks manifest themselves in the form of being exposed toxic chemicals, infectious diseases, and physical injuries, as also respiratory problems due to exposure to hazardous waste (Dada et al., 2022).

Sayed Mohammed Nazim Uddin (2020) analyzed the relationship between waste pickers livelihoods and their health status in Dhaka City, Bangladesh. He argues that most of the health risks experienced by waste pickers result from long working hours under extreme weather conditions and the sorting through hazardous waste materials, such as broken glass, medical waste and sharp objects, which increases the risk of injuries and blood infections (Uddin et al., 2020). The authors further note that waste collectors in Bangladesh often lack access to health care and other essential services, exacerbating their health risks. They may not be able to afford medical treatment or have access to clean water to drink and wash. In addition, many waste pickers prioritize the ability to work and earn a living over their own health, which in turn leads to them working without proper protective clothing (ibid.). Generally speaking, most studies revealed that waste pickers often lack to proper protective equipment and safety measures in order to mitigate these environmental related health risks (Kaza et al., 2018; Morais et al., 2022; R. Schenck & Blaauw, 2011).

Furthermore, working conditions under organic and metallic waste and accumulation of moisture and germs result in a breeding ground for vector borne diseases. For instance, a 2021 conducted study published in the journal BMC Public Health proved a higher level of seroprevalence (presence of antibodies in the blood) of dengue and chikungunya in waste pickers working in the Jardim Gramacho landfill, the largest open-air dump in Latin America located in Rio de Janeiro, Brazil (Cassemiro et al., 2021). Blood samples among the participants

found that waste pickers working at the landfill had a high seroprevalence of both dengue and chikungunya.[3]

3.3.3 Marginalization and Discrimination / Social Exclusion

In many cases the positive contribution waste pickers deliver is not perceived by the mainstream society. This results in social stigmatization and discrimination, leading to social marginalization and exclusion from broader society (Coletto & Bisschop, 2017). According to Coletto and Bisschop this marginalization that manifests itself can be explained due the nature of their work, which is considered dirty and degrading (ibid.) This problem is exacerbated by the fact that policymakers often overlook the informal waste sector and exclude waste pickers from formal waste management systems (S. Dias, 2012).

In this sense, waste pickers see themselves confronted with a limited access to resources, support, and opportunities for advancement (Velis et al., 2022; Viljoen et al., 2018). The lack of social networks can limit their access to education, and other public services (Viljoen et al., 2016).

When talking about social exclusion a gender perspective also needs to be taken into account. Waste picking as part of the informal recycling economy is a phenomenon that prevails in mostly patriarchal societies. As a result, the realities of life are different for men and women. Surprisingly, many of the studies carried out in this area do not include the gender dimension at all. Despite the fact that evidence suggests that gender inequality is particularly evident in the lives of waste pickers (Ogando et al., 2017; Wittmer, 2021). Ana Carolina Ogando and Sally Roever (2017) analyzed the gendered dimensions of waste picking and experienced realities of women waste pickers in Sub-Saharan Africa and Latin America. Their mixed methodology approach, based on quantitative interviews and qualitative participatory observation, revealed that female waste pickers may experience different levels of stigma and social exclusion compared to men, which can impact their sense of identity and self-worth. According to Ogando

[3] 43.2% of the participants have been tested positive for dengue and 21.5% testing positive for chikungunya. Additional to blood samples a questionnaire was used to collect information on their socio-demographic and work-related characteristics. The blood samples were tested for the presence of dengue and chikungunya antibodies using the ELISA method. The study used statistical analyses to determine the prevalence of dengue and chikungunya among the waste pickers and to identify factors associated with their infection status (Cassemiro et al., 2021).

and Roever this aspect can be further categorized into three overarching dimensions: occupational health and safety, experiences of harassment and violence, and maintaining dignity and respect (Ogando et al., 2017).

In conclusion, waste picking can be seen as a global phenomenon that transcends borders and cultures, yet its realities are deeply rooted in local contexts and cultural habits. Given that certain cultural customs, economic realities, and environmental policy structures can influence the realities of waste pickers. Waste pickers, as important stakeholders, often operate in environments where formal waste management systems are absent or ineffective. Hence, they are highly vulnerable due to various factors such as low and instable income, health hazards, lack of social protection, discrimination, and exploitation due to power dynamics. In view of these findings, numerous scholars have highlighted the pressing need to address the economic, environmental, social, and health effects associated with the informal recycling economy to ensure the safety and security of waste pickers and their families.

3.4 Circular Economy and Waste Pickers

According to scholars, the circular economy approach, which prioritizes resource recovery and reuse, can provide new opportunities for waste pickers to improve their position in recycling value chains. (Morais et al., 2022). In light of the nature of their work waste pickers play already a crucial role in the development of a circular economy by returning secondary products to the market through collecting, sorting, and transforming waste into a resource (Buch et al., 2021) Carenzo, 2020).

In other words, waste pickers underpin the recycling loop of the circular economy. Creating a system where materials are reused, recycled and remanufactured, ultimately reducing pressure on primary resources and mitigating environmental impacts. This process is in line with the wider goal of sustainable resource management and waste reduction.

In this context many recent studies try to identify the opportunities of programs that support the better inclusion of waste pickers into the systems of circular economy. Scholars contend that waste pickers possess a distinctive understanding and proficiency in the realm of waste management, which can be utilized to establish a more ecologically viable and all-inclusive economic structure (Carenzo, 2020). Jandira Morais argues that by focusing on a better integration of waste pickers into waste management systems their contribution to circular economy can be enhanced (Morais et al., 2022). A more effective management of waste pickers can also minimize the negative externalities that are experienced. Proper management is

necessary since waste picking can result in some environmental impacts, such as the release of dangerous substances during waste sorting and waste burning (Kaza et al., 2018; Swain & Kambhampati, 2022)

Circular economy solutions highlight the importance of supporting and empowering informal waste pickers to in the transition to more sustainable and inclusive waste management systems. Following this logic, the so-called cooperative model has demonstrated a potential pathway for enhancing the livelihoods of waste-pickers by offering a way to overcome the challenges posed by the informal nature of their work (Buch et al., 2021).

The cooperative model is an effective approach for organizing waste pickers in the informal recycling industry. Under this model, waste pickers collaborate as a collective, sharing resources, knowledge, and profits (Navarrete-Hernandez, P. & Navarrete-Hernandez, N., 2018). This aligns with circular economy principles, as waste pickers are able to lower waste accumulation in landfills and facilitate resource recovery through recycling.

For instance, the cooperative model in Santiago de Chile has improved the working conditions and income of waste-pickers by providing them with a stable income, access to formal contracts, and social security benefits (Navarrete-Hernandez, P. & Navarrete-Hernandez, N., 2018). The researchers Pablo and Nicolas Navarrete-Hernandez analyzed 100 waste pickers in four cooperatives in Santiago de Chile and found a link between the level of government support and waste pickers' sustainable performance. As a result, the main policy recommendation of their paper is to advocate further positive government intervention, particularly to support a stronger structural organisation of the waste picker recycling system. In the case of Santiago de Chile, the municipality provided funding for the establishment of the cooperatives, while NGOs provided technical assistance and capacity building support (ibid.).

According to the Navarrete brothers, the cooperative model has enabled waste pickers to negotiate better prices for their materials. This was also made possible by establishing new partnerships with local businesses and institutions to collect their recyclable waste. In addition to improving their income, the cooperative provided the waste pickers with personal protective equipment and training. This helped to address some of the health and safety issues associated with waste picking and enabled the waste pickers to work more effectively and safely (Navarrete-Hernandez, P. & Navarrete-Hernandez, N., 2018).

Furthermore, Rejesh Buch (2021) explored successful waste picker cooperatives in India, demonstrating how these cooperatives have been able to achieve economic empowerment and social inclusion for waste pickers (Buch et al., 2021). Among other scholars he emphasizes the importance of waste pickers in facilitating the transition to a circular economy by collecting and segregating waste, which can then be used as raw materials for new products (ibid.).

Another prominent example is "Ciudad Saludable" (Healthy City) NGO in Peru, which works with waste pickers to improve waste management in urban areas. The program provides waste pickers with equipment and training to improve their working conditions and helps them to form cooperatives to manage waste collection and recycling. This has resulted in better working conditions for waste pickers, reduced environmental impact, and increased income for cooperative members (*Skoll | Ciudad Saludable*, 2023).

The case studies and most of the academic literature indicate that the formation of cooperative contribute to better circular economy systems which can lead to increased recycling rates and decreased amounts of waste sent to landfills (Anantharaman, 2021; Buch et al., 2021; Gall et al., 2020; Gutberlet, 2020; Gutberlet et al., 2017; Navarrete-Hernandez, P. & Navarrete-Hernandez, N., 2018). By giving higher importance to circular economy narratives these initiatives, that work within the existing system, could address the challenges waste pickers face by ensuring that waste pickers are recognized as key stakeholders in the recycling industry and by providing them with better working conditions and fair pay (Barford & Ahmad, 2021).

A more critical notion on circular economy in the context of the informal recycling systems and waste pickers provides an article written by Kesha Fevrier with the title "Informal Waste Recycling Economies in the Global South and the Chimera of Green Capitalism" published in 2022. Fevrier acknowledges that informal waste recycling economies in the Global South have played a significant role in reducing waste and environmental impact, as well as providing employment and income opportunities for marginalized communities. Besides, she rejects the premise of circular economy solution and green growth strategies in the context of waste picking (Fevrier, 2022).

In order to explore the impact of e-waste in the capital of Ghana, Accra, she carried out an ethnographic study involving more than 40 semi-structured interviews with e-waste works in the scrapyard of Agbogbloshie and Kumasi. Her research findings suggest that while informal e-waste recycling can be described as green and circular, the benefits are not evenly distributed. In the case of Agbogbloshie, unauthorized e-waste recycling allows capitalist interests to obtain

the residual value of e-waste extracted from informal, undervalued, and racialized workers (Fevrier, 2022). Circular economy solutions do not prevent that the informal waste recycling sector is being exploited in the pursuit of profit (ibid.).

Taking one step further, Fevrier criticizes how circular economy narratives are silent on "the historical, political, and economic factors that make it possible to see waste recycling as a viable economic strategy for sustainable development in the Global South" (Fevrier, 2022, p. 1587). This is also the reason why Fevrier speaks of a "chimera" (ibid.). In her opinion notions of "green capitalism", circular economy being part of it, cannot truly address the social and environmental challenges of the informal recycling economy. In the context of her case study in Ghana the circular economy discourse protects the capitalist growth motive. Keeping production and consumption patterns and inequalities within societies alive (ibid.).

4 Research Methodology

4.1 Research Design and Approach

The study builds on a case study in San Rafael del Sur, Managua, Nicaragua, focusing on the informal recycling economy and its impact on the livelihoods and perpetuation of poverty of waste pickers.

To comprehensively analyze the livelihood and poverty dimensions of waste pickers, the study adopted a multi-methods framework, which included narrative interviews, participatory observation, and walking interviews. The use of multiple qualitative research methods aimed to provide a holistic analysis. The aim was to obtain a comprehensive understanding and compare findings from various methods. Data from narrative interviews, walking interviews, and participatory observation can provide distinct perspectives and insights (Hesse-Biber & Johnson, 2015). Furthermore, the comparison aspect helps in the identification of consistencies or contradictions between waste pickers' narratives and observed behaviours, allowing for the identification of convergent or divergent patterns (Mik-Meyer, 2020).

To illustrate this, imaging exploring the marketplace of a city. As a researcher you are interested in gaining insights into the relationship between buyers and vendors. If you would solely listen to the buyers and vendors stories, you might obtain information about their motivations, challenges, and aspirations. However, they would keep you in the dark when it comes to dynamic interactions between buyers and sellers, the visuals that surrounds you, and the social relationships that are characteristic for this economic transaction.

The exclusive use of narrative interviews for example would have only allowed an analysis of subjective statements and perceptions of waste pickers. While participatory observation allows for receiving more “objective” data on waste pickers' interactions, environmental factors, and social structures, as also lived realities. The term objective is put in brackets since the assumption that participatory observation leads to the collection of more objective data can be put into question, as the researcher own biases and subjective perceptions and people can inevitably influence the data obtained (Dannecker & Englert, 2014). To limit this bias observation have been documented through field notes, observation protocols and photographs.

Applied to the research question the multi method approach should ideally allow for a nuanced understanding of the experiences and perspectives of waste pickers, while also taking into account the broader social context in which they operate in San Rafael del Sur, Nicaragua. Like a marketplace, the place where the waste pickers operate in San Rafael del Sur can be described as a vibrant ecosystem, where waste pickers interact, transactions take place, and social relationships are formed. For instance, these visual cues could not have been captured by conducting interviews alone.

Several studies have explored the concept of a multimethod approach as a means to address complex research questions in social sciences, also in the context of waste picking (Hesse-Biber & Johnson, 2015; Ogando et al., 2017; R. Schenck & Blaauw, 2011; Viljoen et al., 2018).

In the following, the individual methods will be examined and information about their implementation and experienced challenges will be illustrated.

4.2 Data collection methods

4.2.1 Semi-structured/ Narrative Interviews

A combination of semi-structured and narrative interviews were conducted with waste pickers in the community of San Rafael del Sur, providing them with a platform to share their personal stories, challenges, and own perception and their involvement in the informal recycling economy. In this way, all participants were able to talk about their experiences as freely as possible; on the other hand, it was important that the obtained data can be compared, in order to identify certain patterns in the livelihood of waste pickers and their felt deprivation.

In other words, the intention behind conducting narrative interviews was to give space to non-static and non-normative understandings of the impact of the informal recycling economy on

waste pickers livelihoods. Instead of asking for clearly predefined factors and dimensions of poverty/ felt deprivation, it was more crucial to perceive waste pickers perception on their own occupation and the challenges they face, as also the potential opportunities they see in waste picking. As Anderson and Kirkpatrick (2015) puts it, narrative interviews “can help researchers to better understand people's experiences and behaviors. Narratives may come closer to representing the context and integrity of people's lives than more quantitative means of research.“ (Anderson & Kirkpatrick, 2015, p. 1). Indeed, most of existing studies so far analyzed waste pickers involvement in the informal recycling economy from a quantitate perspective, providing information on the economic (income, occupation, created informal jobs etc.) and environmental (tons of trash generated and collected, emissions avoided) dimensions (Morais et al., 2022; R. Schenck & Blaauw, 2011; Velis et al., 2022).

However, the interview has been kept within the framework of the research question and followed a semi-structured approach. This “red thread” was particularly helpful, as it became clear during the interviews that a narrative flow, which was supposed to be generated by an introductory question, did not correspond to the reality on the ground. The target group kept the answers to the first thematic question very brief. In general, their answers were in many cases characterized by a juxtaposition of facts. The reason why the interviews did not result in a flowing narrative can only be assumed. From my experience, I suspect that I was perceived less as a social scientist and more as a reporter. In this context the participants gave concise and direct responses, particularly in the initial stages of the interviews. Their narratives predominantly centered around challenges they face or/ and the injustice they feel. Further insights into this aspect will be discussed in the chapter on limitations and weaknesses of the study.

Furthermore, the semi-structured approach was applied, since it enables the researcher to gather comprehensive and in-depth information from interviewees while remaining aligned with the study's research interest (Mashuri et al., 2022). Hence, it was possible to ensure that the interview could revolve around topics such as "role in the informal recycling system", "perception of one's own life and employment conditions", "opportunities".

The questions were deliberately kept open, allowing more space for queries and enabling better reactions to the waste pickers' narratives. Accordingly, all interviews followed an identical format, but differed in narrative structure, length and depth. Some interviewees showed the willingness to share more profound insights into their personal experiences and emotions as

waste pickers, as well as their daily lives in close proximity to the landfill. In these cases, they narrated mainly about economical struggles they face and risks they encounter at the landfill.

Depending on the context, a flow of narration was initiated where certain aspects were enquired about in more detail. Accordingly, the discussions differed from case to case. Nevertheless, the focus was on the following central questions/ aspects:

- *Could you please introduce yourself, explaining who you are and where we are?*
- *Please tell me about your occupation as a waste picker? – Start by describing a typical working day of yours.*
- *What are the difficulties you face in your work as an informal waste picker?*
- *In what form there is organisational support coming from the church or the municipality? if so, in what form? and if not, are there reasons why not?*
- *What changes or improvements would you like to see in relation to your work and the situation of informal waste pickers in general?*

4.2.2 (Non-)Participatory Observation

The participatory observation consisted of observing the waste pickers as they go about their daily activities without actively participating in their work. Initially planned as non-participatory observation the realities on the field made interactions inevitable. Non- and participant observation is a widely utilized data collection method in case study research and has a long history in social and behavioral sciences (Liu & Maitlis 2010). It's mainly adopted to gain a closer understanding of a social phenomenon in its natural context (Lofland, 2005).

In light of the research question, participatory observation was made use of to immerse me, as a researcher, in the daily activities and work environments of waste pickers in San Rafael del Sur, Nicaragua. By engaging in the waste picking process, the idea was to gain firsthand insights into the physical demands, working conditions, and social dynamics of this economic activity. As already described above, participatory observation has been adopted to complement the narrative/ semi-structured interviews. While the interviews gave insights about waste pickers own perception on their involvement in the informal recycling economy, the participatory enabled a comparison of the narrated stories with the real physical conditions and observed challenges of this occupation type. Interestingly, in the context of social science, observations are commonly used as a complementary data collection method for the investigation of social phenomena. Since they offer are more "nuanced and dynamic" of

situations than other qualitative methods, its approach is considered tangent with other data collection methods (Liu & Maitlis, 2010).

Nevertheless, this approach enabled a more empathetic understanding of the daily-life situation, how they plan, conduct and manage their waste picking activities, as well as their interactions with other waste pickers.

The observations were recorded using field notes, observation protocols, and photographs. The observation protocols were conducted before, during, and after waste collection. Settings were the waste pickers home and the landfill, as also the general district of "La Chureca". After prior agreement, waste pickers and their families were accompanied from morning to early evening on two different days. The time frame was determined by prior discussions with the respective participants.

Similar as the initial intention to conduct narrative interviews, the participatory observation (which was initially planned as non-participatory) was characterized by many obstacles once applied on the field. Ideally, the non-participatory observation does not participate in the activities being observed or/ and has no contact whatsoever with the researched population (Liu & Maitlis 2010). However, the interest of the waste picking community towards me resulted in many non-planned interactions with them. These non-planned interactions created a dynamic that may have influenced the behaviors of the waste pickers and the community, potentially affecting the authenticity and naturalness of the observed situations and interactions. A well-known phenomenon in sociology called the "observer-effect".

Over time, as my presence became more familiar to the waste picking community, they appeared to acclimate to the observation process, allowing for subsequent observations to proceed with minimal disruptions or disturbances. To what extent, however, a potential observer effect influenced the outcomes of this studies will be discussed at a later stage of this thesis.

The observation process was accompanied by photography. Examining images can be a helpful method to enhance the examination of qualitative data obtained through interviews and observations. It was and still is a well-known research tool in ethnographic studies (Schwartz, 1989). Hence, the camera was used as a research tool during the field visits and participatory observation at the landfill. For this, prior consent was obtained from the waste pickers.

Upon entering the landfill, I found myself in an unfamiliar world, generating a multitude of overwhelming impressions at first glance. Photography allowed me to capture fine details, nonverbal signals, and contextual elements that may be difficult to express accurately through written or oral descriptions alone. I reflected on my observations long after my visit, without any risk of misremembering. As we know, memory is not always the most reliable resource.

The use a photography goes also beyond its analysis purposes. The image has the ability to connect with audiences beyond written reports. Its visual impact may stimulate empathy and initiate conversations (Callahan, 2020). It gives reality to the written text, underlining that behind these stories are real individuals.

4.2.3 Walking Interviews

In order to better understand waste pickers perception on their involvement in the informal recycling economy, so called walking interviews have been made use of as a complementary data collection method. Walking interview are characterized by accompanying informants on outings in their familiar environment, such as their neighborhood or working site (Carpiano, 2009; Clark & Emmel, 2010). Recognising the importance of direct engagement with research participants' natural environments, this method aligns with sociological ideas to understand social action within its contextual and spatial dimensions. It draws inspiration from Max Weber's concept of "verstehen" and Georg Simmel, who recognised the significance of space and distance in shaping human interactions and experiences (Evans & Jones, 2011).

In the context of my research interest walking interviews, conducted while accompanying the waste pickers of San Rafael del Sur during their collection routes, provided an opportunity to explore the spatial dynamics and contextual factors influencing waste picking practices. On the field, the method was especially used during the participatory observation once the waste pickers went to the landfill to search for recyclable material. The focus of interest was to clarify questions of the "how and why" during their waste picking activities.

It is important to underline that walking interview method played a secondary role in data analysis compared to other methods used, primarily due to two interrelated reasons. Firstly, conducting walking interviews proved to be challenging in practice, requiring careful navigation and coordination within the waste picking environment. Secondly, it became clear that waste pickers preferred for minimal disturbances during their work and were already much occupied in looking for valuable materials. As researcher I respected this and kept questions to a minimum.

4.2.4 Expert Interviews

To supplement the results of the livelihood analysis and dimensions of poverty, expert interviews were undertaken. The interviews were purposefully selected to explore the circular economy solutions. Expert is a relational status, and its classification is oriented by the respective research interest. According to Meuser and Nagel, "whoever has privileged access to information about groups of people or decision-making processes" can be classified as an expert (Meuser & Nagel, 1991, p. 443). In the context of the research question experts interviews were utilized as a qualitative approach to access the specialized knowledge and perspectives of professionals with experience in waste management, informal recycling economy, and circular economy solutions. Their insights offered a valuable outlook on the opportunities of implementing circular economy principles in the waste picking context.

Two expert interviews have been conducted with Simonetta Tunesi[4] and Pietro Luppi[5] . Both bring a deep understanding of the dynamics within the waste management sector and the informal recycling economy, including the regulatory frameworks, best practices and limitations. Their expertise enabled a detailed conversation on circular economy solutions in the context of informal recycling economies. Valuable insights can be gained on how waste pickers can be incorporated into broader waste management systems and how informal recycling systems can be optimized. Moreover, both professionals may possess relevant

[4] Simonetta Tunesi is an experienced environmental chemist with a rich background in developing and implementing science-based policies to optimize solid waste management strategies at various scales. With over 25 years of expertise, she has collaborated with public bodies, social actors, and private sectors to assess health and environmental risks, evaluate the impacts of waste management practices, and remediate contaminated sites. Simonetta's strategic approach combines scientific assessment, knowledge of industrial and public administrations, and a deep understanding of international environmental legislation. Her work includes research on pollutant transport, human exposure to hazardous chemicals, and the development of climate change mitigation strategies.

[5] Pietro Luppi is an expert in informal recycling systems and waste management that already worked in many projects in the Global South. Along with Anne Scheinberg, he authored "From collision to collaboration - Integrating informal recyclers and re-use operators in Europe: A review," a publication that explores the integration of informal recyclers and re-use operators into European waste management systems. Through case studies from various European countries, the review emphasizes the benefits of collaboration between formal and informal waste management sectors, such as increased recycling rates, reduced landfilling, and improved working conditions for informal recyclers.

experience from comparable contexts or initiatives, which can facilitate the drawing of relevant parallels and the sharing of successful strategies.

The experts, specialized in waste management and the informal recycling economy, were confronted with the interviews and observations that were obtained during my fieldwork. Presenting these images right at the beginning of the interview aimed to determine if the situation of waste pickers in San Rafael del Sur is distinct, or if the experts are acquainted with similar instances from other fields, they have worked in. Both of them were already included in waste management programs in the Global South.

Afterwards, Ms. Tunesi and Mr. Luppi were consulted to discuss the possibility of introducing circular economy solutions in San Rafael del Sur and wider areas. They were urged to share their views and stances on how circular economy solutions could potentially impact the informal recycling economy and benefit the waste pickers, based on their professional knowledge and expertise. Also, they were asked to share any personal experiences they had acquired during their fieldwork. The purpose of this approach was to ensure comparability. The guideline helped maintain a focus on the pertinent topics for discussion with the interviewee and ensures the interview stays on track (Meuser & Nagel, 1991).

4.3 Sampling Strategy and Sampling Size

The sampling strategy for the narrative/ semi-structured interviews, participatory observation, and walking interviews with waste pickers needed to be carefully planned and executed, due to challenges associated with reaching waste pickers known as a marginalized and hard-to-reach population (Dada et al., 2022; R. Schenck & Blaauw, 2011; Uddin et al., 2020). Kotie Viljoen even speaks of a „unknown population“ in the context of South African Waste Pickers (Viljoen et al., 2016, p. 179).

Since the use of qualitative research methods, such as participatory observation and walking interviews, involves physically entering into the world of the waste pickers, which can be considered as a sensitive environment (C. J. Schenck et al., 2019; Viljoen et al., 2018), a critical first step was to build trust and developing empathy within the waste picker community in San Rafael der Sur, Nicaragua. Therefore, field trips have been conducted prior to the data collection in order to establish trust within the community. The field trips and visits consisted of getting familiar with the neighbourhood and people, as also to better assess initial reactions to me as a persona and my research interest.

The waste picker community in San Rafael del Sur, Nicaragua is located in close proximity to the central landfill of the city, creating a physical separation from the rest of the city and is symbolized by poor infrastructure, non-asphalted streets and tin houses. It can be described as an invisible border, which becomes apparent with every further step inside this district/ neighborhood. Under locals the district near the landfill is known under the name “La Chureca”. The naming is a direct allusion to the largest municipal garbage dump in Nicaragua, located in the capital, Managua, also known under the name “La Chureca”[6].

Due to safety concerns, individuals who do not life in this community tend to avoid it. However, through personal relationships, contact was established with an individual who had previously lived in the neighborhood, although she was not actively involved in waste picking activities. Nonetheless this person facilitated access to my area of interest. From a scientific perspective this individual played the role as “gatekeeper”. In the qualitative research tradition gatekeepers are individuals with the social networks, position and knowledge to facilitate entry and to establish connections with communities that may otherwise be difficult to reach (McFadyen & Rankin, 2016).

Once the gatekeeper facilitated the access to the community a purposive sampling strategy was initially adopted. Purposive sampling, is a non-probability sampling method mostly used to select participants deliberately based on specific characteristics that align with the study's field of interest and research question (Bernard, 2017; Duan et al., 2015; Palinkas et al., 2015). In the context of my research interest and with the assistance of my gatekeeper a first interview partner has been identified and approached to during the first field visit.

In contrast to random sampling or other sampling strategies, purposive sampling prioritizes depth of understanding over generalizability (Palinkas et al., 2015), which was considered more valuable to analyse the livelihoods of waste pickers and their perception on their involvement in the informal recycling economy. Availability, willingness to participate, and the ability to articulate experiences and personal opinion (Duan et al., 2015) were also of priority in the first selection of the first interview partner. In this sense, an agreement was established with the identified individual to participate in the study during the first field visit. The in-formal

[6] It covers an area of 42 hectares. About 1,000 tons of garbage are dumped there every day (2014). In: https://elpais.com/economia/2014/03/23/agencias/1395584032_433841.html, June 2023

agreement included the consent for an interview, as well as the accompaniment and observation during their waste picking activities for a day.

After conducting the first interview, I used a snowball method by asking the participant to recommend other waste pickers who may be interested in taking part in the study. Due to its ability to access hard-to-reach populations with great success, the method is widely recognised in the social sciences (Biernacki & Waldorf, 1981). Subsequent visits were made easier due to the presence of a familiar face, which helped establish trust between the researcher and the waste pickers.

The snowballing process was pursued until seven waste pickers were selected, two of whom consented to accompany me to the landfill for a full day for observation purposes. The data collection process took place over a total of five days, including the described field trips to the community “La Chureca”.

In their nature, qualitative studies do not seek to achieve generalizability but instead aim to provide in-depth insights into the lived realities of the studied population and the social phenomenon of interest (Dannecker & Englert, 2014). Hence, it was seen more scientifically valuable to delve further/ deeper into the narratives and experiences of the selected waste pickers rather than expanding the sample size. Furthermore, the first interviews with waste pickers revealed certain recurring storylines and patterns. The told stories about the challenges the face, the strategies the employ and the impact of their work on their livelihoods seemed to be surprisingly consistent across the participants. It became clear that the waste pickers' realities and experiences were strikingly similar.

In light of this, the sample size is considered as reasonable to address the research objectives in identifying patterns and poverty dimensions experienced by waste pickers in this particular context. As also to discuss the findings with the concept of circular economy solutions. However, limitations and weaknesses, such as those related to sample size and strategy, will be thoroughly examined in the limitations and weaknesses chapter.

4.4 Data acquisition and preservation method

Data acquisition and preservation followed a systematic process that ensured the accurate and comprehensive representation of the information collected. Due to the amount of data from different qualitative methods, the following procedure was followed: all conducted interviews with waste pickers were recorded using a Smartphone, a practical choice which, more

importantly, aimed to not attract too much attention, as also to work with an object that is familiar the interviewees.

The interviews have been transcribed word-for-word, without correction of dialect or linguistic errors, except in certain cases when incomprehensible words were noted or marked. In order to do justice to the wording, no translation from Spanish into English was done in the transcription of the interviews. However, in order to make the analysis more transparent, relevant passages were translated and integrated into the continuous text with their traditionally in the footnotes. To indicate the roles in the interviews, the interviewer was referred to as "M", while the interviewees were referred to as waste picker one (WP 1) to waste picker seven (WP 7). The transcribed interviews can be found in chronological order in Appendix 1 to 7.

The observation made during the fieldwork were documented by hand using pen and block. The field notes consist of detailed description of the observed scenes and activities happing at this place at this particular time. Notes were not made in a straightforward manner, but in cases where something relevant to the research question was identified. For instance, waste pickers would frequent the landfill without the necessary protective gear. However, they improvised by utilizing readily available objects to shield themselves from the sun, such as cardboard boxes in one case.

The expert interviews have been conducted via MS Teams. Regrettably, the interview with Ms. Tunesi couldn't be recorded due to technical limitations. Nonetheless, I made careful attempts to keep minutes accurate and addressed any uncertainties through further inquiries. The interview with Mr. Luppi has been recorded and transcribed word-for-word.

4.5 Data analysis

The data analysis and approach involved a combination of deductive and inductive methods to explore the experiences and perceptions of waste pickers in the informal recycling economy. The narrative and walk-along interviews were transcribed, and ongoing coding and analysis were conducted to identify conceptual frameworks related to waste picking, the informal recycling economy and existing dimension of poverty within this particular community of waste pickers.

Second, the data collected through participatory observation and walking interviews has been analyzed using content analysis, which involved identifying and categorizing different aspects of the observed behavior (Azungah, 2018). This helped to identify the different ways in which

waste pickers engage in the informal recycling economy and the challenges they face in their work.

The initial step in the analysis of the narrative/ semi-structured interviews was structural coding, where sections of the interviews were categorized to allow for in-depth examination within these structures. Deductive approach was initially applied, where the transcribed interviews were systematically coded according to pre-defined themes derived from theoretical frameworks, such as Amartya Sens's capability approach and the emerged poverty dimensions described in the conceptual framework. The pre-defined themes were:

- Economic instability: encompassing low and unstable income, limited access to basic needs, and lack of formal employment opportunities and alternative income opportunities.
- Social exclusion: capturing experiences of discrimination, marginalization, and limited access to social networks, services, and opportunities. In the case of my study population, this is also characterised by spatial segregation.
- Environmental risk: involving exposure to hazardous waste and pollution, lack of protective equipment and training, and health issues associated with waste picking.
- Political neglect/ lack of political voice: reflecting experiences of inadequate political representation and influence

The process of structured coding revealed also categories that did not align with the pre-defined themes mentioned above. In light of this, the themes were expanded in a second round of coding. For example, a fair number of the interviews revealed that social exclusion often manifested within the waste picker community itself, arising from conflicts over collecting valuable materials on the landfill. As a result, the theme of "social conflict" came up and was included within the social exclusion category/ theme.

In the following phase themes and categories have been added from the codes identified, as they did not entirely align with the pre-defined categories. Inductive coding was made us of since it allowed me as a researcher to remain open to new themes and patterns that emerge directly from transcribed interviews of the sample population, without being restricted by preconceived categories of already defined dimensions of poverty (Azungah, 2018; Ruin, 2017). This approach is particularly valuable for a study focusing on complex and multifaceted phenomena, such as poverty and livelihood experiences within the informal recycling economy, where the understanding of the waste picker realities is often nuanced and context-dependent.

In particularly, it enabled to shed light themes that might not have been previously considered. Lastly, it ensured that imported dimensions poverty, related to waste picking, are not being overlooked.

For instance, the theme of "gender inequality" is a significant example that emerged during the inductive coding process. It became apparent that all interviewed waste pickers, might find themselves living near the landfill as a result of a patriarchal system that often assigns waste picking activities based on traditional gender roles. It turned out that many of the women were single mothers and had to devote themselves to the profession of waste collection due to early pregnancies and the abandonment of the father. The analysis of this theme will be further discussed in the livelihood analysis chapter. Themes that emerged from inductive coding approach are the following:

- Gender Inequality: is about structural inequalities between genders. This can be based on a clear division of labour in waste picking, but also on the experience of discrimination and the additional burden that is placed on an individual in relation to their gender.
- Power Imbalance within the Informal Recycling Economy: is about power dynamics and decision-making power within the existing informal system. it has parallels to "political neglect" but is limited to interactions in the recycling business.

The coding and further data analysis process, based on the defined rounds of coding, also led to the modification of some defined themes to better capture the complexities of waste pickers' lives. For instance, economic insecurity was closely linked to the lack of educational opportunities for the waste pickers' children. The financial constraints compelled these children to work alongside their parents on the landfill, limiting their access to formal education. This highlighted the crucial role of economic factors in shaping educational opportunities and their subsequent impact on the overall economic well-being of the waste picker families. Additionally, the analysis revealed that health and environmental risks were often exacerbated by the hazardous working conditions on the landfill, like being exposed to toxic smoke and sharp objects. For this reason, everything related to working conditions and health was incorporated into “environmental risks”.

The data collected through participatory observation and walking interviews have been analysed using content analysis, which involves identifying and categorizing different aspects of the observed behaviour (Krippendorff, 2013, Lac, 2016). This helped to identify the different

ways in which waste pickers engage in the informal recycling economy and the challenges they face in their work.

The made photos have been categorized based on the themes that emerged from the coding process such as "unsafe working conditions" for images depicting hazardous environments. Once categorized, detailed analysis of each category tried to identify patterns, differences, and subtle details that may have not be apparent through the verbal descriptions alone.

After each dataset – interviews, participatory observation (involving photo analysis) – has been analysed independently using the emerged codes and themes, the final stage of analysis adopted data triangulation which is an established practice in qualitative research to validate the findings and ensure the accuracy of the analysis (Denzin, 2015; Flick, 2018). This involved systematically comparing and contrasting findings from various data sources. The goal was to identify both consistencies and discrepancies in the themes and patterns that emerged. If a particular theme or pattern emerged consistently across multiple sources, it provided robust evidence of its importance.

By integrating multiple perspectives, data triangulation served as a validation method. This helped to gain a deeper and more comprehensive understanding of the waste pickers' livelihoods, as well as the possibilities of circular economy solutions.

4.6 Limitations and Weaknesses

4.6.1 Methodological Weaknesses

The combination of methods was an intend to reduce methodological limitations of qualitative research in order to generate a more complex picture on waste pickers livelihoods. While relying only on one method to understand a complex social phenomenon such as waste picking, the risk of oversimplification is high. Nonetheless this does not imply that the study, especially its methodological approach is free from limitations and weaknesses.

As known qualitative research is mostly open-ended. Participants have more control over the content of the data collected. As a result, the researcher does not have an objective check of the results against the respondents' scenarios (Dannecker & Englert, 2014). Even if through the (non)-observatory observation it was intended to have more influence on objectively validate the subjective statements made by the waste pickers. Since I accompanied them on the landfill site and at their work, I was able to get a picture of their statements about working conditions,

risks and challenges. Nevertheless, many statements were made about power relations, social and above all political exclusion, which could not be objectively verified during my field stay.

As a result, the study primarily captures the perceptions of waste pickers, providing an important but partial view of the wider context. The informal recycling economy is a complex web of multiple stakeholders and is characterized by a lack of transparency. Therefore, this study does not fully capture the experiences, perspectives and challenges of other stakeholders involved in the informal recycling economy. We do not know how the so-called middleman, who was mentioned several times during the interviews, is also not constraint by market mechanism and power structure within the informal recycling economy. This is particularly important when considering the potential impact of the bottom-up circular economy solutions presented. As we have seen in the Azteca model, there is a need to involve all stakeholders in the development of comprehensive waste management strategies, as improvements for one group alone may not lead to holistic and sustainable changes within this informal system.

In addition, this study identified and demonstrated the interrelationships between different dimensions of poverty. However, it cannot definitively establish causal links between the different phenomena due to the absence of empirical evidence (Ma, 2000). Broader societal factors, such as gender inequality and prevailing social norms in Nicaragua, might influence the involvement of waste pickers in the informal recycling economy. For instance, we are now aware that waste pickers of “La Chureca” encounter political neglect, and political factors are present in the informal recycling economy. Still, it is uncertain if political discrimination against these vulnerable individuals led to their situation or if their role as waste pickers is the cause for the discrimination. The causal relationship cannot be adequately proven or measured with the used instruments, despite both factors likely contributing to the issue. Hence, outcomes attained from the interviews and made observation are unique and therefore challenging to replicate. This is due to the lack of statistical results that would have made the process more systematic.

4.6.2 Generalizability and Transferability

Another limitation lies in the sample itself. The study selected a small group of seven waste pickers to interview and two families to observe in order to gain an in-depth understanding of the daily experiences of waste pickers in San Rafael del Sur, Nicaragua. After conducting initial interviews, it became evident that the accounts shared notable similarities. While this approach

allowed for a detailed exploration of their experiences, it also implies limitations in terms of generalizability.

Also, the used sample method is not free from potential bias. It is known to me that my gatekeeper has selected the first interviewee based on her own network and relationship. Since I moved from one interviewee to another using the snowball technique, it's probable that the waste pickers directed me towards individuals within their network who have similar backgrounds. The selection process was not randomized which could have led to a wider range of experiences being shared. This might be why only women were interviewed as waste pickers, despite my observation indicating that no men were involved in waste picking. However, my field presence and observation were limited to a brief period of five days, which could have restricted the scope and comprehensiveness of data collection. A more extensive study duration could have facilitated a broader representation of waste pickers' experiences.

Finally, given that the study took place in a specific place at a specific time limits its generalizability and transferability. The findings and discussions are tailored to the particular geographic context of San Rafael del Sur, Nicaragua. In other words, the grade of the identified dimensions of poverty are context-specific to San Rafael del Sur. The specific geographical features in San Rafael del Sur, where waste pickers are based near the landfill, can have a significant impact on the challenges and experiences faced by the waste pickers, differing greatly from those of a waste picker working on the streets in Delhi for example.

Therefore, they cannot be considered representative of waste pickers in differing environments or circumstances. While certain patterns were identified in this sample and both experts, Ms. Tunesi and Mr. Luppi, identified familiarity with these images and patterns, it is crucial to recognise that waste pickers' experiences can differ significantly based on their location, social norms, and political environment.

4.6.3 Data Quality and Social Desirability Bias

Thomson underlines that „lt is not difficult to acquire data, but gaining the trust and respect of local actors that result in quality data takes time.” (Thomson et al., 2013, p. 2) I was granted access through personal contacts, but the extent to which trust played a role in the quality of the data is difficult to judge. Although the participants appeared to be open and honest about their problems and views, the accuracy of the obtained data may be questionable due to the fact that waste pickers may have participated with the hope of receiving direct assistance to improve their situation. Even if clear expectation-management was implemented, explaining the waste

pickers that all this is due academic purposes, this hope is very human and cannot be excluded. This was particularly significant as I was perceived as a journalist and received in this capacity. They expressed a keen interest in outlining particular grievances. While this may seem favorable at first glance, it can also distort data in particular ways. Within academic literature, this phenomenon is commonly known as the social desirability bias.

In academic settings, this social desirability bias is a common phenomenon (Johnson & Van de Vijver, 2003). The narratives shared by waste pickers in my study may have been influenced by this bias. As an academic authority, my position may have exerted a subtle pressure on them to present their experiences and perspectives in a light they might thing I want to hear from them or that makes me more willing to help them. Furthermore, it is possible that the observer effect, where participants may change their actions because they are being observed, may have influenced the behaviour of those I studied during my time in the field. Waste pickers spoke of ongoing conflicts with other waste pickers over valuable materials, but I did not witness any incidents relating to this issue. The social desirability bias and observer effect may have affected the data collected in the study of informal recycling and waste picking. This could impact how the study's results are interpreted and how valid they are.

When working with marginalized populations, the differentiation between objective fact and subjective interpretation of reality may not always be straightforward. Thomson speaks here about the artificial division between “fact” and “fiction'” (Thomson et al., 2013, p.8). It is conceivable that the waste pickers may have highlighted their difficulties and marginalisation in order to gain sympathy and possibly some help or support from me, the researcher. It's important to recognise this possibility and to consider it as a potential factor in the narratives presented in my research, which may show a selective history. This is not a matter of trust, but of understanding the context of the waste pickers and their expectations of me as a persona.

4.7 Positionality and Ethical Challenges

My research is conducted in a context marked by deprivation and child labor. Waste pickers can be considered as a vulnerable population in Nicaragua. The geographic location alone is characterized by the legacy of colonialism combined with ongoing neocolonial relations. Consequently, it was paramount to approach field visits and statements by interviewees with sensitivity and a high level of responsibility. Respecting ethical consideration prior, during and after data collection was taken into account and guided by academic literature on this topic. In the postcolonial context, Catherine Vanner (2015) offers a framework for Western researchers

to reflect on power dynamics and create strategies for conducting empowering research that avoids participant misrepresentation and exploitation (Vanner, 2015). Nonetheless, in the context of waste pickers, it has been revealed to be a complex endeavor. The process is not yet finalized, and critical reflection needs to be discussed on an ongoing basis.

Interestingly the reviewed academic literature on waste pickers rarely gave an account to ethical challenges faced while working with the waste pickers and reporting on the research results. According to Susan Thompson., this is a common issue in quantitative and qualitative field studies in the Global South. Many academic studies that work with marginalized populations fail to report on the "story behind the findings" (Thomson et al., 2013, p. 1). In actuality, researchers face ethical and emotional challenges before, during, and after conducting fieldwork (Thomson et al., 2013).

4.7.1 Power Imbalances

As I find myself in the position of a Western researcher who represents physical and historical embodiment of colonialism and neocolonialism (Vanner, 2015) the study holds the challenge and/or reproduce power inequalities. In analogy to the Foucauldian understanding of power as exercised and productive, dispersed through social interactions (Foucault, 1980), the direct engagement with waste pickers embodies complex power dynamics. The waste pickers interim finds themselves in fragile economic positions fighting for survival on a daily basis.

In general, it was the aim to address power imbalance with methods of participatory research. Vanner defines participatory research as an approach that grants participants significant influence over the aspects of the research process, such as design, data collection, analysis, and writing stages. The researcher should adopt a flexible approach to design, allowing for adaptation and redefinition of methodology and research questions (Vanner, 2015).

For example, the data collection procedure was modified to suit the actual conditions on the ground. Initially, walking interviews were planned, but they were given a secondary role due to the waste pickers' duties. During data collection, it became evident that the waste pickers were unable to provide detailed responses to the interview questions. The women working on the landfill were juggling multiple responsibilities - searching for valuable materials while also caring for their young children. To prioritize the waste pickers' needs, any additional burdens were avoided.

Photos taken during the field stay were solely for the purpose of documentation. While the waste pickers did give their consent for their photographs to be taken and published, it cannot be definitively ruled out that the power dynamic at play may have influenced their decision. The images provided therefore are purely descriptive and are designed to avoid the identification of any particular individuals.

In order to prevent the do-no-harm, the waste pickers were fully informed about the methodological framework. The interviews themselves started with a clear description of my research goals and on the planned elements. It was always made clear that the participants can end the interview any time. Nonetheless, acquiring valuable personal insights into a world dominated by poverty and, in certain instances, a lack of perspective is a demanding task. Recalling specific experiences could trigger unfavorable emotions for the interviewee, leading to an uncomfortable situation. Thus, it was crucial to strike a balance and acquire meaningful data for the research question without evoking negative recollections, necessitating the avoidance of specific questions. The waste picker should have the freedom to choose what they wish to share with me. For instance, they may have briefly discussed or neglected to talk about social exclusion. In light of this, I did not inquire any further or encourage the discussion on instances of social exclusion or discrimination.

It is important to acknowledge that participatory research goes far beyond the criteria's and methods I applied during and after my research. Waste pickers for instance were not included in the data analysis. How well we understand the issue and how accurate our interpretations are could be affected by this. Waste pickers were not given the opportunity in shaping the narrative around their own livelihoods by discussing with them the identified dimension of poverty. This indeed embodies a lack of empowerment which could have increased the validity of my study. Even if considered, it was deemed too challenging and intricate for a master's thesis. I encountered limitations in time and resources. Nonetheless, this has to be taken into account for future scientific endeavors.

The limited participatory approach is also reflected in the access to the results made. The study was conducted bilingually, in both English and Spanish. Language provides an effective foundation for enhancing the accessibility and comfort of research participants throughout the research process (Vanner, 2015). Though data collection occurred exclusively in Spanish, the documentation of results and expert interviews were conducted in English. It can be seen as critical that data collection and the report of the results happened in two different languages. Consequently, research participants lack insight into data analysis and findings, and cannot

challenge the results. To mitigate this issue, direct quotations were preserved in Spanish with translations appearing in the footnotes. In order to ensure accuracy, a Spanish version should also be taken into consideration.

4.7.2 Do-no harm: Reporting on Political Discontent and Child labor

In light of the no-harm principle, the participant anonymity and confidentiality were safeguarded throughout the study. All waste pickers expressed dissatisfaction and mistrust of the officials, making reporting an uncertain task. To address this concern, the names of the participants were anonymised as a precautionary measure to protect their identities and reduce the probability of negative outcomes resulting from the shared information. This decision was made by me and not by the participants. Therefore, while presenting the results, I refer to Waste Picker 1-8 and not their names.

In addition, reporting on child labour created a particularly sensitive situation. Child labour is against the law in Nicaragua "CODIGO DE LA NIÑEZ Y LA ADOLESCENCIA – Ley No. 287". One of the interviewed waste pickers even shared that the ministry of education threatened to remove her children if she continues to bring them to the landfill. It was evident that the waste pickers felt ashamed and hesitant to admit their reliance on their children's contributions and their incapability to afford formal schooling for them. During my visit to the landfill, I observed that safety standards were not being adhered to, putting children at risk of harm. As a result, I was compelled to intervene several times during my field stay.

Overall, I was presented with visuals that surpassed the usual standard in my upbringing environment. Thomson once wrote that leaving a community can be more challenging than settling in (Barford & Ahmad, 2021; Morais et al., 2022). This sentence holds much truth. When I departed from "La Chureca", I left behind individuals who greatly influenced my academic journey. Unfortunately, they remain in the same challenging social circumstances as they continue to persevere. The least I can do is recognize and reflect on these ethical considerations.

5 Results and Discussion

5.1 Introduction

The following chapter will present the results of the case study in light of the research question(s). The large quantity of data derived from diverse sources has yielded an interesting collection of insights pertaining to a foreign realm. To put it in a metaphorical way: each piece of data, be it from participatory observations, qualitative interviews, or photo analyses, contributed to a puzzle that, when brought together, offers a nuanced understanding of waste pickers' livelihoods and the role they play within the informal recycling economy. The result is a "mosaic of information" that provides insides into their economic decision, challenges, aspirations and other factors that shape their daily lives. As this mosaic/ puzzle is being pieced, analyzed and presented, I acknowledge, as a researcher, that its completeness may remain difficult to achieve, as the chapter on limitations revealed. The resulting image, shaped by the analysis of collected data, provides a basis for discussing bottom-up circular economy solutions. The discussion also addresses aspects that emerged from expert interviews.

The following research questions underpinned the analysis of waste pickers' livelihoods and its findings:

- How does the informal recycling system in San Rafael del Sur, Nicaragua affect the life of waste pickers and their families?
- What dimensions of poverty are waste pickers exposed to, touching the aspect of economic, environmental, social and political dimensions of it?
- How are these dimensions interconnected, particularly within the informal recycling economy? Is the informal recycling economy a poverty trap?

The presentation of the results will be structured along to above mentioned questions. Starting with a descriptive part where key demographic information about the waste pickers will be shared and a picture of the informal recycling system will be drawn. Afterwards, the livelihood analysis, in light of the identified dimensions of poverty/ deprivation/ vulnerabilities will be explained and discussed. As a final step, expert interviews will be used to discuss the potential of bottom-up circular economy solutions within the informal recycling economy. The livelihood analysis and identified dimensions of poverty will serve as the basis for effectively exploring the potential impact of these approaches on waste picker well-being.

5.2 Demographic Insights and the Informal Recycling Economy System

5.2.1 The district of “La Chureca” and the Waste Pickers

The interviewed waste pickers all live in a remote neighbourhood of the city of San Rafael del Sur. The city is the political, economic and cultural centre of the same name county San Rafael del Sur which is one of nine municipalities (municipios) of the governmental district (departamento) of the capital Managua.

This district/ neighbourhood, which is named under the waste pickers themselves “La Chureca”, finds itself in close proximity to the central landfill of the town. It is accessible through a dedicated road, the stark transition from asphalt to a more rudimentary path signalling one's arrival in the neighbourhood and creating a physical separation from the rest of the town. The houses in “La Chureca” are constructed from reclaimed materials - cardboard, tin, and plastic (s. figure 3). It's apparent that these homes lack essential services and amenities, the absence of which becomes all the more conspicuous in comparison to more urban settings of San Rafael del Sur. For instance, plumbing, reliable electricity, and adequate sanitation facilities are either rudimentary or absent altogether. The neighbourhood is characterized by poor critical infrastructure, non- asphalted streets and tin houses (s. figure 4). Every further step inside this district/ neighbourhood gives you a reflection of the economic and social reality of this community.

Figure 3. House of one of the interviewed waste pickers
Source: Authors Own Work

Figure 4. District of La Chureca. View from the main street
Source: Authors Own Work

The interviews with the waste picker revealed that a significant portion of households in this neighbourhood rely on waste picking as their primary means of living.

> *"Son variadas las casa que viven de la coleccion de la basura aqui"*[7] (WP 6, l. 125)

> *"eso pues trabajamos la mayoría de las personas que vivimos aquí a la orilla. A veces podemos, a veces no podemos. Ahí vamos."*[8] (WP 3, l. 11-13)

According to Waste Picker 5 this is simply due to socio-economic reasons. She explains that many residents in the district engage in waste picking as their primary source of livelihood. In simple words she makes the statement that the work itself is "hard" and comes at a high cost but at least it covers the fundamental human needs like nourishment.

[7] There are several houses that live off the collection of rubbish here.

[8] That's because most of us who live here (on the shore) work. Sometimes we can, sometimes we can't. Here we go

> *"Aquí son bastante gente los que andan buscándote botellas buscando esa botella. Porque esto está duro. Está bien, vayamos por lo menos para medio comer*"[9] (WP 5, l. 10-12)

The transition into waste picking/ getting involved in the informal recycling economy as a sustain of life among waste pickers in the neighbourhood of "La Chureca" appears to be driven by the need for income generation. This aspect comes even more apparent when considering reports from waste pickers about the recent influx of new arrivals over the past year, signifying the expansion of the waste picker community in the neighbourhood and in the city of San Rafael del Sur in general.

> "*porque el año antepasado venían familias y ahí sí venía en familia, se llenaba la Chureca, pero esto era de otro barrio*"[10] (WP 6, l. 130-131)

Bringing in the issue of migration into this discourse, this statement could give a hint to a growing population of waste pickers in the region, in light of the fragile macroeconomic state of the region. In the wake of the 2018 protests, Nicaragua experienced a profound economic setback, characterised by consecutive years of GDP decline. Despite a modest recovery of 3.8% in 2022, the country is grappling with its highest inflation rate in a decade, reaching 10.5% (World Bank, 2022). This increase in the cost of living has left many struggling to meet even their most basic needs, particularly as food prices have soared over the past year.

Refocusing on the micro-level; the seven waste pickers interviewed in "La Chureca" present a section of individuals engaged in this occupation. Demographically, there is a notable age difference among them. The youngest of them is just 19 years of age while the oldest counts 60 years of age. This diversity in age confirms the observation that individuals of various generations are actively engaged in waste picking. Similar to the findings of Catherina J. Schenck, waste picking seems to be open to all ages, if they bring the physically requirements to do the work (C. J. Schenck et al., 2019). While looking around the neighbourhood the waste pickers community you notice many multi-generation households. Based on the observations made, it is evident that the typical household structure in "La Chureca" comprises a multi-

[9] There are quite a few people here who are looking for bottles. Because this is hard. All right, at least it's enough for getting some food.

[10] because last year families came and when they came as a family, the churresca was full, but this was from a different neighbourhood.

generational family unit, consisting of a female with her multiple children who shares her household with her mother and in some cases even grandmother. This results into an interesting dynamic concerning family involvement in waste picking: Showing that waste picking affects the whole family regardless of their age.

Figure 5. Family moving towards the landfill in search of valuable materials
Source: Authors Own Work

For instance, Waste Picker 5 entire family, including her adult children, are engaged in in the informal recycling economy. Her oldest son works as a truck driver at the landfill. Her second adult child, aged 18, is engaged as a waste picker like his mother. This involvement is partly due to a physical disability, as explained by the waste picker, since he has been diagnosed with the down syndrome (WP 5, l. 43). Waste Picker 1 younger sister also helps at the landfill. Waste Picker 2 is a 35-year-old single mother whose children range in age from 2 to 17 years old. It is worth noting that her eldest daughter has already taken on the role of a parent herself, highlighting the multi-generational involvement in waste picking within the family. Figure 5 above depicts the active participation of all members of the household in waste collection activities. It underlines that waste picking seems to be indeed a collective activity, involving the presence of both adulty and children creating a family-based involvement in waste picking.

Most of the interviewed waste pickers reported on a longstanding involvement to the informal recycling economy. Waste Pickers 3 looks back at 9 years of working as a waste picker. She was introduced to the occupation by family members that also life in the district. Waste Picker

6 who lives with her husband and her four children in this neighbourhood, is engaged as waste picker in the last four years. In contrast, waste Picker 1 was introduced to this occupation at a very young age, with her 19 years of age she counts already 3 years of involvement as a waste picker in San Rafael der Sur. She reportedly got involved into this occupation after an unplanned pregnancy forced her to move to the district. This turning point prompted her to drop out of school, leaving her an elementary level of education as her highest educational attainment.

> *"Pero de ahí salí embarazada del niño y. Y que soltera. Y ahí me tuve que dedicar más a ello. Ya no pude a mis estudios sino de dejarlo*"[11] (WP 1, l. 21-22)

Their working routine is highly influenced by the arrival of the waste delivery trucks, as also the environmental circumstances. For nearly all interviewed waste pickers their working day starts early morning at 5AM and goes usually until 5PM once the sun sets down. According to waste pickers testimonials this is because of the heat / sun. The waste pickers' scheduling practices are motivated by their desire to steer clear of the scorching midday heat and the harmful effects of sun exposure on their physical well-being. The adjustments in timing allow for a more sensible approach to dealing with the physical exertion inherent in their occupation and reflects waste pickers adaptive strategies within a challenging environment.

> *"menos nos levantamos a las 05:00 para este que el sol pues no los habrá que mucho el sol.[12]"* (WP 2, l. 13-14)

Waste picker 3 describes the working hours as multiple rounds throughout the day. Where waste pickers come and go to collect valuable waste from the landfill. These section of work-and-collects are driven by the arrival of the waste trucks coming from the municipal authorities.

> *"Cuando veo pasar los camiones ahí voy a buscar mi botellita. Ahí tengo una botellita recogida*"[13] (WP 5, l. 8-9)

[11] But from there I got pregnant with the child and. And I was single. And then I had to dedicate myself more to it. I could no longer devote myself to my studies, I had to give it up.

[12] We get up at 5 in the morning for this, because the sunlight is not as bright in the early hours.

[13] When I see the trucks passing by, I go there to get my little bottle. There I have a little bottle collected

> "o en mi lugar, cuando pasan los camiones, pues voy, voy a reciclar, pueden ver ahí tengo chatarra, tengo piscina, que es lo que nosotros recolectamos para venderlo."[14] (WP 6, l. 30-32)

Furthermore, the working day not just consist of picking up waste but also to organize/ sort it. After delivering what they have collected at each round at the landfill the waste pickers families came together to rest, eat and socialize with other waste pickers and their families. The materials waste pickers collect are determined by what they can sell and/ or use. Firstly, they are interested in collecting monetizable materials such as plastic, cardboards, glass-bottles, cans, e-waste, as also metals. Interestingly, the waste pickers seem very well informed about the current prices they get for each of the materials:

> "*Él decide los precios, por lo menos ahorita la botella hasta doce está libre y la chatarra 50. El cartón a cinco reales. Todo por libra. Por libra el cartón a cinco reales, el aluminio que vale un poquito más, la las latitas rojas de jugo de coca-cola de cerveza. Eso cuesta 13 reales la libra* (…)"[15] (WP 2, l. 63-69).

This informed approach is evident in how the waste pickers strategically navigate the landfill environment. The waste pickers I accompanied displayed a remarkable proficiency in identifying areas and methods for locating valuable materials. Their expertise also extends to a nuanced comprehension of the timing and content of incoming waste deliveries. During the walking interviews, a waste picker clearly expressed her emphasis on plastic materials, stating their relatively higher market value and lighter weight compared to metal. This perception was demonstrated when she confidently predicted the arrival of a truck that is likely to bring a significant amount of plastic waste, showing her willingness in obtaining plastic bottles from the shipment. As per the findings in figure 6, only plastic waste and cans were collected during the landfill excursion.

[14] or in my place, when the trucks pass by, I go, I go to recycle, you can see there I have scrap metal, I have picinga, which is what we collect to sell.

[15] He decides the prices, at least right now the bottle is free up to twelve and the scrap is 50. Everything by the pound. The cardboard costs five reales per pound, the aluminium that costs a little more, the red cans of cocacola juice and beer. That costs 13 reais a pound.

Figure 6. During the time at the landfill. Bag of collected materials.
Source: Authors Own Work

Secondly, the waste pickers also collect “valuables” for themselves. These could be clothing, electronic devices, cement for their houses, as also toys for the kids. Pictured in figure 7 you can see how a child just picks up a card game from the landfill. This visual representation portrays with the qualitative interview findings that highlight how waste pickers rely on the discarded items they find, not only for economic survival but also for their daily necessities. During my time in the field, I observed waste pickers' homes, which served as a microcosm of their reliance on found objects. Children played at home with toys they found on the landfill. However, this phenomenon is not limited to toys; numerous common household items in their homes seemed to come from the landfill, exemplifying their reliance on these resources.

Figure 7. During the waste collection. Girl observes playing cards she found in the landfill.
Source: Authors Own Work

In conclusion, examining the demographic profiles of waste picker and the environment surrounding them reveals first insights of their livelihoods, characterized by notable patterns within the context of the informal recycling economy. Firstly, waste picking appears to be a family endeavour, rather than an individual occupation. In all cases observed, entire families are engaged in activities related to the informal recycling economy. In some cases, whole families are directly engaged in waste collection, spanning across various generations from young to elderly members. Furthermore, the family's involvement extends to tasks beyond waste picking, with certain members taking on roles as truck drivers or being responsible for unloading the waste from trucks at the landfill. In one way or another their work is connected to the landfill which they find in front of their homes. This closeness potentially influences their daily routines, habits, and social encounters, emphasizing the strong bond between their livelihoods and the landfill.

Secondly, waste pickers lives seem to be intricately linked to their surroundings. This is pictured in them constructing their homes from materials such as cardboard, tin, and plastic, as also giving a personal use to the found waste such as food, clothing and toys. Notably a high amount of household in the neighbourhood were constructed from simple materials, lacking critical infrastructure and stability. The practice of building the entire house – or at least parts of it – from materials coming from the landfill itself signifies the profound influence of the

informal recycling economy on waste pickers living conditions. Similar to the findings of Catherina J. Schenck, the recyclable waste not just holds monetizable value but also household items such as pots, pans, curtains, mattresses, and other furniture (C. J. Schenck et al., 2019). The worth of waste extends beyond its monetary value.

Finally, the most emerging descriptive pattern is that all interviewed waste pickers are women. This overrepresentation was further substantiated through non-participatory observations, seeing mostly women who move through the landfill in search of materials to make a living for themselves and their children.

At this point, it is important to acknowledge that this outcome may be attributed to the study' methodological approach, which made use of qualitative methods using a relatively small sample size generated through snowball sampling technique. This creates a research bias that cannot be ignored. It is crucial to note that the study does not claim to offer conclusive characterising patterns for the whole waste picker population, but instead delivers detailed insights based on the particular group surveyed and observed. Still, the gendered aspect of waste picking in the sample population can reveal valuable insights into the unique socio-economic dynamics and gender roles within this informal sector. The potential implications of this gendered dimension of waste picking, the mentioned familial engagement in the informal recycling economy and the waste pickers housing conditions will be examined in the forthcoming livelihood analysis.

5.2.2 The System of Informal Recycling Economy

The collected data provides significant insights into how the informal recycling system in the particular case of San Rafael del Sur functions. Indeed, always from the perspective of the waste pickers and observation made by me as a researcher. In spite of this study does not claim / or intend to be an investigation into the informal recycling system in Nicaragua, the data still offer an opportunity for comprehending how the livelihoods of waste pickers are connected to the nature of this system. In this sense, the following part will shed light on the system as perceived by me as a researcher and reflect on its relevance to the research question.

This informal system can be best described as a linear value chain, with waste pickers positioned at the initial stage, being active right after the municipal waste is uploaded at the local landfill. What happens before is seemingly a process where waste, coming from all sorts of direction and encompassing a diverse range of materials, is sourced/ collected from various channels including individual households, supermarkets, private stores, institutions and, from

streets, as even the health center of San Rafael del Sur. Waste pickers uniformly report that the waste is transported via government-owned trucks, as well as delivery vehicles from the city administration.

> *"vienen camiones de la alcaldía que son los que caminan pastoreando ellos y a veces vienen camiones particulares, como digamos, vienen personas que limpian su casa y se acaban como chinga"*[16] (WP 1, l. 48-50)

Figure 8. Waste delivery truck drops load of waste on the landfill
Source: Authors Own Work

The picture (figure 8) of the delivery truck on the landfill provides a tangible representation of the environment in which waste pickers are forced to work. It's evident that no functional waste segregation is at place before the waste arrival at the landfill. This is reported by the waste pickers, as well as further confirmed by my stay in the field, the observations made, and the photos taken. All types of waste are present: organic waste, plastics, paper, glass, metals, and electronic equipment. Only a fraction of this can be monetized, according to the waste pickers.

The material prices are directed by an intermediary buyer that seems to come to the neighbourhood once in a while. (WP 1, l. 68-69 / WP 5, l. 18-19 / WP 6, l. 46-49) He is the only purchaser/ buyer and therefore obtains a monopoly position. In other words, waste pickers

[16] trucks from the mayor's office come and they are the ones that go around and sometimes private trucks come

do not engage with private entities or recycling companies directly. Moreover, they wait for the arrival of this middleman. According to the waste pickers he is an individual who has string relationships to the public authorities and the mayor of the city:

> *"Viene un señor en el camión a traerlo, a veces no viene y ellos se van para usted consiguen así carretón y lo llevan hasta allá afuera a compran. No es una empresa, eso es de Managua. Y el que está organizado aquí se llama Eliécer Molina, que es el encargado que él viene a darte a comprar*[17]*"* (WP 2, l. 60-63)

If we take a look at the value chain illustrated by Barford and Ahmad (2021) in figure 1, this individual takes indeed the place of the middle agent in the "informal recycling economy pyramid" (Barford & Ahmad, 2021). This position provides valuable entry to recycling plants, particularly those that might be located in the capital city of Managua. In the academic literature the middle agent is recognised for their broad network of contacts within the recycling industry. This central placement within the value chain enables him/ them to ease the transition of materials from waste collectors to recycling plants, making an essential contribution to the efficiency of the informal recycling economy (ibid.).

At this point, no further inquiries were made. The extent to which the middleman is exactly related to other stakeholders remains unclear and can only be assumed. If he directly interacts with the recycling companies or is also dependent from another middleman / agent couldn't be answered.

Nonetheless, the interviews revealed that he is significantly impacting the earnings of waste pickers (WP 1, l. 74-77 / WP 2, l. 63-69 / WP 6, l. 46). The waste pickers deemed their interaction with the intermediary of high importance, as it is the determining factor for the value of the collected materials, calculated per weight. As we already know waste collectors exhibit a profound comprehension of the current market prices or at least what they receive from the middleman. Knowing exactly what the pounds of each sort of waste values in economic terms. Hence, they expressed their discontent on the fluctuate nature of the prices and ultimately they earnings.

[17] A man comes in a truck a deals with it, sometimes he doesn't come and you have to bring the stuff to him. He doesn't work for a a company, he is from Managua. And the one who is organises it here is called Eliécer Molina, he is the one in charge and he comes to give you the money (for the valuable materials)

"*Y los precios cambian cada día."*[18] (WP 6, l. 46)

"*Varían según el precio de los materiales en el mercado"*[19] (WP 7, l. 50)

In conclusion, the collected data presents an unfinished mosaic of the informal recycling system, but offers insightful glimpses into a particular aspect: Within the value chain, a pronounced power imbalance is existing between waste pickers and the middleman. From the waste pickers perspective there is no room for negotiation and decision-making. They are exposed to what they get offered and, are according to them particularly under pressure, since selling waste is their only source of income. They are fully dependent from this middleman. The dependency is the product of the nature of informal economies and the monopoly position of this middleman. In this sense, the identified power asymmetry influences waste pickers livelihoods, especially in terms of economic security.

During the coding process, the theme of power imbalance within the informal recycling economy emergent as very present topic, consistently brought up by the waste pickers when the interviews were conducted. In other words, the existing system positions waste pickers in a disadvantaged position in terms of decision-making processes. Giving them literally no influence over the dynamics of the informal recycling economy. They are positioned at the base of the pyramid, making them vulnerable within this hierarchy and limiting their ability to claim rights, negotiate better working conditions, or receive fair compensation for their work. The interviews showed that the power imbalance greatly hinders efforts to improve living conditions.

5.3 Livelihood Analysis along the identified dimension of poverty/ deprivation

5.3.1 Economic Insecurity

In light of the research question economic insecurity is defined by a range of uncertainties related to financial stability. It's important to distinguish this understanding from the quantitative definitions of poverty such as those set forth by the World Bank, where extreme poverty is characterized by living on less than 2.15 USD a day (World Bank, 2022). Influenced by Sen's capability approached, this study recognizes that economic insecurity is a multidimensional phenomenon that deeply impacts waste pickers livelihoods beyond monetary

[18] The prices (for the valuable materials) change on a daily basis

[19] The vary according to the market prices

thresholds. It is evident that waste pickers face financial constraints and often live below the poverty line. The purpose of this study is to provide insight into the specific ways in which waste pickers are affected by these constraints, the decisions they make, and the strategies they employ to manage their limited resources.

The findings align with the recognition that economic insecurity encompasses more than just income levels, but also includes the broader capabilities and freedoms that individuals require to flourish in the intricate dynamics of the informal recycling industry. The extent to which this manifests itself in waste pickers livelihoods will be illustrated in the following.

The most obvious emerging pattern of economic insecurity, as dimension of poverty, is reflected by/ in waste pickers income. Waste Picker 1, shared during the interview that her daily earnings from collecting waste move around 50 to 100 Nicaraguan Cordoba's, equivalent to approximately one to two US Dollars.

> *"mínimo si hacen que 100 reales a como 50 este ocasiones pues dependiendo a como esté el producto*"[20] (WP 1, l. 62-63).

She is the not only one in this narrative. All interviewed waste pickers report that the income they generate scarcely covers basic human needs like food and nutrition. Their gaining's slightly vary from waste picker to waste pickers, but consistently fall below or are very close to the World Bank's defined poverty line. For instance, Waste Picker 2 who has to feed a family of five people reports that just on a "good day" they make 100 Cordoba's from waste picking:

> *"Pues no ganamos tanto a veces que ciento pesos, a veces que cincuenta veces, porque cuando esta malo bastante*"[21] (WP 2, l. 20-21)

Explaining that what she gains from waste picking is for her children and the house. Stating that the expenditures are high and their earnings just are enough for their basic needs:

[20] The minimum is made from $100 to as much as $50, depending on how the product is valued.

[21] Well, we don't earn that much, sometimes a hundred pesos, sometimes fifty times, because when it's bad

> *"ya que los gastos pues son bastante, por lo que tenemos niños pequeños de leche para alimentarnos, pueden buscarles para aunque sea para su arroz y por no dejarlos pueden aguantar hambre*"[22] (WP 2, l. 8-10)

It becomes evident that waste picking is a matter of survival rather than a simple occupation within an informal economy. Waste pickers are very limited when it comes to do economic decision since the entire income is spent on food and housing. How deep this economic insecurity goes, is especially shown by Waste picker 3 explaining that in cases the income is not sufficient for buying food she also looks for leftovers in the landfill:

> *"A veces salen cosas de carne, pollo y nosotros ese para decirle…. a veces nosotros lo recogemos. Viene, bueno, lo lavamos, lo estamos, lo preparamos*"[23] (WP 3, l. 50-52)

The fact that the landfill not only symbolizes a source of income but also directly as food resource underlines the economic insecurity waste pickers change. She even argues that she has no shame in doing because this is "the reality she life's in" (WP 3, l. 48-52).

Furthermore, the economic landscape is characterized by a significant level of income variability and instability. As we already known a potential root cause for this income instability lies in the respective nature of the informal economy, where a middleman[24] decides on the daily income opportunities of waste pickers. The waste pickers are not informed about certain individual preferences or market trends that influence the decision-making process. This knowledge gap puts them in a fragile position of economic insecurity, leaving them uncertain if the waste they collect will cover their basic needs for survival. The interviews revealed that this situation causes mental stress and burden for the waste pickers. For example, Waste Picker 3 reports on the daily concern that there may not be enough recyclable waste available at the landfill.

> *Porque figúrese que a veces hay chatarra, a veces no hay, porque somos bastante compañeras que caminamos muchas arriando, entonces la que no agarra una, agarra*

[22] because the expenses are so high, so we have small children that we have to feed with milk, its hard to provide it even the rice, I can not leave them hungry

[23] Sometimes meat can be found at the landfill, and I am telling you... sometimes we pick it up. It comes, well, we wash it, we prepare it and eat it.

[24] At least in the perspective of the waste pickers

la otra, la chatarra, entonces no nos sacamos la barbaridad que se medio"[25] (WP 3, l. 35-38)

The statement of Waste Picker 3 also brings the aspect of competition and occurring conflicts between waste pickers to the surface. An issue that was brought up in many interviews conducted. Reports of disputes and clashes within the waste picker community were part of the narratives (WP 1, l. 97-99 / WP 2, l. 49-53). For instance, Waste picker 1 and Waste Picker 2 state that they compete for the items as not all the waste which can be found at the landfill is monetizable and collecting valuable materials embodies a matter of survival:

"Y tambien hay conflictos. Hay como problemas, problemas si, ocasiones adicionales, si personas y ahí se pelean por ocasiones como por piscinga, porque la situación está muy mal aquí y ahí y hay varios"[26] (WP 1, l. 97-99)

"Hay muchos conflictos en las familias, también por la colectura de la basura. Porque por lo menos ya con la hermanita de Ana, así viven ellas peleando, pelean por botellas, pelean por chatarra. Entonces yo le digo no, no peleen, no peleen por bote, ahí vendrá y va a venir otra bendición mejor, que tal vez les traen otro, otra cosa más de valor, Entonces sí, sí, los conflicto hay bastante siempre por el reciclaje"[27] (WP 2, l. 49-53)

Reports from Waste Picker 1 and 2 highlight conflicts arising from resource disputes and difficult living conditions, with a focus on family dynamics where a "survival of the fittest" mentality seems to be prevalent among waste pickers. Although I did not personally witness any conflicts during my time with the waste pickers and their families at the landfill, it is evident from their testimonies that such incidents do occur. The interactions observed between the two families of waste pickers were amicable. However, it is important to note that I only spent two days at the landfill and my presence may have influenced the waste pickers' relations and interactions. Nevertheless, the observation revealed that waste pickers are highly aware of the arrival of each delivery truck and the potential value of its cargo. Based on these arrival times they plan their working hours. Starting already at 5AM in the morning. It became evident that

[25] Because sometimes there is waste, sometimes there is not, because there are many of us who walk around a lot, so the one who does not get one, gets the other, the waste, so we don't get rid of the barbarity that is half of the waste.
[26] And there are also conflicts. There are like problems, problems yes, additional occasions, yes people and there they fight for occasions like for "waste", because the situation is very bad here and there and there and there are several
[27] There is a lot of conflict in the families, also over rubbish collection. Because at least with Ana's little sister, that's how they fight, they fight over bottles, they fight over junk. So I tell them no, don't fight, don't fight over the cans, there will come another better blessing, maybe they will bring them another one, something more valuable, so yes, yes, there is always a lot of conflict over recycling.

the waste pickers do this also because they want to get the valuable materials before other do so (WP 3 / l. 15-17).

In this sense, the recurring theme of competition and conflicts between waste pickers underlines the daily effort for getting valuable materials, which has its root cause in the economic insecurity waste pickers are exposed to. They seemingly need to adapt anti-social behaviour in order to cover for food and other basic needs. To put in the words of Bertolt Brecht: „Erst kommt das Fressen, dann kommt die Moral - Grub first, then ethics“[28] (Brecht, 1928).

As already revealed, waste picking, within this particular context, can be described as a collective family endeavour, wherein single mothers often take their children to the landfill with them. This was uniformly reported by the waste pickers and confirmed by the participatory observation made on the field. Figure 9, picturing the mother with her baby in the arm while her older daughter searches for valuable waste, demonstrates the interdependent nature of families who rely on waste-picking as a means of livelihood, with parents involving their children in their work practices.

Figure 9. Waste Picker holding her baby in the arm, while her older daughter scarves for valuable waste
Source: Authors own work

[28] Quote from the play "Threepenny Opera" by Bertolt Brecht (1928)

Waste picking as family effort seems to be a result of economic necessity and introduces an interplay between economic insecurity, educational opportunities and child labour. What can be taken from the raw data is that children support their mothers directly at the landfill and therefore attend school less frequently or even not at all. In fact, only waste picker 6 reports that all her children are given the opportunity to go to school:

> "*Los tres Tengo en la escuela. Sí, los tres. Porque la otra. Esta tiene cuatro meses. Claro que no puede jaja*"[29] (WP 6, l. 58-59)

In other cases, the children's attendance at school is irregular. For example, in the family of waste picker 2, only one of her children participated in school during my field stay/ visit. The younger sister of Waste Picker 1 does not participate in the school system after all and works, as her sister, full time at the landfill in order to support the family (WP 1, l. 5-7).

The involvement of children in waste picking is driven by two closely intertwined factors. Firstly, waste picker children assist their mothers at work in the landfill, increasing the family's total earnings. Therefore, children serve as an additional workforce for the family and play a direct role in meeting their basic needs. Conversely, if children prioritise their education and attend school regularly, the daily income of waste pickers' families may decline.

> "*Si lo más masivo que nosotros ganamos, que son que 100 reales, que si ya este a veces con los niños, pero como ahorita ya entraron a clase ellos, ya eso ya es baja para nosotros, porque cuando ellos andaban si ellos me ayudaban, porque por lo menos decían se empezó a ir sin peso y hubieran 200 para la casa, pero ya ahora ya no, ya no, porque ella por lo menos ahorita ya la once va para clase y ya viene hasta las cinco de la tarde*"[30] (WP 2, l. 23-27)

Waste Picker 2 explains that her children used to assist her in waste picking, which increased her income. However, now that they are attending school, they are unable to contribute as much. This highlights the trade-off between education and the opportunity to earn additional income for family necessities. Therefore, Waste Picker 2 expresses her dissatisfaction.: "Now that her daughter goes to school in the morning and returns in the afternoon, the family's income has

[29] All three I have in school. Yes, all three. Because the other one. This one is four months old. Of course she can't (laughing)
[30] Yes, the most we earn is 100 reales, which is sometimes with the children, but now that they've started classes, that's already low for us, because this was when they used to help me, but not now (my older daughter), not anymore, because at least now she goes to class at eleven o'clock and comes until five in the afternoon.

dropped significantly." This passage highlights the difficult choices that mothers face when making decisions about their children's education in the face of economic necessity. It also explains why only one of her children gets the privilege of attending school regularly.

Secondly, the financial burden of education also limits the access of waste pickers' children to education. Even if education is free in Nicaragua, the school system requires significant initial investments at the beginning of each school year. These expenses include essential items such as uniforms, shoes, and school supplies, which are estimated to cost between 50 and 100 US Dollars per child:

> "*gastos escolares son demasiado caros pa' nosotros ahorita. Y siempre sale mas caro cada ano. Todos los años nos piden que compremos uniformes nuevos que cuestan como 1.200 pesos. Los zapatos también son caros, aunque no me acuerdo bien cuánto como seis siento pesos. Y los cuadernos son un dineral, como 200 córdobas cada uno, y necesitan uno pa' cada clase. Por eso, a veces me las arreglo con un cuaderno de cinquo en uno que cuesta como 400 pesos*"[31] (WP 7, l. 36-41)

Interviews revealed that these investments are challenging for waste picker families, often leading mothers to priorities economic survival over formal education for their children:

> "*No puedo mandar mis hijos a la escuela. No puedo decir que están estudiando porque lo poco que gano no me da para ponerlos a estudiar a ninguno de ellos*"[32] (WP 4, l. 9-10)
>
> „*me gustaría mucho poder mandarlos a la escuela*"[33] (WP 7, l. 35-36)

The given circumstances contribute to the prevalence of child labour in these households. This is the reality of all seven waste pickers households. While waste picker 6 initially stated that all her children are given the opportunity to go to school, she further commits that she is still

[31] School fees are too expensive for us now. And it always gets more expensive every year. Every year they ask us to buy new uniforms that cost about 1,200 pesos. Shoes are also expensive, although I don't remember how much, like six hundred pesos. And the notebooks are a lot of money, about 200 córdobas each, and they need one for each class. That's why sometimes I get by with a five-in-one notebook that costs about 400 pesos.

[32] I cannot send my children to school. I can't say that they are studying because the little money I earn is not enough to send any of them to school.

[33] I would very much like to be able to send them to school

dependent on their daily assistance after school time. Leaving her children with the double burden to carry their education/ school homework's and bags of recyclable waste on their bags.

> *"Pero ellos cuando vienen del colegio. Pues ellos vienen a ayudar a ir a los camiones. Y cuando no van a clase, también van a ayudar en los camiones."*[34] (WP 6, l. 61-63)

In conclusion, families engaged in waste picking are faced with the dilemma of sending their children to school or get higher earnings. Being engaged in waste picking limits children's access to education. Conversely, when children prioritize their education and attend school more regularly, the family's daily income experiences a decline. This interplay leaves waste pickers with a difficult decision, where economic necessity frequently takes precedence over educational opportunities. This tendency reflects the theory in development economics which emphasizes the preference for immediate gains over future benefits, known as hyperbolic discounting in behavioural economics (Kremer et al., 2019). In other words, the perceived cost of sending the children to school today and suffering a reduced income may outweigh the costs of tomorrow and influence the decision-making process of waste pickers.

In the words of Amartya Sen, children's involvement in waste picking activities constrains their ability to access quality education and develop their potential. This trade-off demonstrates that economic instability directly affects available opportunities. The interdependence between economic instability, child labour, and educational access remains a central theme in the lives of waste picker families in San Rafael del Sur. This reflects the broader dimensions of economic insecurity that shape waste pickers' livelihoods.

5.3.2 Social Exclusion and Discrimination

While the academic literature on the informal recycling economy often portrays waste picker as subject to social exclusion who are exposed to marginalization and discrimination (Coletto & Bisschop, 2017; S. M. Dias & Samson, 2016; Morais et al., 2022), this particular dimension is not prominently evident in the collected data. None of the seven waste pickers reported episodes or experiences where they were subjected to discrimination in San Rafael del Sur. Social disputes and experiences of vulnerability manifested themselves more in form of

[34] But when they come from school. Well, they come to help to go to the trucks. And when they don't go to school, they also go to help in the trucks.

conflicts between the waste picker community itself. Conflicts which originate from the economic insecurity discussed in the chapter above:

> *"porque somos bastante compañeras que caminamos muchas arriando, entonces la que no agarra una, agarra la otra, la chatarra, entonces no nos sacamos la barbaridad que se medio*[35]*"* (WP 3, l. 35-38)"

The waste pickers' testimonials did not include disputes between them and other residents. But that does not mean that they are not part of their reality. It is worth noting that the study did not thoroughly investigate biases against waste pickers, as it only conducted interviews with waste pickers themselves.

Moreover, based on my field observations, it is evident that waste pickers have formed their own community. This neighbourhood is isolated from the rest of the city, as evidenced by the deteriorating infrastructure and the unmetalled end of the road. The waste pickers operate on-site at the landfill and do not engage in scavenging on the city's streets for valuable materials, which is a common practice followed by waste pickers in other contexts described in the case studies of South Africa (C. J. Schenck et al., 2019; R. Schenck & Blaauw, 2011) and Latin-America (Morais et al., 2022).

In other words, the geographical segregation of waste pickers could also play a role in social exclusion. "La Chureca" is not comparable to other neighbourhoods in San Rafael del Sur. In this sense, the fact that the interviewed waste pickers did not mention experiences of social discrimination might indicate limited interaction outside their immediate circles. Due to social exclusion which comes in the form of geographical segregation. In addition, instances of political discrimination came to light and will be further explained in a following chapter.

5.3.3 Environmental Risk

In analogy to the street vendors in Delhi who face heightened environmental risks during the winter months[36], the waste pickers in San Rafael del Sur are also exposed to environmental

[35] because we are quite a lot of women who walk around, so whoever doesn't grab one, will grab the other, the scrap metal, so we face the barbarity that we are part of

[36] Air pollution in Delhi tends to be highest during the winter months, particularly in December and January. This is due to a combination of factors, including weather conditions that trap pollutants close to the ground, increased emissions from sources like vehicular traffic and industrial activities, as well as the widespread practice of crop

hazards while they carry out their work. The waste pickers in "La Chureca" life in proximity to and operate in the landfill, exposing them to daily risks associated with moving through dangerous materials, inhale toxic smoke and waste and generally working in unhygienic conditions. As the interviews and field visit revealed the landfill is characterized by bad waste management showing a lack of waste segregation system. According to the waste pickers all the municipal waste ends up in the landfill. This includes also organic waste such as dead animals and waste coming from the local health centre:

> "*Viene de todo, de todo bien, ahí en la basura hasta tiran perros muertos, cosas así de mal olor. Ya, sí, cosas de los hospitales*"[37] (WP 1, l. 72-73)
>
> "*Y no crea que sólo viene en la botella las latas no, ahí viene todo cochino. Sí, porque es un botadero, pues donde la gente anda manchando toda cochina de la basura. Parece enfermo*"[38] (WP 1, l. 76-78)

As can be taken from the testimonial, observations and photos the region lacks a crucial waste segregation system, resulting into an accumulation of all types of waste. The waste pickers complained that, apart from the environmental consequences, the disposal of non-monetizable waste complicates their effort to collect recyclable waste (WP 1, l. 83-84). Hence, apart from the resulting environmental risks, the absence of segregation intensifies their economic insecurity and adds to the challenges they face in making a living.

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burning in neighboring agricultural regions. These factors together contribute to the spike in air pollution levels during the winter season in Delhi (Chatterji, 2020)

[37] It comes from everything, everything well, they even throw dead dogs in the rubbish, smelly things like that. Yeah, yeah, hospital stuff

[38] And don't think that only the cans come in the bottle, no, everything is dirty. Yes, because it's a dump, where people go around smearing all the filthy rubbish. It looks sick

Furthermore, since the search for valuable waste in the landfill is more time intensive, the waste pickers are exposed to these environmental hazards for a longer period of time. The observation confirmed that a lot of time is "wasted" in digging through waste and this under high temperature and a midday sun causing skin burns. The waste pickers uniformly report sunburns and heat strokes (WP 2, l. 13-14). Figure 10 also shows that the waste pickers use tactics to escape the sun. A young girl uses a cardboard box she found on the landfill as a sunshade. A picture that also draws attention to the fact that waste pickers work on the landfill without protective clothing.

Figure 10. Family on the way back after a day's work at the landfill. The girl is wearing a cardboard box on her head.
Source: Authors Own Work

In their pursuit of valuable waste, the waste pickers are forced to navigate an environment full of potentials dangers, which comes in form of toxic materials and sharp objects, like metals and broken glass (s. figure 11). As a result, work-related accidents seem to be inevitable. All interviewed waste pickers reported of such incidents where they fell from trucks and/ or cut themselves from sharp objects hidden in the mountains of waste. This aspect furthermore observed during the field visit. The waste pickers carry many scarfs on their skin underlining the lack of protective gear while navigating through a dangerous environment (s. Figure 11).

Figure 11. Chipped sharp glass at the landfill site
Source: Authors own work

Figure 12. One of the kids shows her scarf on her left leg. The scarf is very visible and resulted from an injury during her work at the landfill.
Source: Authors own work

Figure seven and eight shows the dangers of waste picking at the landfill. The presence of chipped sharp glass reinforces the observation that the landfill site is indeed filled with hazardous materials, waste pickers are exposed to not only potential toxic fumes but also physical dangers, like sharp objects. One of the younger waste pickers showing her scarf (figure 12), which resulted from a work accident, underlines it's consequences. Hence, children are particularly at risk from environmental hazards. The likelihood of injuries remains high due to insufficient safety gear and poor organization of the landfill waste.

> *"figúrese que caerse de los camiones, porque a veces nos trepamos a los camiones a bajar la basura para que ellos nos den tiempo de recoger las cosas, de recoger las chingas. Entonces sí, ese es el problema*."[39] (WP 3, l. 65-68).

Having a deeper look at the statement made by Waste Picker 3 it becomes evident that waste pickers knowingly adapt dangerous working techniques, in order to get first access to valuable waste. Waste pickers sometimes climb directly on the trucks to reach the valuable waste before others do. The lack of safety standards means that this endeavour is associated with an increased risk of injury. This does not seem to be an individual case; nearly all waste pickers interviewed report such accidents where adults and children are both affected:

> "*En ocasiones personas se han caído de los camiones porque a veces no se suelen subir bien. Ha habido bastantes accidentes ocasiones aquí de niños y de adultos también*."[40] (WP 1, l. 41-42)
>
> "*Se han caído, como le doy otra vez en camiones, porque ahí no! A veces uno se levanta y va sofocado y aquí es como el que se menea (...)*"[41] (WP 1, l. 94-95)

The frequency of such injuries is therefore connected to the economic necessity of waste pickers to make their living. The thrive to collect recyclable waste before others do and this in a physical environment full of dangerous materials leads to a permanent environmental risk waste pickers are exposed to. Accidents and injuries seem to happen on a daily basis and children are significantly affected by this (WP 1, l. 93). In other cases, these injuries can result into long-

[39] Imagine falling off the trucks, because sometimes we climb on the trucks to take the rubbish down so that they give us time to pick things up, to pick up the "chingas". So yes, that's the problem

[40] Sometimes people have fallen off the trucks because sometimes they don't get on them properly. There have been quite a few accidents here involving children and adults.

[41] They have fallen, as I give it again in trucks, because not there! Sometimes one gets up and goes suffocated and here it is like the one who wiggles

term chronical pains ultimately affecting the waste pickers productivity and income. For instances, Waste Picker 5 reported on a foot-injury which impacts her working capacities:

> *"yo tengo recorrido, no he ido ahorita porque he andado con dolorcito mi piecito. Entonces yo no voy todos los días. No, no voy todos los días porque entre vez se manejó manejo, fregado* y me duelen mis pies, estoy, padezco, padezco (…)"[42] (WP 5, l. 23-26)

Furthermore, environmental risk manifest itself in persistent bad air and toxic smoke in and around the landfill. As the pictures show, the landfill is covered in ash and smoke from the incinerations that took place. Waste pickers report that the toxic space invades their homes and affects them at work. Some even report chronic headaches and respiratory problems:

> "*La continua la contaminación que haciendo una herida y en el camión que viene viene basura con gusanos*"[43] (WP 6, l. 72-73)

The aspect of waste burning gives interesting insights into the interference between environmental risk and economic insecurity/ the economic necessity to make a living. The interviews revealed that waste burning is a practice applied by the waste pickers themselves (WP1, l. 80-83). Waste is deliberately burned to free up space at the landfill, to facilitate scavenging of non-combustible materials (such as metals) for profit. This practice generates harmful air pollution directly affecting the waste pickers health, posing a serious threat to their respiratory health (WP 1, l. 89-92 / WP 6, l. 72-72).

In addition, waste pickers approach the burned without any footwear which increases the danger of getting burned, as can be seen in figure 13 below. Waste pickers seem to accept these negative externalities because it is a way for them to get rid of non-recyclable waste. It could therefore be seen as a "lesser evil" in the eyes of waste pickers. In any case, they put the economic aspect before their own health.

[42] I have a route, I haven't gone now because I've been having pain in my little foot. So I don't go every day. No, I don't go every day because between times I have been driving and my feet hurt, I am, I suffer, I suffer, I suffer.

[43] The continuous contamination that making a wound and in the truck that comes in comes rubbish with maggots.

Figure 13. Waste picker looking for valuable materials in the middle of burned waste.
Source: Authors own work

In conclusion, the landfill environment itself poses significant environmental risks, exacerbated by the absence of a waste segregation system. This working place poses significant threats to waste pickers health and safety, and generally their wellbeing. Being engaged in waste picking is characterised by a high incidence of work-related accidents, including cuts, burns and infections, all directly related to the demands of the occupation. Despite their awareness of the health risks involved, waste pickers feel compelled to endure them due to the economic necessity of earning a living.

> "*Bueno, cortarlo, despinarlo con jeringa y infección de que vienen de otro lado. Pero ese es el trabajo del pueblo. No hay otro trabajo aquí*."[44] (WP 4, l. 26-27)

"This is the work of the people living here. And there is no other work here" - Waste Picker 4

5.3.4 Political Neglect

In the context of waste pickers' livelihoods, analysing political neglect as a dimension of poverty is crucial for understanding the systemic challenges they face. As the literature review

[44] Well, sometimes we get cuts and infection, that they come from somewhere else. But that's the work of the people. There is no other work here

shows, waste pickers often belong to marginalised communities and their voices are often overlooked in policy-making processes and waste management planning frameworks (S. Dias, 2012.; Morais et al., 2022). This exclusion from policy discussions and resource allocation directly affects their access to essential services, recognition and opportunities for advancement. Notably not many academic papers about waste pickers discussed the dimension of political neglect. Although this dimension is more complex than the other one discussed and is less evident from participant observation data, the interviews conducted revealed certain patterns that point to experienced political neglect by waste pickers.

Figure 14. Waste pickers holds a flag of the "FSLN" party.
Source: Authors own work

Firstly, besides political negligence, the political aspect itself appears to affect the living conditions of waste pickers. This is evident when observing the neighbourhood, where flags of the governing party "Frente Sandinista de Liberación Nacional" (FSLN) are displayed on certain houses. Some waste pickers also carried these flags, as demonstrated in figure 14.

At first glance, this is not unusual in a country like Nicaragua. Nicaragua is a one-party state where patriotism is practically enforced. Especially since the protests of 2018, the colours of the party are much more present than the colours of the national flag. During the period immediately after the protests and in the subsequent months, the national police confiscated any flags or garments bearing the colours of the national flag due to their perceived potential to

represent a symbol of resistance (Digital, 2020). However, the interviews revealed that the presence of the FSLN in the community of waste pickers is not a coincidence.

Some of the waste pickers brought to light that the pieces of land were directly given to them by the mayor of San Rafael del Sur. Hence, Waste Picker 1 reports that she received her piece of land in close proximity to the landfill directly from the city mayor after personal circumstances brought her into a precarious situation. In that way she got introduced into the waste picking occupation. Similarly, Wate Picker 6 was given the land by her father in law who got it from the city mayor. Once arrived they built their house and got engaged into waste picking.

> *"Y ahí me regalaron este terrenito y en medio de la recicladora pues me estaban manteniendo y sacó adelante estos terrenos"*[45] (WP 1, l. 22-23)

> *"El alcalde dio el terreno a mi suegro. Entonces mi suegro nos regaló un pedacito de terreno. Así fue que nosotros llegamos aquí y poco a poco hemos ido levantando pues las casitas."*[46] (WP 6, l. 12-14)

The involvement of local authorities in the provision of land to waste pickers, particularly in response to personal financial crisis or job loss, provides a certain link to the political dimension. While this study is not a journalistic investigation into the political intricacies of the informal recycling economy, it does acknowledge the presence of political elements, as evidenced by the prominent display of FSLN flags around houses in "La Chureca".

The relationship between waste pickers and political authorities appears to be fractured, despite supposed political courtesy. Waste pickers have expressed dissatisfaction with the lack of assistance from public authorities or community resources. They report that both governmental and non-governmental institutions have not provided any form of help to them or the community of "La Chureca".

[45] And then they gave me this little piece of land and in the middle of the recycler they were supporting me and I managed to get these plots of land.

[46] The mayor gave the land to my father-in-law. So my father-in-law gave us a little piece of land. That's how we got here and little by little we have been building the little houses.

"No, no, no tenemos apoyo de la alcaldía, no tenemos aquí, el alcalde no los ayuda nada, nosotros no, no tenemos ningún apoyo de."[47] (WP 2, l. 112-114)

"No hay ayuda del alcalde, no hay para nada, ni para una comida ni para que el que nos vamos a molestar, que queremos ir no lo vamos a molestar, que queremos plástico no hay nada"[48] (WP 4, l. 35-38)

The two statements above underline that the waste pickers of San Rafael del Sur feel left to face their challenges alone, with little interest or support from mayor or/ and the society. Indeed, they report that the mayor's main concerns seem to be in the trading of plastic or that recyclable materials are collected and given to the middleman but not their wellbeing itself. Hence, the city mayor didn't step foot in the district of "La Chureca" for the last three years. The last time he did so was to quiet down protests which were triggered by the waste pickers community:

"Del alcalde pues no en la verdad, porque el alcalde la donación que yo agarré fue hace tres años, tres años fue hace tres años de que nosotros hicimos protesta ahí en la entrada, porque ya la basura la teníamos ahí y los camiones no querían entrar más adentro. Tenimos la basura enfrente de la casa [49]" (WP 6, l. 99-103)

Three years ago, waste pickers in "La Chureca" experienced an unexpected shift in waste management procedures. Instead of being transported to the landfill, trucks started to deposit waste directly outside the pickers' homes. This alteration was due to complications arising from accessing the landfill during heavy rain. Responding actively, the waste pickers obstructed the lorries using a strategically positioned tree trunk, leading to a clash with the drivers and municipal authorities. Ultimately, the trucks had to cease this behaviour. In order to reduce tensions, the mayor made a visit to the neighbourhood with bags of food to demonstrate goodwill. This incidence of protest was a subject that was often discussed during my field visits and informal conversations with the waste collectors before the official data gathering process.

[47] No, no, we don't have support from the mayor's office, we don't have it here, the mayor does not help them at all, we don't, we don't get any support.

[48] There is no help from the mayor, there is no help for anything, neither for a meal nor for the one we are going to bother, we want to go we are not going to bother him, we want plastic there is nothing.

[49] Well, not from the mayor, not really, because the mayor's donation that I got was three years ago, three years ago we protested there at the entrance, because we had the rubbish there and the trucks didn't want to go inside any more. We had the rubbish in front of the house

This episode sheds light to the dimension of political neglect for two reasons. Firstly, waste pickers realities and interest have been totally excluded from the municipal authority's decision in dumping the waste way before the landfill. The lack of existing infrastructure led to a decision that came at the expense of the waste pickers who were the most impacted. They seem to have no real voice or influence in waste management practices. They seem to have no real voice or influence in waste management practices. Their only form of being heard is through forms of civil unrest which, interestingly, have been "successful", at least in the short term. In the long term, things haven't really changed much. That's evident from the absence of the mayor in the neighbourhood, as reported by the waste pickers. This suggests that the situation of the waste pickers has not improved significantly.

Second, the mayor's distribution of food parcels can be interpreted as a symbolic act designed to "appease" the waste pickers rather than address the underlying problems. This incident illustrates how political leaders can use goodwill gestures to quell discontent, rather than implementing significant and lasting solutions that would improve the lives of waste pickers. This particular situation highlights the wider problem of political neglect and instrumentalisation of waste pickers' livelihoods.

Furthermore, Waste Picker 7 also reported that every further discontent about the situation is answered with threats of removing the landfill to another area:

> *"Cada vez que decimos algo nos amenazan con llevar la basura a algún lugar lejano"*[50]
> (WP 7, l. 69-71)

This shows that local authorities seem to be aware of the difficulties faced by waste pickers and appear to be politically exploiting this dilemma. Although the waste pickers problems are mainly due to living near the landfill, it's (the landfill) still their main source of income. The authorities apparently use this situation to prevent waste pickers from speaking out. This highlights the political neglect experienced by waste pickers in San Rafael del Sur. This could severely limit their ability to demand better living conditions, as they are marginalised by the authorities and excluded from decision-making processes.

[50] Every time we say something they threaten to take the rubbish somewhere far away.

5.3.5 Gender Inequality/ Injustice

During the coding process, it became clear that gender injustice was a significant factor influencing the experiences of waste pickers. The analysis revealed distinct patterns of inequality, suggesting that gender challenges intersect with other dimensions of poverty, further complicating the livelihoods of waste pickers. In other words, the collected data underlines that the gender dimension of waste picking goes far beyond the demographic finding that all interviewed waste pickers were women. Of course, this also means that no comparison is possible. As no male waste pickers were interviewed, it is not possible to analyse the extent to which the realities of life differ between men and women and whether this is due to entrenched relations of inequality.

The data suggests this is due to the division of labour within the informal recycling economy. The photographs and observations further demonstrate that waste picking is solely conducted by women and children in this specific context and is also apparent in the work done by the children. The mothers were accompanied by their daughters during their work. Though men participate in the landfill and informal recycling economy, waste picking is not one of their activities. From the interviews it became clear that men are involved as truck drivers and transporters. Figure 15, picturing young men on the delivery truck while women's and a young girl engage in waste picking, illustrates the gender roles and labour division within the informal recycling economy, bringing attention to the unequal roles and responsibilities of men and women in the occupation.

Figure 15. During the waste collection. The family is at the landfill site where a delivery truck has just unloaded waste
Source: Authors own work

The analysis of the interviews has revealed that these objective observations are not coincidental and might go hand in hand with prevailing gender roles and forms of discrimination.

> "*estoy madre soltera, por eso me dedico al reciclaje*."[51] (WP 1, l. 10-11).
>
> "*mi trabajo aquí en la ciudad de andar recolectando porque soy madre soltera. Soy sola con mis hijos y con una hija fallecida que todavía me hace falta*"[52] (WP 4, l. 5-6)

As can be taken from Waste Pickers 1 and 4 statements for the reason of being a single mother she has no choice but to gain money and work as waste picker. Waste Picker 1 narrative is connected to her story of becoming pregnant at a very young age. Therefore, she had to drop out of school. As a result, she only finished primary school. This limited her opportunities and made it harder for her to find other ways to support herself. It is possible to deduce that the young mother had to procure a means of living for herself and her child independently since

[51] *I am a single mother, that's why I do recycling*

[52] my job here in the city of going around collecting because I am a single mother. I am alone with my children and with a deceased daughter that I still miss.

formal social aid was scarce. This aligns with scholarly research on waste-picking, which implies that individuals with limited prospects find waste-picking to be a viable choice.

> "*Pero de ahí salí embarazada del niño y. Y que soltera. Y ahí me tuve que dedicar más a ello. Ya no pude a mis estudios sino de dejarlo*"[53] (WP, 1.21-22)

Waste Picker 2's testimony portrays a similar situation where her husband's departure compelled her to move to "La Chureca" for survival. She used to live near León. However, her husband left her for another woman, leaving her to raise their children alone. This led her to start engaging in waste picking activities for her livelihood.

> "*Antes vivía. Le voy a decir alado de León. Sí, pero como él me dejó por otra mujer y me tocó criar a mis hijos sola, entonces yo empecé en estas chiquitas*" (WP 2, l. 56-58)[54]

Waste Picker 5 became a waste picker after her husband passed away, which left her struggling to cover her rent costs. In light of her fragile position she saw no other alternative then to get engaged in the informal recycling economy and move to "La Chureca":

> "*No había trabajo, no había reales para pagar el alquiler. Entonces vino mi marido y ya falleció él*"[55] (WP 5, l. 49-51)

These occurrences show that women are often forced to work in waste collection due to factors like losing a partner or experiencing financial hardship. Hence, how do these circumstances add to the problem of gender inequality in waste picking and the informal recycling industry?

Generally speaking, all three narratives might illustrate the deeply rooted gender roles and dependency dynamics often experienced by women in Nicaragua. A country where cultural expectations frequently relegate women to subordinate positions, especially regarding assistance and decision-making authority (*Country Fact Sheet | UN Women Data Hub*, 2021). Waste Picker 1 and 2 found themselves in vulnerable position with limited opportunities once traditional support structures failed or have been withdrawn. The experience of all three might

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[53] But from there I got pregnant with the child and. And I was single. And then I had to dedicate myself more to it. I could no longer devote myself to my studies, I had to give it up.

[54] I used to live. I'm going to say next door to León. Yes, but he left me for another woman and I had to raise my children alone, so I started with these little girls.

[55] There was no work, no real money to pay the rent. Then my husband came and he passed away

reflect a broader pattern of gendered dynamics that shape the lives of waste pickers and generally many women in Nicaraguan society.

Furthermore, the interviewed waste pickers are single mothers who suffer from the double burden of having to earn a living for themselves and their children. This double burden compels them to bring their children, including new-borns, to the landfill. Waste Picker 1, 4 and Waste Picker 5 emphasizes that they have no one else to oversee their children:

> "*hay ocasiones me tengo que ir a mi niña y a reciclar junto con mi niño porque no tengo quien me apoye*"[56] (WP1, l. 11-12)
>
> "*como no tengo quien me lo cuide, yo me lo llevo*"[57] (WP 5, l. 27)
>
> "*Una tiene que cuidar a ellos. Como nadie me los cuida tienen que venir comigo. Asi ganamos tambien poco mas*"[58] (WP 4, l. 45-46)

The observations made also underline the fact that children have to accompany their mothers not only for economic reasons. Paradoxically, the mother is forced to expose the children to

Figure 16. Waste picker searching for valuable waste with her stick.
Source: Authors own work

[56] there are times when I have to go to my child and recycle together with my child because I have no one else to support me

[57] as I don't have anyone to look after him, I'll take him with me.

[58] You have to look after them. As nobody takes care of them, they have to come with me. That way we earn a little more too.

these dangerous environments in order to take care for them. This is well portrayed in figure 16 below. What can be seen is a mother holding her baby in the arm while digging through waste with a stick. The image offers understanding into the interconnectedness of waste-picking families, with mothers incorporating their children into their work routines. Showcasing women's dual responsibility as waste pickers, and their struggle to take keep them safe with them. Thus, the occurrence of children on the landfill has not only an economic component, but also a protective one.

Gender inequality was evident in both - interviews and observations - in two different forms. Firstly, within the informal recycling economy itself, women actively engaged in waste picking endure more physically demanding and hazardous conditions. Secondly, gender inequality also emerged as a potential cause of their circumstances. Deep-rooted gender inequalities and injustices might have placed the women interviewed in a position, where engaging in waste picking becomes imperative for their survival. The dual responsibility of ensuring their own survival and that of their children further complicates efforts to break out of this cycle. This raises an important question: to what extent do prevailing gender norms and inequalities drive women, particularly in Nicaragua, to work as waste pickers in the informal recycling economy?

5.4 Waste Picker Livelihoods and Circular Economy Solutions

Exploring circular economy solutions in the context of waste pickers' livelihoods is a multi-dimensional inquiry. As the literature revealed circular economy solutions are shaping today's discourse on the informal recycling economy. The exact role they play is not always clear or discreet. This is partly because the term itself is very broad and appears in many different contexts. It could also be argued that it is simply fashionable to use the term, reflecting the prevailing trends and the “zeitgeist”. Nevertheless, when invoked, circular economy solutions are often positioned as a potential solution to improve the conditions of waste pickers, while contributing to broader economic and environmental goals (Anantharaman, 2021; Buch et al., 2021; Gall et al., 2020; Gutberlet, 2020; Gutberlet et al., 2017).

On the others side scholars like Kesha Fevrier puts green growth/economy strategies into question, contending they can perpetuate racial exploitation and capital accumulation. Fevrier emphasizes the need to consider historical, political, and economic factors when evaluating waste recycling as a sustainable economic strategy in the Global South (Fevrier, 2022).

In contrast to Kesha Fevrier, the analysis here is carried out at a micro level rather than at a macro level. It links the principles of circular economy solutions, under the context of green

capitalism, to the lived experiences of waste pickers, as captured by the available data, and seeks to identify how this theoretical approach may either address or exacerbate the practical challenges they face. This is done on the basis of the expert interviews and the livelihood analysis presented, which identified several dimensions of poverty.

In the realm of informal recycling economies, the cooperative model is emerging as a key methodology for empowering waste pickers. This model, often coupled with the formation of unions, has received considerable attention in recent academic literature and in waste management projects across the Global South, including pilot initiatives in India, Brazil, Chile and various other regions (Anantharaman, 2021; Buch et al., 2021; Gutberlet, 2020; Gutberlet et al., 2017; Morais et al., 2022; Navarrete-Hernandez P. & Navarrete-Hernandez N., 2018).

Although the model existed before the terminology of 'bottom-up circular economy solutions', recent academic work has placed it within this framework. This framing is important for aligning the cooperative model with current discourses and distinguishing it from the dominant technological and engineering-oriented circular economy solutions prevalent in the Global North or contexts with significant financial and technological capacity.

To reiterate, the cooperative model, which in most cases follows the formation of unions, can be an integral facet of circular economy solutions for several reasons. Firstly, it works within the existing system and seeks to improve the position of waste pickers within the dominant value chain of the informal recycling economy. Secondly, it aims to increase recycling rates by better organising waste pickers. Finally, it gives greater recognition and value to the invaluable work of these individuals and attempts to increase their influence.

Thus, the legitimacy of the cooperative model as a bottom-up circular economy solution stems from its alignment with the core principles of empowering waste pickers, increasing recycling rates, and addressing the unique contextual challenges faced by absent waste management sector. As this model gains prominence in the discourse on informal recycling economies, recognition of its bottom-up nature becomes integral to both academic discussions and practical implementation.

Interestingly, both experts interviewed, Ms Tunesi and Mr Luppi, consistently emphasised the establishment of unions as a prominent endeavour, especially in regions where formal waste management systems are absent.

Mr. Luppi clarifies the forming unions are a necessary step for waste pickers. Municipalities and waste management companies often work with organised groups of waste pickers rather than individual members. If waste pickers need to be included in the formal waste management system, negotiations are initiated with the leaders of these groups.

> *"They usually don't speak with an individual waste speaker. They speak with the organizations of waste speakers. Then if they are obliged of involving the waste speaker, they speak with the leader and they negotiate with the leaders the involvement of this population in the formal system"* (Luppi, 2023, l. 20-23)

As can be taken from Luppi's statement unions or organised groups act as important intermediaries between waste pickers and municipal or waste management authorities. They facilitate communication and negotiation and ensure that waste pickers have a better voice within decision-making processes.

Indeed, the livelihood analysis identified the power imbalance within the informal recycling economy and political neglect as core dimensions of the poverty experienced by waste pickers in San Rafael del Sur. From the waste pickers' perspective, there is little room for negotiation or choice. They are forced to accept the terms offered to them and, according to their own accounts, are under considerable pressure as selling waste to given prices since it's their only source of income. They find themselves completely dependent on these intermediaries. A dependency that is shaped by the inherent dynamics of informal economies and the dominant market position of these middleman's/ intermediaries. This power asymmetry has a significant impact on the economic security of waste pickers, exacerbating their vulnerability. They are also marginalised by public authorities and often excluded from key decision-making processes.

In this sense, the cooperative model could embody a promising way to improve the livelihoods of waste pickers in the context of power imbalance, political neglect and ultimately economic insecurity. By pooling their strength, the waste pickers in San Rafael del Sur may be able to exert greater influence in discussions with middlemen and municipal authorities, leading to more equitable arrangements. The equitable arrangement would come in form of higher earnings for waste pickers.

Simonetta Tunesi, however, questions the assumption that cooperatives might be a sustainable answer to the economic insecurity waste pickers face. She points out that valuable waste

materials, such as plastics, are often heavily contaminated when they are collected directly from landfills. This contamination significantly reduces their market value and therefore the revenue generated. In addition, the recycling value chain requires these materials to be thoroughly cleaned before being returned to the market, which requires additional resources and costs (Tunesi, 2023). Given the studied operating framework in San Rafael del Sur, where waste pickers directly work on the landfill site, the case for higher pay will be a difficult one to make. Tunesi's perspective highlights that, beyond issues of power dynamics, the prevailing market rules themselves are crucial in determining the earning potential of waste pickers (ibid.).

Ms. Tunesi continues by stating that, even in high-income countries, the revenues generated by recycling are inherently modest. The establishment of a comprehensive recycling chain is primarily aimed at mitigating externalities rather than maximising profitability (Tunesi, 2023). In the context of San Rafael del Sur, this implies that waste pickers will face ongoing difficulties if their compensation is solely based on the value of the recyclable materials they collect. Following Tunesi's rationale, it becomes evident that waste pickers in San Rafael del Sur, and potentially elsewhere, will continually face financial challenges if their compensation does not account for their significant role in reducing landfill waste and the environmental harm caused by inappropriate waste management practices (ibid.).

Coming back to the formation of cooperative as a bottom-up circular economy solution, Tunesi still underlines that any initiative empowering individuals is of importance. Luppi further emphasises that cooperatives can serve as a platform to advocate for better working conditions, including the provision of protective clothing and gloves, as also essential training and capacity-building (Luppi, 2023).

As revealed from the observations made the waste pickers in “La Chureca” work in a harsh environment without any protection. Waste pickers pick up the waste with their bare hands and do not have any adequate footwear. In addition, they are multiple hours exposed to the burning sun and toxic smoke affecting their health and productivity (s. WP 6, l. 72-73, / WP 1, l. 80-83). Environmental risks predominate and accidents at work seem to be a daily occurrence. The interviews underlined this link between the physical environmental and health risks faced by waste pickers. Following this logic, the provision of protective equipment and capacity building could indeed lead to a reduction in the health risks faced by waste pickers at the landfill, ultimately leading to a lower incidence of cuts and burns.

Nonetheless, it was found that waste pickers are well aware of the harmful practices they tend to do, such as burning waste or collecting it directly from trucks. Some of these actions are driven by economic necessity rather than a lack of knowledge or awareness. Hence, it's structural constraints deeply embedded in the informal nature of the recycling economy that limits waste pickers adoption of safer working practices. It can therefore be argued that mitigating the environmental risks associated with waste pickers' activities requires more than simply establishing cooperatives. Without a substantial process of formalisation and a decisive shift away from reliance on landfills, the persistence of environmental risks will remain inextricably linked to the continuing economic vulnerability of waste pickers.

In this context Luppi identified another problem: forming a union or cooperative may only replace one intermediary with another. While this may benefit some individuals, it will not significantly improve the situation for the environment or the social and economic wellbeing of waste pickers. The phenomenon of substitution, or as Luppi puts it, "a replacement of people in the intermediate ring of the supply chain" (Luppi, 2023, l. 33-34), is controversial since it's not free from the risk of enduring exploitation. Although it is perceived as democratic because members can vote for their leaders, internal power dynamics often undermine the real effectiveness of this democratic structure. In essence, the cooperative format may be more ideological than practical once applied on the field:

> *"Then cooperative is a very... It's a very ideological format, this format of the cooperatives. Because this appears as democratic, each member can vote the leader, but the relationship of strength inside the cooperative make that this democracy is not really effective."* (Luppi, 2023, l. 48-50).

The cooperative model can potentially give waste pickers a stronger collective voice within the system. However, it is important to recognise that they may still compete with each other if their interests are not aligned, as Luppi points out. This dynamic can also affect their relationships with other stakeholders in the informal recycling value chain. According to the livelihood analysis, municipal authorities have a vested interest in marginalising waste pickers from "La Chureca" and excluding them from key decision-making processes. Therefore, it can be assumed that they will continue to maintain the system as long as it remains profitable to them.

So far, cooperative model is an improvement over the prevalent method of individual waste picking, as seen in San Rafael, where independent waste pickers collect recyclable materials at

a local landfill. The collaborative structure of the cooperative model provides several benefits, including improved organizational efficiency, increased collective bargaining power, and better working conditions. Principles of the circular economy can therefore be better addressed. However, although the model has notable merits, it is clear that it is limited by the challenges inherent in the informal recycling economy. While the formation of unions addresses only some of the aspects highlighted in the livelihoods analysis, Luppi has introduced a model based in Mexico City that takes a more comprehensive approach. This model takes the central ideas of the circular economy and adapts them to the specific local context.

> *"Mexico City are more than ten millions of inhabitants. And it is like a miracle. That the waste is is well collected and that the city is clean and this miracle is possible thanks to the system that I have outlined you"* (Luppi, l. 169-171)

The system referred to by Mr Luppi is known as the "Azteca Model". The model focuses on optimising the efficiency of the existing informal waste collection and recycling system in Mexico City. A detailed description of the concept is beyond the scope of this analysis. It uses a door-to-door collection system where waste pickers work directly with households. This model is based on informal coordination with the formal municipal waste collection system, creating a functional bottom-up economic flow. Unlike the cooperative model, the Azteca model does not simply replace one set of intermediaries with another. Instead, it enhances the existing system, recognizing its effectiveness and making strategic improvements, without imposing external European-style models (Luppi, 2023).

In the specific context of waste pickers in San Rafael del Sur, the Azteca model offers a crucial advantage: it removes waste pickers from the dangerous environment of the landfill. The identified environmental risks and associated health hazards, as well as the other multiple dimensions of poverty experienced by waste pickers, are largely due to their close association with the landfill. They literally work and live (in proximity to) this physically hazardous terrain. Luppi agrees that the coexistence of waste pickers and landfills is fundamentally unsustainable for real progress.

> *"the Latin American government needs to improve the waste management system. And this improvement, this evolution is not compatible with the presence of waste pickers in the landfills. Okay. This is not compatible. It's not okay. It's not possible. No possible to to maintain this population inside the the landfill"* (Luppi, l. 75-77)

Shifting the waste pickers activities from landfills to street-based door-to-door collection, as implied by the Azteca model, could indeed reduce environmental risks. Furthermore, this also holds the opportunity to improve the economic status of waste pickers by ensuring that they are dealing with less contaminated materials, helping them to generate higher prices for it.

Moreover, the model presented introduces a dimension of income diversification. In this system, street cleaners/ waste pickers collect waste directly from households and are paid according to the amount of waste collected. According to Luppi, approximately 30% of the system's operation is covered by formal salaries, another 30% by direct contributions from housholds, and the rest by the sale of recyclable materials (Luppi 2023, l. 144-146).

This income diversification described in the Azteca Model is interesting because it brings in some aspects of "payment for environmental service" (PES). The waste pickers receive a payment proportional to the amount of waste they collect. This creates a "pay as you throw" system where households pay according to the amount of waste they produce. The municipality allows this informal coordination because it recognises its effectiveness in waste collection (Luppi, 2023).

In addition, extending compensation to the cleaning service itself could lead to a significant increase in income for waste pickers. Answering to the low and fluctuate prices of the materials (WP 6, l. 46). This potential increase in income exceeds what could be achieved by negotiating higher prices for the recyclable materials they collect alone. Such a development offers a significant opportunity to address the deep-rooted challenges of economic insecurity faced by waste pickers in the context of San Rafael del Sur. Since the livelihoods analysis revealed a link between economic insecurity and pressing issues such as child labour, limited educational opportunities for their children and increased health risks, the extra income would be highly needed for a significant improvement in waste picker well-being. By targeting economic insecurity through avenues such as the PES approach there is potential to alleviate these multiple deprivations. In what way, of course, will need to be the subject of further studies.

Another important aspect is the increased cooperation with the municipal authorities. In contrast to the cooperative model, the Azteca model demonstrates a high level of commitment and involvement of the intermediate levels of the municipality, which plays a key role in the effectiveness of the system. In the case of San Rafael del Sur one of the main challenge waste pickers faces is political neglect. Their relationship is characterized by distrust and discontent.

While waste pickers complain about a lack of support, municipal authorities seem to have little interest to include waste pickers better in waste management practices.

The collected data suggests that the current system of informal recycling economy in San Rafael del Sur is characterized by disorganized competition among various stakeholders including municipal authorities, waste collectors/ intermediaries, and waste pickers (WP 2, l. 68-69). This poses a significant challenge in implementing a functioning system where waste pickers can benefit from. At this point some waste management experts would argue that a transition to a formal system is required to address these weaknesses within the informal value chain. However, this requires a high level of investment and, when implemented, often leaves the waste pickers out of the process (Fahmi & Sutton, 2006; Hartmann, 2018; Kasinja & Tilley, 2018). As a case of "La Chureca" in Managua has shown: Such exclusive formalisation can be very controversial[59] (Hartmann, 2018). In this context, the Azteca model could offer a more practical approach. It suggests integrating waste pickers into the existing system rather than completely transforming the entire waste management framework, which would require significant financial and logistical resources. By integrating waste pickers into the existing system, the municipality can allocate fewer economic resources compared to a complete system overhaul. In this way, waste pickers can make an effective contribution to waste management while minimising the need for major financial investment and large-scale restructuring.

In addition, local authorities could recognise the benefits of cleaner streets, reduced pollution and improved recycling rates that result from diverting materials from landfill. Hence, this collaborative nature of this model illustrates a potential pathway to answer to the dimension of political neglect and power imbalance waste pickers face as it could not only empower waste

[59] La Chureca garbage dump site in Managua, Nicaragua, which was one of the largest open-air garbage dump sites in Central America. For years, waste pickers lived and worked in the dump site, collecting recyclable materials to sell and making a living from the waste they found. In 2013, the Nicaraguan government implemented a new policy aimed at closing the dump site and transitioning to a more formal and modern municipal waste management system. The policy included the construction of a new landfill, the establishment of a recycling center, and the incorporation of waste pickers into the new system. In his article 2018 published Artivle Hartmann highlights that the privatization of waste management services and the implementation of exclusionary policies have severely impacted the livelihoods of waste pickers who were previously dependent on collecting recyclables from the dump site. Hence, the formalization and transition to technical more developed recycling system did more harm than good in the perspective of the waste pickers (Hartmann, 2018)

pickers, but also improve waste management and recycling performance with little investment. Therefore, the model could provide an attractive incentive for municipalities to improve the efficiency of their waste management operations without incurring the significant costs associated with a complete system transformation.

In light of the results of the livelihood analysis conducted in San Rafael del Sur, it's important to recognise the specific limitations of a circular economy solution like the Azteca model. Of course, apart from the fact that the model was only tailored to the Mexican context, it raises the question of transferability. Mr. Luppi also stresses that the success of the concept lies in the fact that the model is not an imposed European system, but one that has evolved from the local context (Luppi, 2023). It takes into account and improves existing informal waste collection practices. It recognises that there's no direct route to a functioning waste management system, at least in the short term.

However, while the model improves economic opportunities, working conditions and reduces associated health risks by diverting waste pickers from landfill work, it might not comprehensively address the multiple socio-economic dimensions of poverty experienced by waste pickers in this context.

A significant limitation may be its potential impact on child labour, a widespread problem driven by both economic necessity and the lack of alternative care options. The interviews revealed that this practice is deeply embedded in family structure and dynamics. While the higher income waste pickers might generate from this circular economy solution could help to overcome the economic barriers to schooling, it may not address the social barriers. Circular economy solutions that work within the system, such as the Azteca model, may not adequately address the systemic factors that drive child labour in this context. As we know the phenomena of child labour and the presence of children at the landfill in San Rafael del Sur is also the result of the double burden these waste pickers face. Coming from the fact that they are single mothers who do not receive any childcare support. This situation often leads to unequal educational opportunities, as children have to accompany their mothers due to lack of supervision.

This dimension is also highly intervened with the issue of gender inequality within the informal recycling economy and outside of it. The prevalence of single mothers in this population highlights a structural imbalance in caring responsibilities and economic opportunities. The burden of childcare falls overwhelmingly on women, hindering their ability to engage in alternative, more stable forms of employment. Moreover, gender inequalities and injustices

may have played a key role in shaping the circumstances of the women interviewed in San Rafael del Sur.

Finally, the Azteca model conceptualises a bottom-up circular economy solution, representing a significant progression in the landscape of waste management within informal economies. This model aims to empower waste pickers while strategically incorporating key elements of circular economy principles. Notable features of this initiative include the implementation of the "pay as you throw" approach, a departure from traditional landfill practices with door-to-door collection, and direct collaborations with recycling companies. These innovations have collectively improved the efficiency of the informal recycling value chain.

However, in light of this intersectionality between waste picking, gender, poverty and informal labour it remains questionable how a solution that works on establishing a more efficient informal recycling value chain can and/ or will address these deeply rooted challenges waste pickers are exposed to.

6 Conclusion and Outlook

6.1 Introduction

All over the world the legislation says that cities are responsible for waste management and not the central government. This creates a paralipsis, in many countries of the Global South, as the city authorities do not provide a functioning solid waste management system. The reasons why that is the case can be many – lack of knowledge, insufficient financial capacities, bad governance. Solid waste management is not considered a priority in many cases. This opens the door for the informal economy.

Waste pickers find themselves right at the bottom of the informal recycling economy pyramid (Barford & Ahmad, 2021; Morais et al., 2022). The informal nature of this economy is characterised by its unregulated, decentralised structure, where transactions often take place outside formal market channels, contributing to a lack of transparency and stability in the livelihoods of waste pickers. Waste pickers lack legal protection and social safety nets, making them vulnerable to the dynamics of this economy. The research aimed to explore the complex relationship between these vulnerabilities and the role circular economy strategies could play in this particular context. By deepening our insights into the dimensions of poverty faced by waste pickers and discuss the potential effectiveness of circular economy concepts in

addressing these challenges, the research endeavours to promote a more inclusive and thorough dialogue surrounding circular economy solutions within informal recycling economies.

6.2 Waste Pickers livelihood analysis – Multiple dimensions of poverty

It can be argued that the informal recycling economy system plays an important reducing waste and the negative environmental impact on the landfill, as well as providing employment and income opportunity for the marginalized community of "La Chureca". The occupation covers the basic needs of the waste pickers families. They got engaged into waste picking because of socio-economic reasons. In fact, waste picking gives them an occupation opportunity that otherwise would be absent. It's not for nothing that that some scientific paper always speak of economic opportunity instead of economic insecurity (Hayami et al., 2006; Morais et al., 2022). Some of them even see the potential in waste picking as poverty alleviation (Hayami et al., 2006). While this might be true in some cases I would neglect this statement in the context of the waste pickers in San Rafael del Sur. The analysis of livelihoods has shown that economic insecurity is the root cause that led them to waste picking. Nevertheless, the current state of waste picking perpetuates their situation.

The interviews revealed that waste picking is not an economic decision, but a matter of survival for the waste picker. They do it because of the lack of viable alternatives. Their socio-economic position leaves waste pickers with few options, forcing them to continue in this occupation. The low and fluctuating income, combined with a power imbalance within the informal recycling economy, further reinforces their dependence on waste picking and perpetuates the cycle of economic insecurity. The waste pickers who usually earn more money per day, can rely on the help of their children. But the price they pay for this extra labour is limited access to education. As a result, child labour seems inevitable and limits the children's future opportunities. The social and personal costs they pay for this activity may be higher than the monetary income they receive. All this limits their potential to break the cycle of poverty.

The landfill itself embodies this complex dilemma, as it serves as a working and living space for the waste pickers. While it has negative impacts on the community of "La Chureca", it paradoxically provides an income-generating opportunity for the waste pickers. Living and working near and at the landfill is responsible for many related health problems faced by waste pickers. Toxic fumes, moving around unprotected in a dangerous environment, have a significant impact on the wellbeing of waste pickers. The problem is that waste pickers are well

aware of this but see no alternative as they need to make a living and reach/collect valuable waste before others do.

> *"La basurera. O sea que la puedes dejar como yo le explique. El primer día que se vino yo le dije de nos afecta porque sí nos afecta, pero es un beneficio porque de eso trabajamos, porque yo lo veo."*[60] (WP 6, l. 116-118)

As articulated by Waste Picker 6, the landfill can be seen as a double-edged-sword. It provides a means of livelihood but also brings significant suffering.

The complex relationship the waste pickers have with the landfill is also reflected in the social exclusion and political neglect they experience. "La Chureca" itself is a segregated neighbourhood from the rest of the city. Social exclusion is not as widespread as in other cases described in the academic literature, but this may be largely due to the fact that exclusion is already geographically given. It leaves little space for social interaction and forces waste pickers to build their own community. Walking through the direction, it becomes clear that the value of waste within this community goes far beyond its monetary value. Waste from the landfill is used to make houses, toys and other objects for daily use.

This is what makes waste pickers so vulnerable, as they are highly dependent on the landfill. Therefore, the exclusion and marginalisation they experience also comes from the municipal authorities. They seem to show little interest in properly involving waste pickers in municipal waste management practices. From their stories, it is clear that they have no voice in decision-making processes that fail to take into account their interests and needs. To the extent that municipal authorities use the waste pickers' dependence on the landfill against them. This relationship and power imbalance, which is characterised by competition rather than cooperation, will make future efforts very difficult.

Furthermore, waste picking has a gendered component and may be linked to norms and dynamics within Nicaraguan society that systematically place women in a disadvantaged position. These women found themselves in vulnerable positions, often with limited alternatives, reinforcing broader patterns of gender dynamics that shape their lives. The dual responsibility of making money from waste picking and taking care of their children leads them

[60] The landfill. I mean, you can leave it as I explained it. The first day he came, I told him that it affects us because it does affect us, but it is a benefit because that is what we work for, because I see it as a benefit.

to take them with them to the landfill, exposing them to a dangerous environment and opening the door to child labour. This paradox illustrates how engagement in waste picking can be deeply intertwined with existing social inequalities, particularly for women in Nicaragua.

In conclusion, the challenges faced by waste pickers are deeply rooted in socio-economic inequalities. I agree with Coletto & Bisschop (2017) assessment that the dynamics of inequality and poverty drives these individuals into waste picking. Nonetheless waste picking is an occupation that keeps them stuck there, at least in the context of my research sample. Involvement in the informal recycling economy may not be the cause of many dimensions of poverty, but it certainly perpetuates them. It is difficult to distinguish between cause and symptom in this informal economic sector. What has become clear, however, is that the problem goes far beyond low income and lack of protective equipment. The system cannot continue in its current form, which brings us to the discussion of circular economy approaches.

6.3 Conclusion and Discussion on Circular Economy solution

Analysing circular economy solutions in the context of waste pickers' livelihoods highlights both their potential benefits and their inherent limitations. While these solutions hold promise for improving the well-being of waste pickers, particularly in the informal recycling economy, they are not without their complexities.

In this study, a circular economy solution referred to an approach that aims to improve the capacities of waste pickers within the value chain of the informal recycling economy in order to generate higher incomes, improve environmental outcomes and increase recycling rates. Unlike the transition to a formal waste management system with specialised sorting facilities, the solutions presented - the cooperative model and the “Azteca model” - work within a non-existing waste management framework. They are designed to accommodate the informal nature of the circular economy, while recognising the monetary value of waste materials. In addition, these models highlight the key role that waste pickers play in keeping recycling chains functioning in the face of an absent or dysfunctional waste management system. To distinguish these approaches from the infrastructure and engineering techniques that are more commonly used in the Global North, the study also referred to them as bottom-up circular economy approaches.

The cooperative model, mentioned by both experts interviewed and prevalent in the Global South, plays an important role in strengthening waste pickers within the informal recycling economy value chain. This is achieved by forming a structured unit from them. Circular

economy principles play a more prominent role within these unions than in normal waste picking, as observed during my field study. Waste pickers work more effectively and receive recognition for their environmental impact, resulting in higher recycling rates.

However, in the informal recycling economy, it also presents its own challenges and limitations. There is a risk of merely replacing one intermediary in the value chain with another, without fundamentally changing or improving the system itself. This phenomenon of substitution, as Luppi highlights, is a crucial consideration. While cooperative models may seem democratic, internal power dynamics can impede their effectiveness, making them more ideological than practical in practice (Luppi, 2023).

Furthermore, the model is constrained by inherent market limitations, which can only be addressed through comprehensive systemic improvements at various levels. In the studied case of San Rafael del Sur, the impact may be limited as waste from the landfill generates low profits. The product itself does not cover the cost for the full recovery chain (Tunesi, 2023). This suggests that while the co-operative model is a necessary step, it may have its own limitations and set its own boundaries in terms of achieving holistic improvements within the informal recycling economy.

Moving on to the Azteca model, it emerges as an interesting approach that addresses several of the identified dimensions to which waste pickers are exposed. It aims to improve the value chain at several levels, ultimately benefiting waste pickers. Most importantly, through promoting and incentivizing local authorities to place waste pickers more in a door-to-door collection system, the model takes waste pickers away from the landfill. As the livelihood analysis revealed, the landfill is responsible for most environmental and health risks waste pickers in San Rafael del Sur are exposed to. This transition to safer environments would reduce their vulnerability to accidents, injuries and long-term health problems caused by exposure to toxins and unsafe conditions. It would also recognise their crucial role in recycling efforts and their contribution to keeping the streets of San Rafael del Sur clean.

Securing an improved position within a system that delivers superior environmental and recycling outcomes also allows for diversified income streams. This is also due a better collaboration between all stakeholders of the informal recycling economy value chain. As

illustrated by Luppi, the implementation of a PES model[61], drawing on both formal and informal sources (including wages and household allowances), has the potential to address the economic insecurity of waste pickers in San Rafael del Sur. This approach reduces their dependence on the sale of recyclable materials as their primary source of income. It could therefore better respond to issues related to economic insecurity, such as child labour, access to education and dangerous working techniques. In what way will need to be further analysed through impact evaluation.

Hence, the Azteca model offers promising concepts of improvements for the recycling system itself, and most importantly, for the livelihood of waste picker affected by it. But in its strength lies also its potential limitations which are, in my opinion, symbolic for the concept of bottom-up circular economy solutions. These approaches seek to improve existing informal recycling systems and promise sustainable change within them. However, the livelihood analysis shows that the waste pickers interviewed face hardship due to deep-rooted inequalities. This may be linked to the wider socio-economic context. It is noteworthy that all waste pickers were women, with six out of seven being single mothers, despite the limited sample size. Most of them got pregnant at a very young age and have more than three children. Some had to move to "La Chureca" because they were left by their husband, other couldn't afford the rent in their former apartment because of an economic shock or had to leave school because of early pregnancy. They saw waste picking as their only option and got driven to it once the city mayor (dis)placed them near the landfill. A district of San Rafael del Sur that is segregated from the rest of the city/ town. What should become evident at this point is that the challenges faced by waste pickers, particularly the women in the sample, might not be isolated incidents but rather symptoms of systemic inequalities within a society and national economy.

Similarly, the fact that waste pickers are exposed to environmental risks as one of their dimensions of poverty is not a breakthrough. Nevertheless, the analysis showed that they use harmful working techniques because they see no alternative. The strategies they use, combined with their physical environment, pose significant challenges to their livelihoods. The question then arises: how can a solution be found within the system? As Simone Tunesi rightly points out, waste management is mostly organised by the respective municipalities. Without a functioning waste management system, bottom-up circular economy approaches will inevitably

[61] Luppi did not use this term but what he described falls under the category of PES.

be limited in their effectiveness. She stresses that without a transition to a formal waste management system, the informal recycling economy will continue to be characterised by inefficiency and exploitation of waste pickers. This argues for the incorporation of circular economy principles through a top-down approach, where municipalities fulfil their responsibility to the citizens in keeping the streets clean.

However, this does not imply that, in the context of informal recycling economies, circular economy solutions are a "Chimera", as Kesha Fevrier puts it, holding false promises (Fevrier, 2022). Green campaigns aim to redefine ideas around waste and value. According to Fevrier, they frequently fail to acknowledge the intricate interaction of different racial, gender, political, and economic aspects influencing recycling as an economically viable activity in the Global South, notably for particular societal groups. While there lies a lot of truth in this statement, the Azteca model indeed showed that initiatives can be adapted to the local contexts and work effectively with the realities on the ground. The model effectively incorporates circular economy principles into informal recycling economies by empowering waste pickers and improving the system as a whole. This study did not do an impact analysis of this model in Mexico City, something I suggest to follow-up, but from a hypothetical perspective it addresses several of the challenges identified in the context of the waste pickers in "La Chureca". Future research could explore the adaptability of such models in similar contexts, shedding light on their potential to bring about positive change in the lives of waste pickers and in waste management and recycling practices.

6.4 Outlook

In any future discourse on circular economy solutions within complex contexts, such as the informal recycling economy in Nicaragua or more broadly in the Global South, it is crucial to approach the issue with critical reflection. This means acknowledging their potential limitations in specific settings and avoiding romanticizing the informal recycling economy, as seen in some academic discussions. Circular economy approaches should be more broadly conceived when implemented in informal recycling economies. Adopting the perspective of waste pickers can help to address existing gaps. The current informal recycling system in San Rafael del Sur has high environmental and social costs, but it is the waste pickers who pay the highest price. Bottom-up approaches, as exemplified by the Azteca model in other contexts, have demonstrated the effectiveness of improving such dysfunctional systems through circular economy approaches. However, it is important not to lose sight of the structural factors that drive individuals into waste picking in the first place.

Finally, it remains the responsibility of central governments to protect the health and well-being of their populations while mitigating the negative impacts of increasing waste generation. This requires collaborative efforts and initiatives involving both the public and private sectors. The ultimate goal is to establish a functional and environmentally sustainable waste management system. Crucially, socio-economic conditions must be improved to ensure that people are not forced to rely on unregulated landfills for their survival. This multifaceted approach, based on socio-economic and environmental considerations, will offer a more holistic way forward.

7 Resources

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