UNDERSTANDING OF ENERGY POVERTY CHARACTERISTICS IN TÜRKİYE: A BASELINE STUDY FOR IDENTIFICATION OF ENERGY POOR HOUSEHOLD PROFILES

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submitted by **ELİF ÇORA** in partial fulfillment of the requirements for the degree of **Master of Science** i**n Regional Planning in City and Regional Planning, Middle East Technical University** by,

Prof. Dr. Halil Kalıpçılar
Dean, Graduate School of **Natural and Applied Sciences** _____

Prof. Dr. Emine Yetişkul Şenbil
Head of the Department, **City and Regional Planning** _____

Prof. Dr. Mehmet Melih Pınarcıoğlu
Supervisor, **City and Regional Planning, METU** _____

Examining Committee Members:

Prof. Dr. Anlı Ataöv Demirkan
City and Regional Planning, METU _____

Prof. Dr. Mehmet Melih Pınarcıoğlu
Supervisor, City and Regional Planning, METU _____

Assist. Prof. Dr. Zafer Yılmaz
Business Administration, TED University _____

Date: 11.12.2023

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name Last name: Elif Çora

Signature:

ABSTRACT

UNDERSTANDING OF ENERGY POVERTY CHARACTERISTICS IN TÜRKİYE: A BASELINE STUDY FOR IDENTIFICATION OF ENERGY POOR HOUSEHOLD PROFILES

Çora, Elif
Master of Science, Regional Planning in City and Regional Planning
Supervisor: Prof. Dr. Mehmet Melih Pınarcıoğlu

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Energy poverty, as defined by Bouzarovski (2014), is a condition in which a household lacks the necessary level of energy services due to high energy prices, low incomes, and inefficient buildings and appliances. Thus, it is a significant issue in both urban and rural areas, exacerbated by low incomes and high energy costs (Katsoulakos, 2014). The concept of 'energy rights' embodies the belief that access to energy services is a fundamental right of individuals and necessary for maintaining a dignified standard of living. Addressing energy poverty and developing targeted interventions necessitates an understanding of its complex and multifaceted nature. The existing literature does not provide a comprehensive framework for understanding energy poverty, nor does it offer a accepted definition of the concept. In the political context of Türkiye, while there is no legally recognized definition of energy poverty, public institutions and civil society organizations provide natural gas and coal fuel assistance within social aid programs. However, these aids are not targeted specifically at energy poverty or energy-poor households but are based on households in financial difficulty. Such assistance does not offer a direct and permanent solution to the problem, merely postponing its significant consequences.

Therefore, a comprehensive understanding of the concept of energy poverty and its characteristic features is crucial for a more comprehensive approach.

This thesis presents a preliminary study on the phenomenon of energy poverty in Türkiye, exploring its multifaceted characteristics and outcomes. Central to this research is the identification of household profiles experiencing energy poverty and the exemplification of emerging parameters and indicators related to it. The study examines the underlying causes of energy poverty, demographic trends, and socio-economic impacts, investigating the dynamics of energy poverty in Türkiye.

Through in-depth interviews, the research highlights the distinctive features of energy-poor households in Türkiye and examines the interaction between household structure, socio-economic conditions, and spatial factors in energy consumption patterns. The thesis underscores the importance of understanding these dynamics in informing policy formulation and intervention strategies aimed at reducing energy poverty. Consequently, this study contributes to an understanding of energy poverty in the Turkish context through intensive and extensive research methods and adds to the broader discourse on energy poverty in similarly developing economies.

Keywords: Energy Poverty, Energy Poverty Measurement, Energy Poor Profiles, Vulnerability, Affordable Energy

ÖZ

TÜRKİYE'DE ENERJİ YOKSULLUĞU ÖZELLİKLERİNİN ANLAŞILMASI: ENERJİ YOKSULU HANE PROFİLLERİNİN BELİRLENMESİ İÇİN BİR TEMEL ÇALIŞMA

Çora, Elif
Yüksek Lisans, Bölge Planlama, Şehir ve Bölge Planlama
Tez Yöneticisi: Prof. Dr. Mehmet Melih Pınarcıoğlu

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Bouzarovski (2014) tarafından tanımlandığı şekliyle enerji yoksulluğu, yüksek enerji fiyatları, düşük gelir ve verimsiz bina ve cihazlar nedeniyle bir hanenin gerekli enerjiden yoksun olduğu bir durumdur. Enerji yoksulluğu hem kentsel hem de kırsal alanlarda önemli bir sorundur ve düşük gelirler ve yüksek enerji maliyetleri nedeniyle daha da kötüleşmektedir (Katsoulakos, 2014). 'Enerji hakkı' kavramı, enerji hizmetlerine erişimin bireylerin temel bir hakkı olduğu ve onurlu bir yaşam standardını sürdürmek için gerekli olduğu inancını somutlaştırmaktadır. Enerji yoksulluğuyla mücadele etmek ve özel müdahaleler geliştirmek için yoksulluğun karmaşık ve çok yönlü doğasını anlamaya ihtiyaç vardır. Mevcut literatür, Türkiye özelinde enerji yoksulluğunu anlamak için kapsamlı bir çerçeve sunmadığı gibi, kavramın kabul edilmiş net bir tanımını da yapmamaktadır. Türkiye'de politik bağlamda enerji yoksulluğunun resmi bir tanımı bulunmamakla birlikte, devlet kurumları ve sivil toplum kuruluşları sosyal yardım programları kapsamında doğal gaz ve kömür yakıt yardımları sağlamaktadır. Ancak bu yardımlar enerji yoksulluğu hedef alınarak ve enerji yoksulu haneler tespit edilerek değil, maddi açıdan zor durumda olan haneler bazında yapılmaktadır. Bu tür yardımlar soruna doğrudan ve kalıcı bir çözüm sunmamakta, sadece önemli sonuçlarını ertelemektedir. Bu nedenle,

daha kapsamlı bir yaklaşım için enerji yoksulluğu kavramının ve bu kavramın karakter özelliklerinin net biçimde anlaşılması önem arz etmektedir.

Bu tez, Türkiye'de enerji yoksulluğu olgusunu inceleyerek, çok yönlü özelliklerini ve sonuçlarını bir ön çalışma olarak ortaya koymaktadır. Bu araştırmanın merkezinde, enerji yoksulluğu yaşayan hane profillerinin tanımlanması ve buna bağlı olarak ortaya çıkan parametre ve indikatörlerin örneklendirilmesi yer almaktadır. Çalışma, enerji yoksulluğunun altında yatan nedenleri, demografik eğilimleri ve sosyo-ekonomik etkileri incelemekte ve Türkiye'de enerji yoksulluğu dinamiklerini araştırmaktadır.

Araştırma, derinlemesine görüşmeler yoluyla Türkiye'deki enerji yoksulu hanelerin belirgin özelliklerini ortaya koymakta ve enerjiye erişim hanehalkı yapısı, sosyoekonomik koşullar ve mekânsal faktörler arasındaki etkileşimi incelemektedir. Tez, bu dinamikleri anlamanın, enerji yoksulluğunu azaltmayı amaçlayan politika formülasyonu ve müdahale stratejilerini bilgilendirmek için önemini vurgulamaktadır. Sonuç olarak, bu çalışma, yoğun ve kapsamlı araştırma biçimleri ile, Türkiye bağlamında enerji yoksulluğuna dair bir anlayış sağlamakta ve benzer biçimde gelişmekte olan ekonomilerde enerji yoksulluğuna dair daha geniş bir söyleme de katkıda bulunmaktadır.

Anahtar Kelimeler: Enerji Yoksulluğu, Enerji Yoksulluğu Ölçümü, Enerji Yoksulları Profilleri, Kırılganlık, Erişilebilir Enerji

To all beings who endure the chill of neglect and the shadow of energy scarcity,
may this work illuminate the path towards equality

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LIST OF ABBREVIATIONS

ABBREVIATIONS

EU: European Union

HDI: Human Development Index

Hh: Household

MEPI: Multidimensional Energy Poverty Index

METU: Middle East Technical University

NUTS: Nomenclature of Territorial Units for Statistics

OECD: Organization for Economic Cooperation and Development

TR: Turkish Republic

UN: United Nation

UN CESCR: United Nations Committee on Economic, Social, and Cultural Rights

UNDP: United Nations Development Programme

CHAPTER 1

INTRODUCTION

This thesis delves into the relatively uncharted domain of energy poverty in Türkiye, an issue that has often been overlooked in the national discourse. It aims to lay a foundational framework for understanding this phenomenon within the context of Türkiye's distinct socio-economic landscape. By examining the key features of energy poverty in the country, the research provides a methodological foundation tailored to Türkiye's demographic composition and spatial characteristics. It investigates various aspects such as the nature of energy-poor households, their coping mechanisms, the government's response to energy poverty, and its overarching effects on overall wellbeing. This study thereby sets the preliminary research for region-specific future studies in this field.

1.1 Problem Definition

The 'right to energy' concept embodies the belief that access to energy services is a fundamental right of individuals, essential for sustaining a dignified standard of living. It enables the satisfaction of basic needs such as health, civic engagement, education, and empowerment. This concept includes a variety of energy services critical for daily life, extending beyond mere access to electricity. Essential services identified include heating and lighting, cooking, sanitation, washing facilities, and protection against adverse weather conditions and other potential health risks (United Nations Committee on Economic, Social, and Cultural Rights [UN CESCR], 1991). Additionally, energy is pivotal to the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change. The UN indicates that achieving SDG7 could create new economic opportunities, enhance education and health, and contribute to global sustainable and equitable development.

The predicament of young adults facing energy poverty in Europe presents a multi-faceted and complex scenario. Research highlights that energy poverty arises from inadequate income, high energy costs, and inefficient energy infrastructure, associated with broader issues such as public sector cuts and economic downturns.

A study spanning 32 European countries revealed an uneven distribution of energy poverty, significantly impacting health and well-being, particularly in Eastern and Central Europe. This suggests a geographical and economic gradient to the issue. As of 2023, over 41 million Europeans are unable to afford adequate home heating, despite EU's efforts to combat energy poverty (Eurostat, 2020a, 2020b).

Before the 2020 energy price crisis, 7.4% of European households struggled to maintain sufficient warmth, and 6.5% faced delays in paying energy bills. These numbers have escalated, with 17.8% of households now at risk of poverty and experiencing difficulties in heating their homes adequately (Eurostat, 2022a). Energy poverty, therefore, denotes the nexus between the essential role of energy in human well-being and the struggle of a significant portion of society to access it. While lacking a universal definition, it is generally characterized as a household's difficulty in securing enough energy for essential needs, becoming a pressing concern in both developed and developing nations.

In Türkiye, energy poverty has not been officially adopted as a distinct type of poverty warranting direct research and intervention by state authorities. Nevertheless, for years, low-income households have received support for heating, such as coal and natural gas, through state and civil society mechanisms. It is argued that assistance based solely on income and state policies may not be adequate. It is recognised that one-off aid only postpones and obscures the solution to the problem. Understanding energy poverty characteristics and identifying energy poor profiles is essential to develop strategies to mitigate or eliminate it. Various indicators, such as the proportion of income spent on energy, levels of energy consumption, and access to modern energy services, are used for measurement. However, there is a gap in knowledge and methodology concerning energy poverty measurement. Energy

poverty is a private experience within households, culturally specific, and changes dynamically (Simcock, Thomson, Petrova, & Bouzarovski, 2017). Moreover, Türkiye's unique mix of urban and rural settings, socioeconomic diversity, and energy policy framework offers a unique context for studying this complex issue. It is noted that poverty in Türkiye differs from that in the West (Işık & Pınarcıoğlu). Therefore, **to develop mitigation and elimination strategies**, it is important to first recognise the **local dynamics of energy poverty**.

This research aims to provide a preliminary baseline for understanding energy poverty in Türkiye. The central question of this thesis is: '**What are the main characteristics of energy poverty in Türkiye?**'. The premise here is to investigate **whether similar socio-economic and socio-demographic groups share common experiences and whether the profile of the energy poor differs according to these variables**. To address this, the research will categorize **energy consumption patterns based on different household types**, define **parameter and indicator examples for measurement**, evaluate **coping strategies** of different hh, identify **energy aid mechanisms**, and explore the **impact of energy poverty on household wellbeing**.

1.2 Aim and the Scope the Thesis

The lack of a universally accepted and effective measurement for energy poverty has been identified as a significant barrier in addressing the issue of energy poverty (Kaliampakos, 2018). Bouzarovski (2018) underscores the importance of a comprehensive understanding of the interconnections between energy poverty, vulnerability and justice. This study aims **to provide a preliminary basis** for future methodological frameworks and research that will enable a **broader understanding and assessment of energy poverty** by examining the **energy characteristics** and energy **consumption patterns of households** in different demographic groups.

Specifically, it seeks to determine if individuals and communities within **similar socio-economic and socio-demographic groups experience energy poverty** in comparable ways, and how these **experiences differ across diverse groups**. This research aims to contribute to a more nuanced understanding of energy poverty, facilitating targeted policy interventions and support mechanisms.

Accordingly, to understand energy poverty, it is crucial to undertake a detailed characterization and measurement of various household types, analyze their coping mechanisms in the face of energy poverty, and evaluate the effects of energy poverty on household well-being. This study identifies the coping strategies employed by households in Ankara to address energy poverty. It investigates households' coping methods, including reducing consumption, substituting energy sources, increasing income, and arranging payments. Also, this study evaluates the impact on individual well-being by examining the numerous consequences of energy poverty on physical and mental health, financial stability, social inclusion, and educational outcomes. Consequently, the thesis exemplifies various energy poor household types, classified by factors such as income, size, location, building characteristics, and primary energy sources as an intensive research.

Moreover, the study extends its inquiry to the existing framework of energy aid in Türkiye, scrutinizing the government's official stance and strategies pertaining to energy poverty, as well as the existence and efficacy of such approaches. It critically evaluates the policy responses and support mechanisms implemented by the state, assessing their alignment with the actual needs of energy-poor households. This examination consists of interviews with stakeholders on review of the identification methods energy poor households, energy adequacy of current subsidies, the accessibility of aid programs, and the extent to which these interventions are integrated with broader social welfare systems. By analyzing the policy landscape, this research aims to illuminate the strengths and shortcomings of the response to energy poverty.

The complex and multifaceted nature of energy poverty requires a comprehensive examination that goes beyond traditional boundaries. Wang (2015) highlights the necessity for a nuanced understanding of energy poverty and the development of suitable measurement approaches that account for factors such as energy service usage, social factors, cultural sensitivity, and regional differences. The primary goal of this thesis is to **draw a frame to understand energy poverty characteristics in Türkiye** by considering various aspects such as **consumption habit** including **coping mechanisms, and energy poverty triggering factors and impacts**. The insights gained from this study have the potential to inform future policy decisions, thereby contributing to the broader goals of energy equity and sustainability.

1.3 Relevance and Necessity of the Study for Turkish Case

Current literature does not offer a comprehensive framework for understanding energy poverty specifically within Türkiye, nor does it provide a clear definition of the concept. Although Türkiye **lacks an official delineation of energy poverty**, **state and non-governmental social aid programs do supply fuel aids** such as natural gas and coal. However, these aids are allocated not by identifying the energy poor, but by offering assistance to financially struggling families. Such assistance does **not offer a direct and permanent solution** to the problem, but only **postpones its major consequences**. Therefore, it is not assured that the provision of fuel aids is directly associated with the mitigation of energy poverty.

The discourse on energy poverty in Türkiye, while still in its infancy, has begun to emerge, diverging from the broader expanse of energy-related research prevalent in the country. This evolving recognition of energy poverty as a distinct field of study underscores its significance and the imperative for more targeted research. Such research is essential for a holistic understanding and effective intervention in the context of energy poverty.

A variety of methodologies have been employed in the assessment of energy poverty in Türkiye, including the "10% approach", the "twice the median approach", and the "Low Income-High Cost approach". The adoption of these varied methods allows for an extensive exploration of energy poverty across different demographic segments, contributing to a nuanced comprehension of the issue. These divergent methodologies also underpin a robust methodological base for prospective scholarly inquiry and policy formulation in Türkiye. Notably, in the Turkish milieu, incorporating factors such as property ownership characteristics into energy poverty studies is crucial. Additionally, elements like the type of heating system and the accessibility to natural gas are pivotal in the dissection and understanding of energy poverty. For instance, given that natural gas is a primary heating source in buildings, the availability or lack thereof to a home can significantly influence the energy poverty levels experienced by its inhabitants. Integrating these characteristics into research on energy poverty will enable a more accurate portrayal of the conditions in Türkiye.

In conclusion, the necessity of this study highlights the gaps in current literature pertaining to the experience of energy poverty in Türkiye, which lacks both a precise understanding and a comprehensive energy poor identification framework. Thus, this thesis **contributes to a preliminary study for understanding of energy poverty in Türkiye as a baseline for future studies on energy poverty measurement** to build upon, a critical step towards fostering energy equity and improving the well-being of all citizens.

1.4 Data Sources and Methodology

The methodology of this research is designed to examine the energy characteristics of households from diverse demographic groups and the parameters and indicators of energy poverty. The primary aim of this research is to establish a foundational study for understanding energy poverty in Türkiye. Thus, the methodological framework **comprises a literature review** and **in-depth interviews** and is structured

upon the guiding philosophy of critical realism, which informs the entire research process.

In addition, this thesis analyses the data collected from a household survey targeting 1,304 households within the scope of the Samsun Urban Spatial Planning Project conducted by METU Matpum but not completed **to create a basis frame for in-depth interviews**. Since Samsun is located in a different region and the survey covers both urban and rural areas, this survey is included in the case study as it will complement the results of the in-depth interviews. The survey applies stratified random sampling method to represent different socio-economic and geographical segments in Samsun. Aiming to shed light on the spatial distribution and accessibility of energy resources, the survey focuses on heating methods, energy consumption patterns and potential indicators of energy poverty. The methodology provides a **context to previously unused data from the project and links it to the energy poverty study**. It is aimed to interpret the energy use patterns identified in the Samsun survey and thus to understand the dynamics of energy poverty and the differentiated profiles of energy poor in urban and rural areas.

Critical realism serves as the philosophical foundation for this research, providing a lens through which data is systematically analyzed. The investigation commences with a thorough examination of the Çiğdem and İşçi Blokları neighborhoods in Ankara, Türkiye—sites of the case study—and the concept of energy poverty. Subsequently, intensive research involving interviews is conducted to explore the concept through the perspectives of the involved actors. This approach facilitates an understanding of the interplay between individual perceptions, social constructs, and the objective realities of energy poverty.

In detail, the initial stage involves an **extensive literature review**, encompassing a **broad array of books, articles, and** reports from the fields of energy economics, energy justice, and energy poverty. This phase aims to construct a robust theoretical foundation in four key areas: **energy poverty** and **energy poor definitions, measurement methods including parameters, indicators,** and **thresholds,**

household energy consumption patterns and **tackling methods,** and **energy poverty related policies**.

Following the literature review**, semi-structured in-depth interviews are conducted with individuals from various household types**, including households with members over 65 years of age, young women living alone, student and young graduate households, and families with children. All these group of participants consist of **households from different income levels including those earning minimum wage or less**. Additionally, interviews are held with **apartment managers responsible for controlling energy consumption in building level**, **local municipal officials and civil society representatives involved in social assistance**, **elected neighborhood representatives** and **civil servants of community house**. This diverse sample provides a comprehensive perspective on the impact of various factors on energy consumption and energy poverty. In Figure 1.1, methodology and factors identified in literature reviews with information evaluated from interviews and surveys is given.

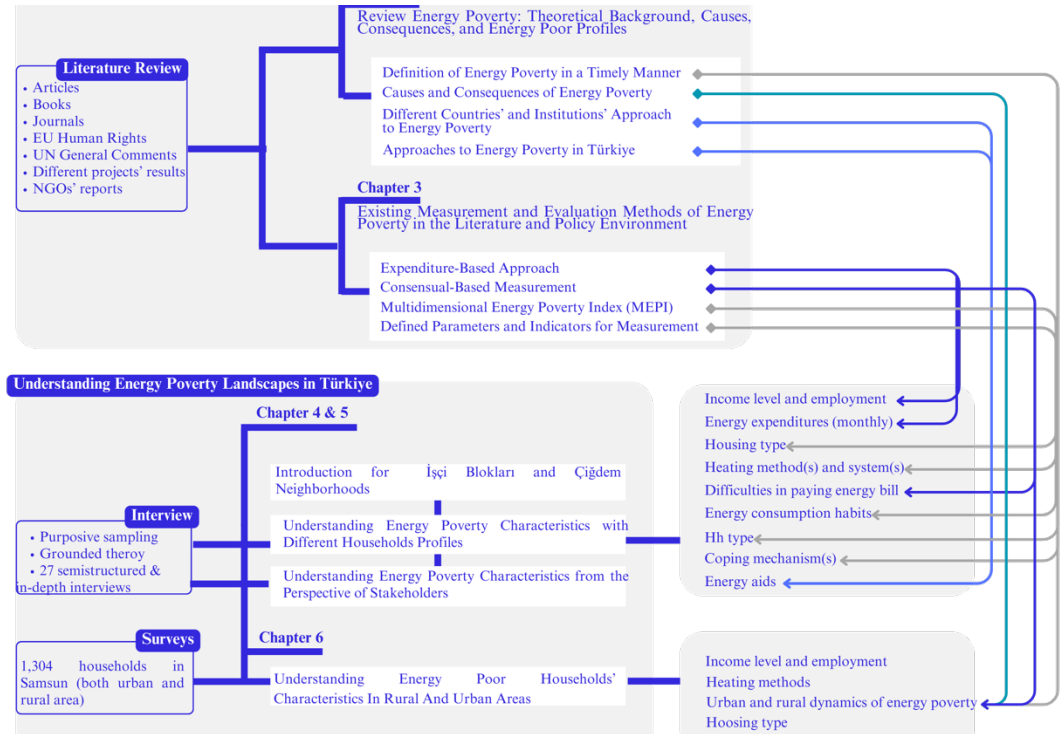


Figure 1. 1. Methodological framework and energy poverty-related factors obtained from literature review discussed through interview and survey results

In total, 27 face-to-face interviews are conducted to gather detailed information on participants' energy consumption patterns, energy bill management, experiences with energy poverty, and energy efficiency strategies. An interview control card is used to guide the process and ensure a semi-structured but adaptable dialogue. (See pg. 138)

The data collected from the in-depth interviews were rigorously analyzed using **grounded theory methodology**. The following methodological steps, with examples, detail the conduct of this research and the application of this methodology:

- Open coding analyzes the data initially. For instance, a respondent's answer to "How do you manage your energy bills?" is coded to define the concept of household energy management. Similarly, responses to "What strategies have you employed to reduce your energy costs?" elucidate the concept of energy poverty mitigation strategies.
- Memoing entails recording observations made during the coding process. For example, regarding energy-saving strategies, a memo might note the adoption of energy-efficient products or the habit of turning off electrical appliances.
- Axial coding synthesizes identified concepts and categories. For instance, the concepts of energy-saving strategies and energy bill management are amalgamated into the broader category of energy consumption behaviors.
- Selective coding focuses on developing a core theme or theory. For example, the overarching relationship between energy consumption behaviors and energy poverty may be established as a central theme for comprehending the underlying dynamics of energy consumption and energy poverty.
- Theoretical modeling integrates the relationships between coded concepts and categories to construct a theoretical framework. By synthesizing concepts such as energy-saving strategies, energy bill management, and energy poverty, a comprehensive theoretical model is formulated to

understand the interconnections between energy consumption and energy poverty.

This methodological approach offers **extensive and intensive research framework** for acquiring an in-depth comprehension of the issues surrounding energy consumption and energy poverty and for evaluating these concerns within a broader context. The stages of data coding, memo writing, and theoretical modeling aim to develop substantive theories in the process of investigating energy poverty characteristics and possible indicators.

Given that the research explores a poverty-based concept, the **income status** of all household types is a **pivotal consideration**. Households from varying income brackets are assessed, ensuring representation from each household category. For instance, families with children living below the minimum wage and those with middle to higher incomes were both included in the interviews. The premise is that similar **socio-economic** and **socio-demographic groups share common experiences**.

Çiğdem and İşçi Blokları neighborhoods are chosen for case study due to **their socio-economic** and **spatial diversity**. Interviews are conducted with selected households in these neighborhoods with the support of civil society organizations, employing **purposive sampling** to gain insights into the energy poverty experiences of distinct household types and to delve into their energy consumption patterns, experiences of energy poverty, and strategies for addressing energy poverty.

Purposive sampling is a technique wherein individuals or scenarios with specific characteristics are intentionally chosen to achieve a particular research objective. This approach is typically utilized when an in-depth exploration of a specific issue is desired, and when it is important to illuminate certain attributes of a particular demographic or situation. Interviews with individuals from the following household categories who are in charge of tracking energy consumption and payments are conducted to provide a broad perspective on the impact of various factors on energy consumption and energy poverty:

- **Households with members aged 65 and over**: To gain insights, in-depth interviews are carried out with members from six different households. The focus on these demographic stems from the heightened susceptibility to energy poverty, which is exacerbated by age-related vulnerabilities. Contributing factors include insufficient retirement pensions and various health conditions, which compound the challenges faced by the elderly in managing energy costs and maintaining adequate living conditions. It is aimed to shed light on these challenges and explore potential solutions to mitigate the impact of energy poverty on elderly.
- **Households composed of students or new graduates**: This study focuses on households made up of students or recent graduates. This segment of the population is interviewed to understand their economic situation and how it relates to energy poverty. The study aims to explore the vulnerability of these households to energy poverty due to their unstable or low income.
- **Women living alone**: This research investigates the intersection of gender and energy poverty, with a focus on the unique vulnerabilities faced by women who live alone or with a flat mate. It recognizes the compound effect of economic independence and societal structures on women's experiences with energy poverty. The study involves conducting in-depth interviews with four women to understand the gender-specific challenges they face in economic and social spheres that contribute to energy poverty. This approach aims to provide a nuanced understanding of how energy poverty affects women differently.
- **Families with Children**: Energy poverty in such households can have direct negative effects on children's well-being and their environment, which is essential for their growth and development. The research delves into the differences in energy poverty based on various factors such as household structure, income, and social conditions. By conducting interviews with four households that have children and come from diverse economic backgrounds, the study aims to understand the patterns of energy expenditure

and consumption. This examination is aimed at establishing a foundation for further research that could inform policies and interventions to alleviate energy poverty among families with children.

Also, apartment managers are the other group who are involved in this research. Generally knowledgeable about energy consumption and management, these respondents—often managers or board members of their residences—offer insights into the energy efficiency of buildings. They can provide valuable information on the collective energy habits of the residents, the efficiency measures implemented within the building infrastructure, and the challenges faced in reducing energy costs. Their perspective is crucial in understanding the larger scale of energy consumption that goes beyond individual households and how it can be optimized for better sustainability and affordability.

And the final group consists of personnel from stakeholder or decision-maker institutions including local governments, community centers, humanitarian organizations, and elected neighborhood representatives. These individuals have a broader view of energy poverty, influenced by their roles in policymaking, community support, and social welfare. Their input is essential for understanding how energy poverty is addressed at a community and policy level, and for identifying systemic changes that might mitigate this issue. Their contributions can highlight the effectiveness of existing policies and pinpoint gaps where additional support is needed, providing a comprehensive outlook on the fight against energy poverty.

Each respondent type is selected to elucidate the diverse impacts on energy consumption and energy poverty and to cultivate a comprehensive understanding.

1.5 Limitations of the Study

Thomson (2017) underscores the challenges in measuring energy poverty, notably the absence of a unified framework for conceptualization and measurement and the restricted access to suitable data and indicators. Correspondingly, this study is

employed a comprehensive methodology to examine the scope and intricacies of energy vulnerability in Türkiye. It strives for an in-depth understanding of the traits linked to energy consumption and vulnerability. Nonetheless, this investigation is subject to its own set of methodological and data-related limitations.

While the methodological framework embraces specific theoretical approaches to decode the intricate nature of energy vulnerability, there may be questions about their capacity to encapsulate all facets of the issue. For instance, the reliance on manual dexterity and local demographics for sample selection could impede the study's broader applicability. Furthermore, the neighborhoods chosen for field studies might mirror unique socio-economic and spatial conditions, which may not accurately reflect the broader national picture of energy vulnerability.

The temporal aspect is also crucial, especially considering the evolving energy policies and environmental shifts in Türkiye. A study conducted within a fixed period may not fully represent the outcomes' potential fluctuations over time.

Inherent methodological subjectivity poses a limitation in gathering interview-based data, with respondent biases possibly affecting the data's integrity. Moreover, the external validity of the study's findings and interpretations might be limited to the Türkiye context due to its distinctive energy policies and socio-economic circumstances, thus offering restricted comparability internationally.

Data limitations, particularly regarding the accessibility of quantitative income and energy consumption data, present a significant hurdle. The robustness of the energy poverty assessments are heavily dependent on the availability of data. Restrictions in data accessibility, both from personal data protection laws and national policy frameworks, can impede the collection and dissemination of energy consumption data, thus affecting the study's scope and applicability-especially for more comprehensive and energy poverty measurement-focused future studies.

In sum, while this research takes a step forward in deciphering the complex nature of energy vulnerability, it also acknowledges methodological and data-related

limitations. Therefore, this research only provides a basis for future measurement and assessment efforts and does not aim to quantify and identify energy poverty. These limitations should encourage researchers to broaden the methodological scope and investigate energy vulnerability more comprehensively, encouraging further research that transcends the Turkish context and incorporates broader global perspectives.

CHAPTER 2

REVIEW ENERGY POVERTY: THEORETICAL BACKGROUND, CAUSES, CONSEQUENCES, AND ENERGY POOR PROFILES

Protecting the right to energy requires a comprehensive knowledge on socio-economic dynamics, variety of measures, and data-driven strategies. Initiatives include ensuring access to reliable energy infrastructure, ensuring continuity of supply and protection against service interruptions; finding affordable energy solutions, such as bill payment assistance, to secure the right to energy use; and promoting energy democracy, including participation in political decision-making, participation in energy communities and access to information and justice. It is also critical to protect and defend these rights, as well as to take corrective measures when abuses occur. Given the focus of policy makers on reducing disparities in regional economic growth, analyses of regional conditions and the current situation, including problem definition, are critical for the formulation of specific policies for future regional development (Lisinski et al., 2020). The first step towards the implementation of these measures, on the other hand, is to define and measure energy poverty, identify energy poverty triggers and define energy poor profiles. Effective policies to significantly expand modern energy access need to be based on a solid knowledge base, and metrics that can be used for benchmarking purposes and to track progress towards targets are therefore an important support tool (Nussbaumer et al., 2012).

Within the scope of the research objectives, an extensive literature review is conducted in this field. The study starts with the definition of energy poverty, which varies across nations and organizations. It covers the concept of energy deprivation in chronological order, as well as the definitions of energy poverty and energy poor in different situations. The study also explores existing studies about ways of

measuring energy poverty in policy level. It also covers various project results and academic studies that reveal the effects of energy poverty on individuals and households, as well as the methods used by households to cope with energy poverty. At each step of the research, it also includes studies and practices related to energy poverty in Türkiye.

2.1 Definition of Energy Poverty in a Timely Manner

The term “energy poverty” evolves over time, and each era is marked by a different approach to understanding and addressing the issue. The initial focus is primarily on the immediate economic challenges faced by households in obtaining energy.

The term becomes more prominent in the late 20th century, particularly in the context of fuel poverty debates in the United Kingdom. The term "fuel poverty" first appeared in the United Kingdom in the 1970s. This is a period of intense focus on the economic burden of energy costs on low-income households. This is a period of increased awareness of the difficulties faced by low-income households in providing adequate heating in the face of rising energy prices due to the oil crises. The term describes situations where households spend a significant portion of their income on fuel to heat their homes.

In the early 1990s, the approach to energy poverty began to consider energy efficiency and household income, as well as energy costs. An important development in the conceptualization of energy poverty emerged in 1991 with the work of Brenda Boardman. His seminal book “Fuel Poverty: From Cold Homes to Affordable Heat” plays a key role in defining fuel poverty and bringing the issue to the forefront of policy debate in the UK. Boardman's definition focuses on the inability to afford adequate heating and emphasizes the roles of energy efficiency, income, and energy costs.

The early 2000s witness a shift towards a more holistic and multidimensional understanding of energy poverty. Pachauri and Spreng (2004) expand the concept of

energy poverty. They propose a multidimensional strategy that emphasizes not only energy types and sectors, but also dissemination, sustainability and accessibility. This approach takes into account households' energy consumption and socio-economic concerns, recognizing the broader global consequences of energy poverty.

In the 2010s, the perspective on energy poverty evolved to emphasize that access to basic energy services is a fundamental right. Nussbaumer et al. (2012) define energy poverty as a household's inability to access basic energy services such as heating, lighting and cooking. This approach emphasizes the critical role of energy in supporting human activities.

In the late 2010s and early 2020s there is greater focus on the systemic and structural aspects of energy poverty. Sovacool (2012) sees energy poverty as a condition affected by the underlying technical and social systems and power structures that affect energy supply and management. During this period, the institutional systems, market forces and social values that trigger energy poverty begin to be examined in more depth. Since energy poverty is a complicated issue impacted by several factors, it is difficult to find a coherent definition that is universally recognizes in the literature or by policy-making organizations. As Bouzarovski et al. (2012: 78) point out, in addition to the multifaceted nature of the problem, the lack of a solid institutional foundation for policy efforts, a scarcity of robust scientific data, and some Member States' reluctance to recognize energy poverty as an outstanding form of deprivation are obstacles to the development of a common definition. On the other hand, it is critical to comprehend the causes and create a definition that will embrace numerous organizations and allow them to design comprehensive reaction and fighting plans (Thomson et al., 2016a).

In recent developments, energy poverty is increasingly viewed from a global and intersectional perspective. Bouzarovski and Petrova (2020) consider energy poverty as a global problem that intersects with other disadvantages such as gender, ethnicity and geographical location. This approach highlights how energy poverty is intertwined with social and political problems and can be magnified.

Over time, understanding of energy poverty will evolve to encompass a range of issues, such as the quality of energy access, the sustainability of energy resources, and the broader socio-economic impacts of inadequate energy access. It is now recognized as a complex and multifaceted issue that intersects environmental, economic and social dimensions. However, there is still no universally accepted definition at the international level and many countries do not directly adopt the concept.

2.2 Causes and Consequences of Energy Poverty

Energy poverty is a complex phenomenon that arises from a confluence of factors including low income, escalating energy costs, substandard housing, and systemic policy and market failures. Vulnerable groups such as low-income families, the elderly, households with children, and those from diverse ethnic and gender backgrounds are disproportionately affected (Bouzarovski & Petrova, 2015; Heindl, 2015). This section explores the causes of energy poverty and its impact on these groups, highlighting the multi-dimensional challenges they face to better understand possible measurement parameters and energy poor profiles.

2.2.1 Causes of Energy Poverty

A range of factors contribute to energy poverty, with household income, employment, and access to electricity being key determinants (Zang & Chandio, 2021; Ismail & Khembo,2015). However, at the heart of energy poverty lies a paradox: households with limited financial means are often those burdened by excessive energy costs. With global energy prices on the rise, these households are hit hardest, lacking the financial flexibility to invest in energy-efficient technologies or to make home improvements, thereby perpetuating a cycle of high energy bills (Bouzarovski & Petrova, 2015; Heindl, 2015).

Geographic location significantly influences energy poverty, as access to energy resources and infrastructure can vary dramatically between urban and rural areas (Hernández, 2016). Household composition, including the number and interrelation of family members, affects the ability to afford energy services. The demographic characteristics of the head of the household—age, gender, and education level—can impact the household's energy access and management (Boardman, 2010).

The condition and energy efficiency of housing play a critical role in energy poverty discussions. Older buildings often lack proper insulation and efficient heating and cooling systems, leading to higher energy consumption. Tenants, especially those financially constrained or bound by rental agreements, may lack the power to make necessary enhancements (Tirado Herrero & Ürge-Vorsatz, 2012; Bird & Hernández, 2012).

Structural factors deeply root energy poverty, with energy-inefficient buildings contributing significantly to the issue by increasing demand and costs (Healy, 2003). The design and governance of energy markets and the adequacy of social policies greatly influence energy poverty prevalence. Markets may struggle to provide affordable and reliable energy services universally, while social programs might fail to meet the needs of energy-poor households. The absence of targeted approaches to improve energy efficiency and advance renewable energy use often aggravates the situation (Middlemiss & Gillard, 2015; Gillard, Snell, & Bevan, 2017). Moreover, labor market deficiencies that restrict income-earning potential can exacerbate energy poverty (Bouzarovski & Petrova, 2015).

This comprehensive review of the literature underscores the multifaceted nature of energy poverty and the need for a holistic approach in policy and practice to effectively combat it.

2.2.2 Consequences of Energy Poverty

The repercussions of energy poverty extend across health, social, and environmental domains, affecting individuals and communities profoundly. Inadequately heated or cooled homes contribute to a spectrum of health issues, from respiratory conditions to cardiovascular diseases, and can lead to increased morbidity and mortality rates, particularly during extreme weather conditions (Liddell & Morris, 2010; Marmot Review Team, 2011; Hernández & Bird, 2010).

Empirical evidence posits a direct link between alleviating energy poverty and enhancements in health and educational outcomes. The experience of energy poverty often coincides with poor living conditions, which in turn can precipitate a host of adverse health effects. Additionally, the lack of access to stable and sufficient energy can stifle educational opportunities, perpetuating the poverty cycle (Thomson & Snell, 2013; Liddell & Morris, 2010).

From a societal perspective, energy poverty can lead to social exclusion and diminished quality of life. The economic burden of energy costs forces households to forgo other basic needs such as adequate food, clothing, and healthcare. Moreover, there is a tendency among those affected to withdraw from social activities as a means to conserve energy, which can exacerbate feelings of isolation and negatively impact mental health and well-being (Bouzarovski et al., 2020; Thomson et al., 2017).

Environmentally, energy poverty contributes to increased carbon emissions due to the reliance on inefficient appliances and heating systems. The financial inability to invest in renewable technologies or to undertake energy efficiency improvements also hinders the transition towards a more sustainable environmental footprint (Heindl, 2015; Gillard et al., 2017).

To encapsulate, energy poverty is a multifaceted challenge with interconnected roots and impacts. Addressing it necessitates a holistic analysis of both its causes and consequences, as well as the dynamic interplay between them. It is clear that a

multidisciplinary and integrative policy approach is required to devise and implement effective strategies and interventions that can mitigate the complexities of energy poverty.

2.2.2.1 Impacts of Energy Poverty on Vulnerable Groups

Energy poverty casts a long shadow over the most vulnerable sections of society and is a formidable barrier to achieving a decent standard of living. Existing studies in the literature shed light on the plight of those disproportionately affected by the lack of affordable and reliable energy access.

Energy poverty is intrinsically linked to **low income**, where households must allocate a disproportionate amount of their budget to energy costs, compromising other basic needs. This precarious situation often forces them into a "heat or eat" dilemma, choosing between adequate heating and sufficient nutrition, with profound implications for health and well-being.

Elders are particularly susceptible to energy poverty. Typically, on fixed incomes, their energy requirements are elevated due to health-related needs and increased time spent indoors. The prevalence of cold homes can exacerbate health issues like respiratory and cardiovascular diseases, significantly affecting their quality of life.

For **households with children**, the stakes of energy poverty are especially high. Substandard living conditions can result in chronic health issues for children, including respiratory problems and inhibited growth. Educational achievements are also at risk, with poor lighting and limited access to energy-consuming educational resources potentially hindering learning and development.

Energy poverty has a pronounced **gender dimension**. Women, especially single mothers, face a higher risk of energy poverty due to typically lower incomes and increased domestic energy use. In less developed contexts, women's traditional roles often involve energy-intensive tasks like gathering firewood, amplifying the impact of energy poverty on their lives.

Ethnic minorities often experience higher rates of energy poverty due to a confluence of lower income, higher unemployment, and residence in less energy-efficient housing. Discrimination and language barriers may further obstruct access to energy assistance programs and fair energy contracts.

In the context of this thesis, low-income households, the elderly, families with children, and women are included in the pre-sample. These interviews aim to uncover the lived experiences and daily challenges faced by these groups and shed light on the harsh realities and multifaceted impacts of energy poverty.

2.3 Different Countries' and Institutions' Approach to Energy Poverty

Energy poverty is gaining increasing recognition as a global problem. This section examines how different countries and institutions approach energy poverty, how these approaches have evolved over time, and their relationship with sustainable development goals. The urgency of combating energy poverty is amplified by crises like COVID-19 and geopolitical tensions, exacerbating the difficulties faced by millions in regulating their home temperatures. This issue, compounded by lockdowns, income drops, and soaring global energy prices, underscores the need for inclusive energy access.The following presents how different countries define, measure, and intervene in energy poverty:

- Ireland: Energy poverty defines as a situation where a household cannot access acceptable energy services (including heating, lighting, etc.) at home. This issue arises from the inability to meet these needs at an affordable cost. The criterion involves spending more than 10% of the household's disposable income on home energy services. The related regulation is given below:

  > *"A household that spends more than 10% of their income on energy is considered to be in energy poverty." (Department of Communications, Energy and Natural Resources, 2016: 8)*

- Slovakia: Energy poverty defines as a situation where a significant portion of the average monthly household income goes to electricity, gas, and heating consumption compared to the average monthly household expenses. A household considers as suffering from energy poverty if its available monthly income is below the minimum monthly household income threshold. The Ministry of Labour, Social Affairs and Family of Slovakia publishes this threshold on the website of the Regulatory Office for Network Industries, and on the notice boards of jobs, social affairs, families, municipalities, and municipal authorities.

  "Energy poverty under the law No. 250/2012 Coll. Of Laws is a status when average monthly expenditures of household on consumption of electricity, gas, heating, and hot water production represent a substantial share of average monthly income of the household." (Strakova, 2014: 3)

- United Kingdom (England): A household faces energy poverty if i) its income falls below the poverty line considering energy costs, and ii) its energy costs are higher than what is typical for the household type. The low income, high consumption (LIHC) criteria apply. This includes two criteria: i) fuel costs above the median level, and ii) remaining income after fuel costs falls below the official poverty line. While England implements this, other component countries use the 10% threshold criterion. The related regulation is given below:

  "A household is considered to be fuel poor where they have required fuel costs that are above average (the national median level) were they to spend that amount, they would be left with a residual income below the official poverty line" [60% median income] (Department of Energy and Climate Change, 2013: 3)"

- United Kingdom (Wales, Scotland, Northern Ireland): In these regions, energy poverty defines as households spending more than 10% of their income on all household fuel use.

  > *"A household is said to be in fuel poverty if it needs to spend more than 10% of its income on fuel to maintain an adequate level of warmth." (Department of Energy and Climate Change, 2010: 1)*

- North Cyprus: Energy poverty associates with low-income consumers unable to meet the necessary costs for reasonable electricity supply needs.
- France: Energy poverty defines as individuals struggling to meet basic energy needs due to insufficient resources or housing conditions. However, the absence of a quantitative threshold makes the definition not fully functional.

  > *A citizen is considered fuel poor "if they encounters particular difficulties in his/her accommodation in terms of energy supply related to the satisfaction of elementary needs, this being due to the inadequacy of financial resources or housing conditions" (Translation of De Quero and Lapostolet, 2009: 16).*

Regionally, Catalonia's legislation against disconnecting energy and water supplies for needy households showcases a commitment to addressing energy poverty. Empirical studies affirm the effectiveness of such interventions, with energy efficiency improvements in buildings reaching up to 60-70%. Globally, Brazil's "Luz para Todos" initiative aims to extend electricity access to rural areas, fostering socioeconomic progress. India's Pradhan Mantri Ujjwala Yojana provides free LPG connections to impoverished households, promoting clean cooking fuel. The United States' LIHEAP assists low-income households with their energy bills. Countries like Spain, France, Greece, Colombia, South Africa, India, Pakistan, and the Philippines recognize the right to energy through various legal frameworks, highlighting the global imperative to combat energy poverty.

Also, NGOs, such as Practical Action and Energia, emphasize community-led, gender-responsive initiatives and renewable energy technology adoption, playing a pivotal role in grassroots efforts against energy poverty. International organizations, namely the European Union (EU), the United Nations Development Programme (UNDP), and the World Bank, are actively addressing energy poverty with specific policies and strategies:

- European Union: The EU has acknowledged the widespread issue of energy poverty, particularly highlighted by the high energy costs and living expense crisis in 2022. In response, the European Commission has issued recommendations that focus on energy efficiency and renewable energy investments, targeting fundamental causes like poor home energy performance and high energy expenses relative to household incomes. The EU approach necessitates the identification and management of energy poverty in each member state's National Energy and Climate Plan, scheduled for updates by 2024. Additionally, the Social Climate Plans, benefiting from these strategies, are expected to be in place by June 2025, complemented by the Social Climate Fund. The EU Energy Poverty Observatory (EPOV), initiated in December 2016, was a significant project for compiling resources and developing national energy poverty indicators. These indicators are crucial for assessing and comparing energy poverty across member states.
    - The EPOV's activities have since been integrated into the Energy Poverty Advisory Hub, continuing its mission. This integration includes the regular update of national indicators and the development of local energy poverty indicators in collaboration with the Covenant of Mayors cities, focusing on municipal-level monitoring and impact assessment.
- United Nations Development Programme (UNDP): The UNDP considers access to modern energy services for the poor as a priority, integral to eradicating poverty, empowering women, and creating opportunities. The program aims to reach the impoverished with energy services that

simultaneously boost productive activities and safeguard the environment and human health.

- World Bank: The World Bank’s approach to combating energy poverty focuses on increasing access to electricity and renewable energy, and enhancing energy efficiency. It emphasizes the need to address not only financial but also political barriers, such as fossil fuel subsidies that disproportionately benefit the wealthy. The Bank endorses small-scale solar energy initiatives, exemplified by Bangladesh's off-grid electrification program. A significant portion of the World Bank's loans is directed towards clean energy types, tripling the capital flow to clean energy projects. The Bank also co-leads the 'Sustainable Energy for All' initiative with the UN Secretary-General, targeting universal access to modern energy services, the expansion of renewable energy, and the improvement of energy efficiency.

The examination of energy poverty approaches in these countries and institutions reveals the complexity and diversity of the issue. Although there is a common understanding that energy poverty includes the struggle to meet basic energy needs, specific criteria and definitions significantly vary. This diversity in approaches indicates that solutions to energy poverty must be tailored to the unique conditions of each country. Moreover, many countries still lack direct policies, definitions, and measurement methods for energy poverty. The absence of a universal definition or criteria underscores the need for more research and dialogue to develop more effective and comprehensive strategies globally to address energy poverty. Policymakers and stakeholders, by understanding and learning from these diverse approaches, can better identify the most vulnerable groups and create targeted interventions to alleviate energy poverty.

2.4 Approaches to Energy Poverty in Türkiye

The literature concerning energy poverty in Türkiye is notably scarce. This thesis analyzes the available Turkish literature to determine the inclusion of concepts such

as 'energy poverty', 'energy poor', and 'energy deficiency'. Furthermore, it evaluates various state and civil society projects and policy practices that indirectly address energy poverty from the related reports published by public institutions or non-governmental organizations (NGO).

2.4.1 Theoretical Background of Energy Poverty in Turkish Literature

When the literature is examined, the first thing we come across is a study focusing on fuel types in 2012 chronologically. Emec et al. (2012) use the Turkish Statistical Institute's Household Budget Survey data to investigate the primary determinants causing energy poverty in Türkiye. They examine households' energy preference profiles. This study finds that low-income level is a significant determinant of household energy poverty in the country. As household income levels increase, they shift from traditional energy sources like wood, coal, and manure to modern energy sources. Additionally, higher education levels correlate with reduced consumption of coal and wood. Household size negatively affects electricity consumption due to high electricity prices. Larger households tend to prefer cheaper energy sources over electricity. As the number of rooms in a household increases, there is a greater need for central energy sources like natural gas, replacing wood, coal, manure, and other energy sources. A key finding of the article is that poor households, regardless of their location, primarily use wood and coal as their main energy sources. However, the article supports the 'energy ladder hypothesis', suggesting that as households' economic conditions improve, they tend to shift from traditional to modern energy sources. One of the significant features of this article is its focus on household energy preferences as a fundamental factor in addressing the issue of energy poverty.

Köktaş (2018) utilizes "Income and Living Conditions" data sets for the EU and Türkiye in his research. The study's most significant finding is that despite a general decline in energy poverty across the countries examined, Türkiye still has households facing high levels of energy poverty. In 2017, while the proportion of households unable to adequately heat their homes in the EU stood at 8.2%, it was significantly

higher in Türkiye at 22.3%. Another crucial result of the study pertains to households struggling financially with bill payments for utilities like electricity, water, and gas. In the EU, 8.1% of people face difficulties in paying these bills, compared to 24.2% in Türkiye. Therefore, Türkiye's rates in both aspects significantly exceed the EU average.

In 1993, the United Nations Commission on the Status of Women highlighted that socio-economic policies impact women more severely compared to men, with rural women experiencing the deepest levels of poverty. Furthermore, single-parent families, predominantly led by women, often live in extreme poverty (Yılmaztürk, 2020). Women experience poverty more intensely than men due to gender inequalities. Factors contributing to this include women's position within the household, lack of income or decision-making power over household income, and limited access to economic resources. These issues amplify the problem of economic resource allocation within society and lead to economic exclusion (Yılmaztürk, 2020). The inequality in the distribution of income and resources within households, coupled with the undervalued domestic labor of women, are significant causes of the poverty and economic violence faced by women. Therefore, addressing gender inequalities in labor market participation, household inequalities, and educational disparities is crucial for alleviating female poverty (Yılmaztürk, 2020).

The underlying reasons for the more severe poverty experienced by women include lower participation rates in the workforce, inadequate educational levels, the increased workload due to traditional roles, lack of child care support, and issues in the implementation of equal pay for equal work. Beyond these factors, the inadequacy of policies aimed at achieving equality also plays a significant role (Yılmaztürk, 2020). In conclusion, gender inequalities are rooted in unequal power relations, starting within the family and extending to broader societal and economic participation. The lower educational levels of women lead to inadequate participation in the workforce or an increase in informal employment. To change these power dynamics, it is essential to enhance women's self-awareness and capabilities, encouraging their participation in social and economic life. This

approach will help prevent the feminization of poverty (Yılmaztürk, 2020). For this reason, a sample of women groups is also selected for the in-depth interviews to be conducted within the scope of this thesis. And even in families with children, women's right to have a say in energy management and their practices in daily life are examined to try to understand the profile of energy poor women.

Existing research indicates that numerous studies have been conducted to assess energy poverty in Türkiye. While these studies converge on several common aspects, there is a notable variation in the datasets and methodologies employed by individual researchers. For guiding energy policies in Türkiye, it is imperative to select an energy poverty measurement method that is contextually suitable for the region. This entails determining a set of parameters that will facilitate the assessment of qualitative and quantitative data within this framework. Furthermore, it is essential to devise a methodological approach for this evaluation. In addition, energy poverty - just like the concept of poverty – differs based on local dynamic. This thesis aims to provide a preliminary study for future progress in this field, both in terms of the local characteristics of energy poverty, different household profiles, and the approach to sampling parameters, indicators and thresholds.

2.4.2 Policies and Implementations for Energy Poverty in Türkiye

Türkiye's energy policy journey is intricately linked to the problem of energy poverty by influencing and shaping policy decisions in different periods. Therefore, this section first analyses energy policies in general. Then, its policies and practices towards energy poverty are analysed.

In the 1970s and 1980s, the establishment of Electricity Generation, Transmission, and Distribution Corporation (TEK) marked a significant step in centralizing energy production and distribution. This period saw heavy investments in hydroelectric and thermal power plants, focusing on using domestic resources to meet the country's growing energy needs. However, this approach had implications for energy poverty.

The centralization under TEK might not have adequately addressed the energy needs of remote or poorer regions, potentially worsening energy poverty in these areas. Additionally, the focus on large-scale hydroelectric and thermal projects, while crucial for national energy needs, may have overlooked smaller, community-based energy solutions that could directly alleviate energy poverty.

During this early phase, policies aimed at rural electrification were critical. The effectiveness of these policies in reducing energy poverty depended on their implementation and the extent of rural electrification achieved. However, in some cases, these efforts might not have sufficiently reached the most energy-deprived communities.

The 2000s marked a shift towards renewable energy and natural gas, driven by the need for sustainability and diversification. This transition brought new dimensions to the energy poverty issue. Renewable energy initiatives, while focusing on sustainability, also needed to ensure affordability to avoid exacerbating energy poverty. Subsidizing renewable energy can be seen as a step towards making cleaner energy accessible to more people, including those suffering from energy poverty.

The integration of natural gas into Türkiye's energy mix, primarily through imports, raised concerns about energy security and cost. These concerns were particularly acute for energy-poor households, for whom rising energy costs could be devastating. The government's response, potentially through subsidies or social tariffs, was critical in protecting low-income households from these rising costs.

Furthermore, policies promoting energy efficiency and conservation aimed to reduce overall energy consumption, indirectly helping address energy poverty by lowering energy bills. However, the challenge lies in balancing the goals of sustainability with the immediate need to provide affordable energy.

As Türkiye continues to develop its energy sector, it faces the challenge of ensuring that all regions and demographics have access to affordable and reliable energy. The energy policies have increasingly focused on inclusivity, balancing sustainability

with affordability, and encouraging local and community-based energy solutions, such as small-scale renewable projects. These approaches are not only more direct ways to address energy poverty but also contribute to the broader energy goals of the nation. Thus, Türkiye's energy development history and policies reflect a dynamic sector, grappling with economic, environmental, and social challenges, with strategic shifts towards sustainability and diversification while continually addressing the nuanced issue of energy poverty.

In addressing the pervasive issue of energy poverty in Türkiye, government initiatives have played a pivotal role, particularly since the turn of the millennium. Since 2003, a notable social aid project has been in place, under the coordination of the Energy and Natural Resources Ministry. This project focuses on distributing heating coal to families in need, a significant step towards mitigating the immediate effects of energy poverty. Over the span of two decades, this initiative has successfully distributed approximately 3 million tons of coal, with a strategic emphasis on utilizing domestic coal resources. This approach not only aids in alleviating energy poverty among vulnerable populations but also supports the domestic energy sector.

However, the effectiveness of these initiatives, while providing immediate relief, brings to the forefront a series of debates and considerations. The primary concern revolves around the long-term impact of these measures in addressing the root causes of energy poverty. Are they sustainable solutions or mere temporary alleviations? Furthermore, the heavy reliance on coal, despite its local abundance, raises significant environmental concerns. This dependency on a fossil fuel, notorious for its ecological footprint, poses questions about the balance between immediate social needs and long-term environmental sustainability. Thus, while these government-led initiatives mark crucial steps in combating energy poverty, they also open up a dialogue about the future trajectory of Türkiye's energy policy, particularly in the context of global environmental challenges and the country's commitment to sustainable development.

In conclusion, Türkiye's journey to address energy poverty through evolving energy policies is a complex narrative of balancing immediate social needs with long-term sustainability. The establishment of TEK in the 1970s and 1980s with a focus on centralised power generation marked an important stage in meeting national energy needs, but potentially exacerbated energy poverty in remote and poor areas. Efforts such as rural electrification have played an important role, but their impact has varied across communities. The transition to renewable energy and natural gas in the 2000s posed new challenges and opportunities in tackling energy poverty. While renewable energy initiatives need to balance sustainability and affordability, the integration of natural gas has raised concerns about energy security and cost, particularly affecting low-income households. Furthermore, government initiatives since 2003, such as the distribution of coal for heating, can be considered as an indirect measure to address energy poverty. However, these measures also raise questions about long-term sustainability and environmental impacts, given the dependence on coal.

Overall, Türkiye's energy policy reflects a dynamic response to multiple challenges, seeking to strike a balance between economic growth, environmental sustainability and social equity. The future trajectory of the country's energy policy continues to evolve, seeking to reconcile the urgent need to alleviate energy poverty with commitments to sustainable development.

CHAPTER 3

EXISTING IDENTIFICATION METHODS OF ENERGY POVERTY IN THE LITERATURE AND POLICY ENVIRONMENT

Energy poverty measurement is a complex task that requires a multidisciplinary approach. It is a multidimensional concept that is deeply tied to individuals' domestic privacy, varies over time and place, and includes cultural sensitivities. In this section, existing approaches to measuring energy poverty are discussed in detail and their applications in the policy-making process are examined.

Measurement approaches can range from determining the incidence of energy poverty at the national, regional or even urban level, to policy delivery at the local scale. Data and resource availability and policy priorities of social groups' vulnerability and support needs shape these measurement approaches. Various methods are used to measure and evaluate energy poverty. Here are some of the basic methods:

i. Direct Measurement Approach: This approach involves comparing the energy services provided in the home (e.g. heating) to a set standard. This is assessed on factors such as physical indicators or the capacity to achieve minimum standards.
   - Physical Indicators: This method involves assessing a household's physical characteristics, such as the absence of certain energy services (such as electricity or clean cooking facilities), poor housing conditions, or dependence on traditional biomass for energy.
   - Energy Efficiency Gap: This method evaluates the difference between a household's current energy efficiency and a set minimum standard. A larger difference indicates greater energy poverty.

ii. Expenditure-based Approach: It is a method that examines the comparison of the ratio of household income to energy expenditures with certain absolute and relative thresholds. This can be evaluated under methods such as income-based metrics and energy expenditure to income ratio.

- Energy Spending as a Percentage of Revenue: Similar to revenue-based measurement, this method evaluates the percentage of revenue going to energy costs. Higher percentages indicate greater energy poverty. A common threshold is that if a household spends more than 10% of its income on energy, that household is considered energy poor.

iii. Consensual-based Approach: Based on individuals' or households' self-reports of their ability to meet certain basic needs. This includes subjective assessments of energy poverty and measurements based on household surveys.

- Subjective Measurements: These are based on household surveys in which residents are asked about their perception of their ability to adequately heat or cool their homes.
- Minimum Income Standard (MIS): Used in some studies, this method calculates the income a household needs to meet basic needs, including energy, and compares it to actual household income.

iv. Household Identification Indicators: This includes a variety of indicators used to identify households' risk of energy poverty. This may include factors such as household demographics, housing quality, energy access and usage patterns.

- Multiple Indicator Approaches: This approach combines various indicators such as income, energy expenditure, housing quality and energy use habits to provide a more comprehensive assessment of energy poverty. Multidimensional Energy Poverty Index (MEPI) is a

measurement method belonging to the Multiple Indicator Approaches category. This approach provides a more comprehensive assessment of energy poverty by combining various indicators such as income, energy expenditures, housing quality, energy use patterns, etc. Using these indicators, MEPI measures various dimensions of energy poverty and thus provides a broader perspective than measurements based on a single indicator

- Low-Income-High-Costs (LIHC) Indicator: Used primarily in the United Kingdom, this method considers households that have above-average energy costs and whose remaining income after paying these costs is below average as energy poor. official poverty line
- Energy Services Poverty Index: This index measures access to a variety of energy services, such as lighting, cooking, heating, cooling, and electrical appliances, to determine the level of energy poverty.
- Composite Indicators: These combine various factors such as income, energy costs, energy consumption and access to clean energy sources to create a more holistic measure of energy poverty.

3.1 Expenditure-Based Approach Measurement for Detecting Energy Poverty

One of the most common ways to measure energy poverty, the expenditure approach analyzes the ratio of household incomes to energy expenditures. This approach classifies households that spend energy above a certain threshold as energy poor. Generally, households where the ratio of household income to energy expenditure exceeds 10% or twice the national median are considered energy poor (Boardman, 1991).

On an absolute measure of energy poverty, a household is considered energy poor if it spends more than a fixed percentage of its income on energy. For example, in the UK, there is a threshold previously set at 10%. These measures could make it

possible to completely eliminate energy poverty. In relative measures, energy costs are typically calculated based on the median cost-income ratio. Given that energy prices are not fixed, relative benchmarks may reflect the 'moving target' problem and more accurately represent relative difficulty (Thomson et al., 2013).

For expenditure-based energy poverty measurement, a specific amount of energy costs needs to be calculated. There are two main approaches: theoretical expenditure required and actual expenditure. Modeling in the UK takes into account required internal temperatures, dwelling occupancy rates, energy efficiency, and the types of energy available to households. The required energy expenditure is considered meaningful as it is not affected by the actual decisions of the household, but the housing data required to collect this information is generally only available in the UK, and so other European countries do not provide in-depth modeling (Liobikiene et al., 2020).

The minimum energy budget approach calculates the essential energy required for a household's basic needs, providing a detailed perspective of energy poverty that accounts for individual household characteristics such as size, location, and climate (Moore, 2012).

An accurate assessment of household income is required for required and actual energy expenditure patterns. The definition of income is controversial, particularly over what welfare payments or benefits should be included in this calculation and whether income should be equalized to reflect household size (Healy, 2003).

The expenditure approach is one of the most widely used methods of measuring energy poverty due to its objective and quantitative nature. The Low-Income High Costs (LIHC) indicator, a quantitative measure prominent in the UK, identifies households facing energy poverty by assessing if their energy expenses exceed the median level for their household type and whether their remaining income post-energy costs dips below the poverty threshold. The LIHC indicator aids policymakers and utility providers in pinpointing households in need, ensuring that resources and support are allocated to those most vulnerable (Department for

Business, Energy & Industrial Strategy, 2015). However, it has occasionally been found that UK methodologies are applied incorrectly or uncritically in other countries. This indicates that the underlying methodology is complex and there may be a need to build technical and scientific capacity in this area. Data requirements/accessibility, assumptions around energy needs, and definitions of income raise criticism (Liddell & Morris, 2010).

The expenditure approach stands out among the methods used to assess energy poverty and tries to determine energy poverty by proportioning households' energy costs to their income. However, the difficulties encountered in applying this approach indicate that we need to improve our capacity to understand and respond to energy poverty. This measurement is a critical component for the design and implementation of energy poverty policies (United Nations, 2015).

3.2 Consensual-Based Measurement for Detecting Energy Poverty

The subjective or consensus approach has emerged as an alternative to expenditure-based and direct measurement methods in measuring energy poverty. This approach is based on households' self-assessment of their ability to meet their energy needs. Consensus energy poverty measures examine the ability of individuals and households to meet basic living needs and provide a more comprehensive understanding of energy poverty.

Consensual approaches to measuring energy poverty prioritize the subjective experiences and preferences of those directly affected. These methodologies align energy poverty with broader societal exclusion, integrating indicators that encompass the capacity of households to maintain adequate warmth, operate essential appliances, and meet energy costs in a timely manner (Middlemiss & Gillard, 2015). Unlike solely quantitative, expenditure-based methods, consensual approaches require engagement with affected households and experts to determine what constitutes adequate energy availability and affordability.

Consensual methodologies enhance the understanding of the lived experiences, ambitions, and concerns of those in energy poverty. By integrating budget standards, expert surveys, and participatory methods, assessments can be more context-sensitive and aligned with the realities of those affected. The budget standards approach defines the requisite level of energy services needed for an acceptable quality of life, incorporating the consensus of experts, affected households, and stakeholders. This method allows for a tailored view of energy poverty, reflecting the specific requirements of different communities (Thomson et al., 2020). Expert surveys involve consultations with professionals to reach a consensus on adequate energy availability and affordability. These surveys provide crucial qualitative insights into the unique challenges faced by vulnerable households and permit the incorporation of diverse expert opinions, enriching the understanding of energy poverty from multiple angles. Participatory methods actively involve affected households in the measurement process, giving voice to their concerns and experiences. These may include focus group discussions, workshops, and interviews, identifying community-specific indicators of energy deprivation (Liddell et al., 2011). Such bottom-up approaches allow communities to articulate and address their unique needs.

In this approach, households are typically asked questions about whether they can adequately heat their homes, pay their energy bills, or use energy services adequately. Data sources such as European Union Statistics provide a rich pool of information for such subjective assessments and allow measuring energy poverty in a relative way.

Subjective indicators assess energy poverty not only as an economic issue, but also in terms of individuals' quality of life and social exclusion. This method has the potential to capture broader aspects of energy poverty, such as material deprivation and social exclusion. It is also suitable as an interim measure of energy poverty for countries without standardized microdata on energy expenditure or household conditions.

However, subjective indicators can be misleading by households who do not accept that they are energy poor or who deny the reality of energy poverty. Furthermore, subjective measures raise concerns about the degree of overlap with expenditure measures.

Subjective indicators are an important tool in measuring energy poverty, but the use of these indicators can sometimes lead to biases such as exclusion error. For example, individuals may not think that they are energy poor or may deny this situation due to fear of social labeling. Therefore, data collected with subjective indicators need to be interpreted and analyzed correctly.

When using subjective approaches to energy poverty measurements, policy makers should consider the potential limitations of these measures and the subjectivity in individuals' self-reporting. In the design and implementation of energy poverty policies, subjective indicators should be combined with expenditure and direct measurement approaches and used to provide a more comprehensive picture of energy poverty.

The subjective/consensus approach offers a valuable perspective in understanding and measuring energy poverty. This approach enables policymakers to take into account the actual experiences and perceptions of households in the fight against energy poverty. However, in addition to general assessments of energy poverty, using these measurements in policy implementation at the local level is important for designing and implementing effective interventions. In order for this approach to be used effectively, it is necessary to understand the factors that may be misleading in subjective indicators and to integrate these factors into measurements.

3.3 Multidimensional Energy Poverty Index (MEPI)

Measuring energy poverty has become an important research topic in recent years. Multidimensional approaches proposed by researchers such as Okushima (2017), Sadath (2017), Nussbaumer (2012) and Santillán (2020) help us better understand

the prevalence and socio-economic consequences of energy poverty. The findings on energy poverty in the different regions covered in these studies show that this problem is a global issue and how it may differ in different geographical and social contexts.

For example, Okushima's work in Japan highlights the impact of rising energy prices on vulnerable households. This study shows how rising energy costs can be a burden, especially for low-income families. Sadath's work in India focuses on the correlation between energy poverty and other forms of deprivation. This study reveals that energy poverty is not limited to just lack of energy, but is also linked to general living conditions. Nussbaumer's study reviews existing energy poverty measurement tools and proposes a new composite index. This approach aims to more effectively capture both the incidence and intensity of energy poverty.

A synthesis of these studies, Santillán's analysis using the Multidimensional Energy Poverty Index (MEPI) focuses on the relationship between energy poverty and the Human Development Index (HDI). This study highlights the need to further understand the impact of energy poverty on people's quality of life and well-being. The multidimensional approaches highlighted by these studies can help better understand energy poverty and inform effective policies. In this context, in this section, MEPI, this new approach to measuring energy poverty, will be examined in more detail.

In traditional assessments of energy poverty, such as expenditure-based measurements, the focus is on the monetary aspect of energy availability. These assessment provide valuable insights into the economic burden of energy prices on households, often overlooking the multifaceted nature of energy vulnerability and the challenges faced by vulnerable individuals. To address these shortcomings, the Multi-dimensional Energy Poverty Index (MEPI) is generally considered as a comprehensive and holistic approach to assessing the intricacies of energy vulnerability.

The combination of qualitative and quantitative methods in MEPI is not incorrect. Unlike solely quantitative record-based expenditure-based controls, MEPI takes into account various dimensions of deprivation, including both objective and subjective aspects of energy availability. This multifaceted approach allows for a more comprehensive evaluation of where households face challenges in meeting their energy consumption needs. MEPI assesses the level of energy poverty of a region or country in a multidimensional way, taking into account various factors such as energy access, energy quality and sustainability:

- Energy Access: Assessing access to basic energy services such as access to electricity, access to clean cooking facilities.
- Energy Quality: Factors such as the quality and efficiency of the energy used and exposure to frequent outages.
- Cost and Affordability: The ability of households to cover energy costs.
- Sustainability: Environmental impacts of energy sources and access to renewable energy sources.
- Health and Safety: Health and safety risks associated with energy use.

MEPI is based on the notion that energy vulnerability is influenced by a variety of factors, including energy availability, prices, energy efficiency, and distribution, rather than just the amount of household income spent on energy. By incorporating these factors, MEPI provides a more comprehensive tool for identifying and addressing the underlying causes of energy vulnerability in policy-making.

MEPI involves calculating various weights and impacts based on the significance and relevance of each dimension in relation to energy vulnerability. It is then standardized for each dimension, resulting in an index ranging from 0 to 1. A higher MEPI score indicates a greater degree of energy insecurity or a more severe level of energy vulnerability in a specific location.

One of the most significant benefits of MEPI is its capacity to determine not only the prevalence of energy vulnerability but also its ability to determine the degree to which it determines the poverty level of a household. This broad perspective on

affected populations' incomes and circumstances allows for the development of tailored policies addressing the unique challenges faced by different housholds.

MEPI provides unique insights into the realities of energy deprivation, including variables such as access to and distribution of energy. By enabling more effective and equitable policy development, it ensures that interventions are tailored to the specific needs of energy poor households.

Therefore, MEPI is considered a significant step in monitoring energy vulnerability. It offers a more holistic perspective on energy deprivation and adopts a comprehensive approach that addresses various dimensions, guiding targeted actions and policies. As the world seeks universal energy access and a more sustainable and inclusive energy future, MEPI stands as an actionable framework that can contribute significantly to these goals. However, in order to implement this management, context-specific parameters and indicators must be defined. This thesis will provide a basis for the parameters that should be used for different measurement methods, especially MEPI, in Türkiye in the future.

3.4 Defined Parameters and Indicators for Measurement of Energy Poverty

There is a wide range of parameters and indicators used in energy poverty measurement to be used in the aforementioned methods. These indicators evaluate a variety of factors, such as income and expenditure levels, living conditions, energy consumption, individuals' perceptions and access to energy services, to understand the causes and consequences of energy poverty. Here are some parameters, indicators, and thresholds compiled with the literature review:

Income-Expenditure Ratio Indicators:

- Ratio of Energy Expenditures to Household Income: The ratio of energy expenditures to household income exceeding a certain percentage (usually 10%).

- Median Income Thresholds: Households whose energy expenditures exceed twice the national median income.

Energy Efficiency and Housing Quality:

- Energy Efficiency Classification: Classifications or energy performance certificates regarding the energy efficiency of buildings.
- Indoor Temperatures: Whether temperature levels considered adequate for health and well-being are reached.
- Physical Condition of the House: Insulation quality, presence of roofs and mold, and availability of energy efficient devices.

Access to Energy Services:

- Presence of Heating and Cooling Installation: Whether the house has heating and cooling systems.
- Energy Outages: Frequency and duration of interruptions in energy supply.

Subjective/Perceptual Indicators:

- Adequate Heating and Cooling Capacity of the House: Individuals' perceptions of whether they can adequately heat and cool their homes.
- Energy Debts: Existence of debts related to energy bills and payment status of debts.
- Energy-Related Health Problems: Health problems caused by lack of energy.

Social and Demographic Factors:

- Household Size and Composition: Presence of single-person households, large families or elderly individuals.
- Rental Status and Housing Type: Whether tenants or homeowners and housing type (apartment, detached house, etc.).

Energy Consumption Indicators:

- Per Capita Energy Consumption: The amount of energy consumption adjusted for household size.
- Rationalization of Energy Consumption: Consciously limiting energy consumption or sacrificing some energy services (e.g. cooking, lighting).

Energy Resources and Technology:

- Selection of Energy Carriers: Types and types of energy available to households.
- Status of Energy Infrastructure: Availability and reliability of regional and national energy infrastructure.

These parameters and indicators represent a combination of various methodologies and approaches used to measure energy poverty. This diversity and complexity must be taken into account when shaping energy poverty policies. Additionally, local conditions and cultural factors may affect the applicability and usefulness of these indicators. Therefore, the choice of indicators used to measure energy poverty should be appropriate to the specific needs and data access of the measured region.

CHAPTER 4

UNDERSTANDING ENERGY POVERTY LANDSCAPES WITH DIFFERENT HOUSEHOLDS PROFILES: İŞÇİ BLOKLARI AND ÇIĞDEM NEIGHBOORHOODS CASES

Thomson et al. (2017) discuss the complexities of quantifying energy poverty within Europe, underscoring the necessity for pertinent data and metrics. The dynamic nature of energy poverty, influenced by cultural nuances and the absence of a unified framework for its conceptualization and measurement, presents significant challenges. The significance of measuring energy poverty is paramount, and the study offers insights into its dynamics and the various methodologies for its assessment in differing contexts.

Gaining a comprehensive understanding of energy poverty and its detrimental effects on well-being is critical for the precise identification and elucidation of the issue. Consequently, exploring diverse methods to measure energy poverty is essential. Such explorations enable a review of energy poverty's prevalence globally and across different regions. Understanding the causative factors of energy poverty provides crucial insights into its underlying dynamics. Moreover, proposing interventions to alleviate the issue can offer policymakers substantial guidance for effective mitigation strategies.

Assessing whether energy poverty is confined to specific income brackets or is a pervasive issue across different economic levels is also vital. This encompasses situations where households endure energy poverty despite not being impoverished overall, and conversely. Numerous studies adopting an expenditure-based approach concentrate on low-income groups to assess energy poverty.

Hence, the creation of composite parameters and energy poverty triggering factors that encompass a broader spectrum of energy poverty's facets is of significant

importance. Such parameters and energy poverty triggering factors enhance comprehension of the issue and aid in the formulation of targeted policies to eradicate the problem.

In this context, the study involves conducting interviews with diverse household types using purposive sampling to understand the nuanced experiences of energy poverty. These interviews aim to probe the energy consumption behaviors, encounters with energy poverty, and the strategies employed as coping mechanism. The selection of these groups is informed by findings from a thorough review of the literature. For example, to ensure a representative sample reflecting a range of demographic factors that could influence energy use, interviews encompassed individuals from multiple types of households selected based on energy poverty vulnerabilities.

Accordingly, the sampling offers a baseline for comprehending the influence of several factors on energy use and the phenomenon of energy poverty. In this section, the data is obtained within the scope of open-ended interviews in Çiğdem and İşçi Blokları Neighborhoods. Energy poverty indicators, households' energy poverty and the way they deal with energy poverty mentioned in the literature review section are evaluated for the understanding the characteristics of energy poverty in Türkiye. Middlemiss and Gillard (2015) identifies six key challenges for the energy poor, including dwelling quality, energy costs, income stability, tenancy relations, social dynamics, and health. Interviews are semi-structured based on these challenges. Thus, the aim of the interviews is to understand the participant's energy consumption habits, energy management strategies, reasons affecting energy consumption habits including income, tenancy, health, hh type, condition of dwelling, and the challenges they face.

During the open-ended interviews, firstly, volunteer participants are briefly informed about the thesis, and participants are asked about their age, gender, occupation, income level and their household type. Afterwards the questions are posed to the

participants to release their energy consumption patterns including usage habits, energy bills, income. The interviews are structured under the following headings:

- Energy costs and income levels,
- Understanding knowledge and awareness on energy efficiency and energy poverty,
- Measures and strategies for energy saving and efficiency,
- Household type,
- Household energy management and consumption insights,
- Dwelling type and ownership,
- Community support, awareness, and energy aids of institutions.

4.1 Understanding Different Households Profiles in terms of Energy Poverty in Ankara: İşçi Blokları and Çiğdem Neighboorhoods Cases

The study involves conducting interviews that specifically targeted various household types. The interviews employ purposive sampling as a method to comprehend the energy poverty experiences of various household types and to delve into their energy consumption patterns, encounters with energy poverty, and approaches employed to address energy poverty. The identified household types encompass households with members over the age of 65, young women living alone, student or newly graduated households, and families with children. This sample offers a baseline or comprehending the influence of several factors on energy consumption pattern and the phenomenon of energy poverty.

4.2 An Introduction for Selected Case Study Areas

The quest for sustainable and equitable energy access is one of the defining challenges of urban development. Within the scope of this thesis, in-depth and semi-structured interviews on energy poverty are conducted with residents of two different neighborhoods in Ankara – İşçi Blokları and Çiğdem – which serve as microcosms with heterogeneous sociodemographic and spatial characteristics to examine energy poverty. Initially designed to embody a collective spirit with a pioneering central heating system, İşçi Blokları demonstrates a shift from collective energy solutions to individual efforts amidst increasing energy demands and economic inequalities. Within the scope of the study, this neighborhood is selected to learn about energy access and consumption patterns for different demographic groups such as students, working families and the elderly. Adjacent to this is the Çiğdem Neighborhood, a mosaic of different housing typologies ranging from villas to multi-storey buildings and slums. Here, energy consumption patterns and inequality in housing conditions provide a microcosm of the city's stratified access to energy resources. By comparing these areas, the aim is to examine the layers of energy inequality and the lived realities of residents grappling with the everyday challenges of energy poverty. This chapter aims to shed light on the spatial and sociodemographic structure of these two neighborhoods.



Figure 4. 1. Çiğdem and İşçi Blokları Neighborhoods' Borders

4.2.1 İşçi Blokları Neighborhood: From Central Heating System to Individual Struggle for Energy Poverty

Established in Ankara, İşçi Blokları (*Workers' Blocks*) Neighborhood is historically and architecturally significant. Its establishment date back to 22 January 1965, when the Ankara Confederation of Labour Unions Members Cooperative started the project with the vision of providing housing for its members.

The cooperative first started the construction of social housing for low-income worker families in Aydınlıkevler, Ankara. However, due to intense demand, the project was expanded to the Yüzüncü Yıl region. With this expansion, the foundation of the Yüzüncü Yıl İşçi Blokları complex was laid in 1973. Although it was initially designed to cover 3,500 houses, the increasing demand caused it to expand to 4,906 houses, which were completed in various stages. The first phase was completed in 1977 and the entire project was completed and handed over to the homeowners in 1988.

Constructed using reinforced concrete frame and brick infill, Türk-İş housing stands out as an example of social housing. The project includes a social design philosophy surrounding parks, schools, service buildings and a marketplace. One of its notable features is the central heating system, a pioneering approach at the time. Initially, the location of the METU campus on the outskirts near the eastern border meant that the housing catered mainly to low-income working families and METU students. With its built-in marketplace, cultural centre, parks and gardens, the settlement captured the essence of modern neighborhood design and social life, thus earning a special place in social memory.

In 2019, the registered population of İşçi Blokları is 17420 people (TURKSTAT, 2021). It is known that this population has a very heterogeneous socioeconomic structure. Due to its proximity to universities, the student population is quite high. In addition, families with children, newly graduated young people who have just started their professional life, and the elderly population are also around 3000.

Today, it is possible to divide the neighborhood into two sections in terms of both socioeconomic structure and built environment. The neighborhood near the METU campus preserves the old cooperative buildings and texture. On that side of the neighborhood, the tenant population and the student population are quite high. On the opposite side of Konya Road, as seen in the close neighborhood of Çukurambar, families with middle to upper economic status live. It is seen that the number of tenants and students is low on that side of the neighborhood. In addition, it is seen that the houses on this side are post-2000 and even post-2010 buildings.

4.2.2 Çiğdem Neighborhood: Slums, Multi-storeys, and Villas Together

Positioned in the southern region of Ankara, Çiğdem Neighborhood boasts both a strategic location and a rich natural environment. With a total population of 13114 as of 2022, comprising 6216 men and 6898 women, the neighborhood stands as a notable residential area in the city. Çiğdem Neighborhood is the close neighborhood to İşçi Blokları and METU A4 entrance. There are villas, multi-storey buildings and slums in the neighborhood. So, similar to the İşçi Blokları Neighborhood, Çiğdem Neighborhood also consists of diverse population like student population and families. In addition, as can be seen from the housing types, there are households from different income types.

4.3 Understanding Energy Poverty of Households with Different Types

The household participating in the interview include households with members over the age of 65, young women living alone, student or newly graduated households, and families with children, as seen in Table 4.1. These groups are heterogeneous across different income levels. Examination of responses reveals differentiated patterns of energy consumption according to income levels and types of household structures. Thus, interview results are examined in line with existing research in the literature, tracking income levels as a clear parameter of energy poverty. Questions

cover demographic information, the relationship between energy expenses and income levels, energy bill management, types of heating and cooling systems, challenges in energy management, support from governmental or societal organizations, changes in energy use over time, primary energy-consuming activities at home, various aspects of energy management, and measures taken for energy conservation.

Table 4.1 Participant Households

Participant Group	Description	Income Level	Pax	Alignment with Literature
Households with Members Over 65	Households consisting of one or more members aged 65 and above.	Varying (Low to High)	6	Correlation with existing studies on energy usage in older adults.
Young Women Living Alone	Single-women households, often young professionals or individuals in early career stages.	Generally Low to Medium	6	Links to research on energy consumption in single-person households.
Student/New Graduate Households	Households of students or individuals who have recently graduated, often with limited or unstable income.	Generally Low to Medium	4	Comparison with findings on energy use in transitional life stages.
Families with Children	Households with one or more children, encompassing a range of family structures.	Varying (Low to High)	4	Insights into household energy consumption with minors present.

4.3.1 Households with Members over the Age Of 65: Battling Energy Poverty in the Golden Years (!)

The first group to be discussed in this study comprises households with members aged 65 and over. In-depth interviews are conducted with six households. The over-65 group is considered among those most affected by energy poverty due to the vulnerability associated with age, experiencing different challenges caused by inadequate retirement pensions and health conditions.

Analysis of these interviews indicates significant differences in energy consumption levels based on income. Therefore, all responses are considered in light of income levels. The socioeconomic profiles in the interview vary from high to low according to income level as follows;

- Households with higher income level: Retired households and households with passive income from rent,
- Households with medium income level: Those who are retired but work for additional income and those who only receive a pension,
- Households with low-income level: Households with people who do not have a pension or whose salaries are mortgaged or who work without insurance on a daily wage basis.

As mentioned before, the energy consumption patterns of households vary according to these three groups differentiated by income level. Households in this group consist of elderly couples or elderly individuals living alone. Therefore, household size is not considered as a criterion for this group.

When examining these households in terms of energy poverty, a differentiation based on income level is observed, but unlike other groups, the behavioral pattern does not radically change with income level. Even in households with higher income level, people over the age of 65 are seen to consume energy with a focus on saving. However, the measures they take vary according to income level. Households with higher income level are observed to pay attention to the physical conditions of the

house when buying or renting, considering factors such as the age of the building, insulation condition, the orientation of the apartment, whether the apartment is on a middle floor, and the type of fuel used. Additionally, households with higher income level prefer central heating to prevent heat loss due to insufficient heating on the top floor and ground floor, which is different from other groups who prefer to control their heating levels.

Moreover, if they own their home, they pay attention to renewing elements like windows, and renovating floor coverings and wallpapers with materials that maintain thermal insulation. Households with lower income levels, who do not own their homes or cannot afford major renovations, resort to minor measures such as renewing window silicones every year. This routine of minor annual changes distinguishes household types with members over the age of 65 from other participant groups. Regardless of physical conditions, all income groups share similar energy-saving behaviors, such as keeping lights off when not needed, adapting to lower room temperatures in winter by wearing season-appropriate clothing, and not using mechanical cooling elements in summer.

On the other hand, the choice and usage patterns of energy-consuming appliances in homes also vary. Households with higher income level tend to replace household appliances to save as much energy as possible, while those with lower incomes continue to use their first washing machine and refrigerator, maintaining them through constant repairs. Households with medium and lower income level avoid using dishwashers unless necessary, while elderly individuals in high-income groups never run their dishwashers unless they are completely full. Households with higher income level also believe that the use of tablets and computers increases their energy expenditures. Therefore, the variety of measures taken for energy conservation, the methods of saving, the ownership, and usage patterns of electrical devices can be considered important parameters in defining the profile of energy poverty.

Although the behavioral pattern remains the same, the ability to meet energy expenses varies. Notably, the ratio of energy expenses to income changes among the

groups. Retiree households with passive income have an energy expense to income ratio that changes between 4-6%. Retirees who work for additional income have a ratio between 8-10%, and those with pensions who cannot work approach 15%. For households without a pension or with a mortgaged pension, this ratio varies monthly, and they cannot make payments without external support.

These changing ratios correspond to the condition of being energy poor. Retiree households with passive income have their energy expenses set up for automatic bank payments and do not even check the bill amounts, facing no difficulties in payment. Those relying solely on retirement pensions receive financial support from relatives—usually their children—to cover energy expenses during the winter months. This group of individuals has a significant taboo against receiving government support, considering it a matter of pride.

> *"We used to be able to pay the bills ourselves, but our expenses have increased in recent years. Thankfully, we have children who do not leave us alone. They all educated well and reached good positions in different sectors, and they support us even if we do not ask for it."*

Those without a regular income always apply for government support and strive to receive multiple types of assistance. It is observed that these groups reported to the elected neighborhood representative and sought help.

Moreover, the increase in energy bills over the years and the inadequacy of retirement pensions triggers for retirees with good health condition to continue working. Retirees whose pensions are insufficient mention wanting to work but being unable to do so due to health reasons or the inability to find employment.

Interviews reveal that homeownership is another significant factor determining energy poverty. Those living on just a retirement pension—even when receiving it as a couple—struggle to pay rent and energy expenses without homeownership.

Participants note that their energy consumption needs have changed over time. They all emphasize the importance of room temperature for staying healthy, mentioning

difficulties such as joint discomfort and coughing. In extreme weather conditions, along with measures for energy efficiency, they try to take additional steps to maintain a comfortable indoor temperature. Households with medium income level prefer a secondary heating system, which they call a natural gas stove and consider highly efficient, rather than increasing the combi boiler during extreme weather conditions. Additionally, an electric heater that increases the electric bill is an alternative, but these groups only use it when their children or grandchildren visit, considering it wasteful when alone. Those with lower incomes try to keep the bill as low as possible and do not increase the temperature unless they are ill, leading to a consumption pattern that sometimes risks their health. It is observed that they used to be able to install a coal stove in the past, but they could no longer manage it for health reasons. Households with higher income level in centrally heated homes complain that the heating bills are costly and that the room temperature is often higher than desired, which they find restrictive. They mention negotiating with their apartment residents for a more economical heating arrangement. Other reasons for change over time include increasing energy prices and, in their words, the proliferation of electronic devices in modern times.

For households with middle and low-income, there are also problems with the energy used for cooking. Because oven usage significantly increases electric bills, they never prefer it, and they continue to use gas cylinders for stoves. The main reason for this is that landlords do not want to invest in connecting the gas system to cooker stoves and hot water. Therefore, they try to save on hot water consumption.

> *"Actually, we have neighbors who use natural gas for cooking and heating water. Their bills are quite reasonable. But our landlord did not want to pay the necessary 10,000 to 15,000 TL for the gas system, saying if you want it, connect it yourself; I don't care. We think, why should we connect it when it's not our own house, and if we could afford such an expense, we would change the refrigerator. Now we renew the gas cylinder every two months. The prices of cylinders have also increased a lot. Also, hot water usage directly affects the*

electricity bill. If it stays on every day, it quadruples the bill. So if we're not going to take a shower, we don't turn on the hot water."

This group is careful not to delay bill payments. While the high-income group pays bills via automatic payment orders, other households, if they have enough money, prioritize paying their bills. A notable example comes from a household living on just a retirement pension; civil servants provide an important indicator in terms of bill payments:

"Civil servants have a habit of first paying the bills and then living with the remaining money. We used to divide and allocate money first for essential expenses like rent or bills. This was a habit when we were working. I still continue to pay this way."

Thus, households indicate that they do not have difficulty in paying energy bills, but they still have to give up other expenses and adjust their lifestyle according to what remains after the energy bills. This situation exemplifies a profile of energy poverty that is compliant, unaware, and resigned, which can be encountered locally, while also highlighting the importance of consumption items and prioritizations in terms of energy poverty.

The results obtained when all these inpultars are analysed with the grounded theory approach are presented in the Table 4.2. This study methodically explores the phenomenon of energy poverty in households with members aged 65+, revealing the complex interactions of economic, behavioural and infrastructural factors that influence energy consumption behaviours. Using open coding, key themes such as income-related energy consumption behaviours, health-related energy needs and a range of energy saving tactics were identified. Axial coding further disaggregates these findings, highlighting the correlation between behavioural patterns and income levels, as well as the profound impact of home ownership on energy management. Selective coding reveals a central theme: a cultural ethos of self-reliance that influences the orientation of energy management around income and health preconditions and the uptake of external support.

The theoretical model developed from this analysis proposes a multifaceted framework for understanding energy poverty among the elderly. It underlines the need for policy interventions and social support systems that are sensitive to the economic stratification in this demographic. While high-income older households take a conservative approach to energy consumption due to habit and efficiency, middle- and low-income groups are often constrained to minimal energy use, which sometimes negatively impacts their health and well-being. This highlights the sharp contrast between choice and necessity.

Table 4.2 Detected Profiles of Households with Elderly Members

Category	**Energy-Saving Strategies**	**Health & Energy**	**Support & aid**	**Expense Ratio**
High-Income Households	Technological upgrades, efficient heating systems, home renovations for insulation.	Prioritize comfort and health; can afford higher room temperatures.	Rarely need support; prefer self-sufficiency.	4-6%
Medium-Income Households	Season-appropriate clothing, efficient appliance use, secondary heating systems.	Adjust room temperatures, may use additional heating sources selectively.	Sometimes receive support from relatives, but see aid related to pride.	8-10%
Low-Income Households	Minor adjustments like renewing window silicones , adapt	Avoid high temperatures to keep costs low, which can risk health.	Often rely on government support and community assistance.	Varies; often high and unpredictable.

	room temperatures.

Therefore, this part of the research modestly provides a complex depiction of energy poverty in older households, highlighting a multifaceted dependence on economic, behavioral and infrastructural parameters. The research investigates that energy consumption patterns are not monolithic but vary significantly according to the economic stratification of the elderly population since a critical determinant of energy consumption profiles among the elderly is the economic group to which they belong. Households with higher income level tend to save energy even though they have the financial ability to cover higher energy costs. This conservative approach is often the result of ingrained habits or a conscious decision to allocate resources efficiently. In contrast, households with middle and low-income level are constrained in minimizing energy use, which is out of necessity rather than choice and often leads to inadequate heating or cooling, which can have detrimental effects on their health and well-being. In conclusion, the detection of energy poverty in elderly households requires a nuanced approach that considers the interplay between economic status, behavioral patterns, and housing conditions. The parameter list compiled as a basis for future studies as a result of the interviews is given in Table 4.3. The economic classification of the elderly is a fundamental aspect that informs their consumption patterns, coping strategies, and resilience in the face of energy poverty. To effectively address energy poverty among the elderly, policies and interventions must be tailored to accommodate the diversity within this demographic, ensuring that all elderly individuals have access to the resources and support necessary to live comfortably and healthily.

Table 4.3 Parameters to Measure Energy Poverty and Identify Energy Poor Households with Elderly Members

Parameter	Indicator	Measurement	Threshold

Income Level	Monthly income	Total monthly income	Below poverty line as defined by TURKSTAT
	Source of income	Pension, rental, investments, etc.	Passive vs. active income sources
Housing Quality	Insulation quality	Presence of wall and window insulation	Standards as per Turkish building codes
	Age and condition of home	Year of construction and current state assessment	Above or below average standards
Energy Expenditure	Energy expenditure to income ratio	Percentage of income spent on energy bills	Above 10% of income
	Frequency of energy bill payments	Timely vs. delayed payments	Delays in payment indicate potential poverty
Energy Consumption Behaviour	Daily hours of heating or cooling usage	Number of hours per day	Deviation from national average
	Type of energy sources used	Gas, electricity, renewable, etc.	Dependence on less efficient energy sources
Health and Energy	Incidence of health issues	Number of temperature-related health incidents	Above average for age group

	related to temperature		
Energy Saving Measures	Investment in energy-efficient appliances	Number and type of energy-saving appliances	Below standard requirements
	Behavioral adaptations for energy saving	Frequency and type of behaviors	Comparison with national behavior patterns
	Type of spatial measures	Temporary and small-scale or permanent and major	Temporary and small-scale investments risk energy poverty

4.3.2 Households composed of Student(s) or New Graduate(s): Collective Living as a Solution to Combat Energy Poverty

The other group to be discussed in this study comprises households composed of students or new graduates. In-depth interviews are conducted with six households. The main sources of income for the students interviewed are scholarships, student loans, wages from part-time jobs in the service sector, or allowances from their families. For recent graduates, if employed, their income is considered relatively low, at the entry wage level. On the other hand, young people who have difficulty finding a job and continue to live on low allowances from their families are also included in the interviewed group. Therefore, households belonging to this group are considered among those with high potential for energy poverty.

Certainly, individuals who prefer collective living as an experience are also part of this group, but generally, this study takes into account the group that chooses collective living due to the potential for energy poverty stemming from low-income

status. The interviews conducted with this group within the thesis evaluate energy management and poverty through income and expenditure ratios, energy consumption behaviors, and living conditions. This study aims to provide a basis for identifying parameters that should be considered in addition to income and expenditure ratios for the measurement of energy poverty.

Energy poverty emerges as a constant balancing act between financial obligations and living standards for households consisting of students and new graduates. The interviews show that these households adopt proactive approaches to managing and distributing energy costs. Individuals with similar and low-income levels usually cannot afford the expenses of a house on their own and are paying for bills such as rent, food, energy, and water by sharing these costs in a collective living arrangement. The participants, whose household sizes range from 2 to 4, are observed to evaluate their expenses in a common pool and pay for it by sharing it.

When considering the total income and expenses of the household, the ratio of energy costs to income varies between 6-10%. However, it is clear that this does not mean they are exempt from energy poverty, as energy poverty cannot be evaluated within a framework limited only to cost and income ratios. Additionally, the increase in fuel costs is indicated to cause economic difficulties, especially for new graduates. Some participants struggle to pay energy bills and resort to various strategies.

Although the energy bills of these rented households appear low relative to income, it is observed that the households resort to restrictive measures on consumption. These measures have been analyzed by dividing them into spatial and behavioral categories, similar to the responses of the first group. When examining behavioral measures, the primary method that emerges is, in their own words, *"using just enough natural gas to break the cold*". These groups rely on their youth and resistance to cold, keeping the temperatures low to reduce bills. They keep the heating off all day or use it at the lowest possible level. On the other hand, it is observed that this group does not hesitate to increase the temperature when a guest visits the house.

"In general, we just heat enough to break the cold. When we are not at home during the day, we completely turn off the combi boiler and only turn it on for a while when we come home in the evening, and we turn it down a lot before going to bed. I prepare a hot water bottle before going to sleep and sleep with it. If a friend or one of us' family visits the house, we do not hesitate to increase the combi boiler. Not everyone is used to the cold."

Income levels and household sizes vary inversely. The issue of sharing expenses, which is a factor in moving in together, is solved by moving in with more people if the income level is low. In terms of energy consumption, the heating does not change according to the number of people but varies depending on the size of the house and preferences. The amount each person pays decreases as the number of people sharing the electricity consumption increases. Therefore, although the household sizes change in a 1:1 ratio, such as 3 people in a 3-room house or 2 people in a 2-room house, practices such as living 4 people in a 2-room house are also present.

This group also seeks to balance their income and expenses by engaging in freelance activities such as photography or tutoring to cover the increased expenses during winter. Furthermore, this group, as a fundamental feature, holds the hope of finding a job after graduation or entering higher-paying positions, even if they are energy poor.

"One of our housemates graduated and got a job. Her salary isn't that bad. So, she moved to a new house to live alone for a while. If it gets too cold, maybe we go to her sometimes...(laughs.) We found someone immediately to replace her, two people can't cover the payments."

It is observed that they are concerned about energy poverty because they are worried about losing their jobs or not being able to find a job. Increasing conventional fuel prices also have a high impact on this. In other words, they experience energy poverty anxiety intensely together with future anxiety.

Moreover, almost the entire group does not resort to any type of fuel other than natural gas. Only in a household with a better income condition, an electric heater is used as an alternative when the air is very cold, and the room is heated for a short time. In addition, the card system, which is found in many houses within the study area, continues mainly in buildings where students live. This card system is observed to create pressure on students in terms of energy poverty and provides a control mechanism. Participants who state that their balances go negative until their allowances are replenished and are not enough for heating, mention that in a billed system, they would be able to cope with it by delaying payments.

Another common measure against extreme heating and cooling in winter and summer is not staying at home. In winter, they prefer to study in libraries or cafes as an alternative to their cold homes. In the summer, this group, which tries to cool the house with only natural methods, tries to find a solution by spending time in public areas with air conditioning when the house is very hot.

> *"It gets too hot, and we can't stay at home. We leave early in the morning and come back to the house in the late afternoon. The landlord doesn't want air conditioning installed. Maybe if we could occasionally turn on the air conditioning instead of spending our money in cafes because the house is hot, but they don't accept that either. When it's cold in the winter, we get sleepy, we can't study at home. We go to the library or a cafe."*

This group, known to be conscious about energy efficiency, pays significant attention to the equal division of expenses. Another common theme in all households consisting of young people is the use of a digital tool - for example, mobile phone applications where expenses are jointly entered - for tracking energy bills. This method not only ensures fairness within the household but also develops a sense of collective responsibility. More importantly, these platforms enable consistent monitoring of energy consumption, helping households identify excess areas and potential savings.

The only area where this group is observed to be extravagant in terms of energy consumption is computer use. When they list the devices and activities that consume the most electricity, on one side there are obligatory and unchanging energy expenses, such as old and low-energy-class white goods, heating expenses with very low efficiency during winter months; and on the other side, there is computer use. It is seen that students with a habit of playing e-games somehow purchase expensive and high electricity-consuming gaming computers with their allowances and keep these computers on 24/7. This expenditure is made to spend the time at home more comfortably and enjoyably. However, they manage to cover this expense by cutting back on other needs - such as eating cheaper food.

In addition, an interesting and different behavior from the other groups is detected in this group. At the point where they find a legal loophole, there is a tendency to continue to use without reporting energy expenses. The example of a household that continued to use natural gas without reporting this to the relevant institution during a period when the natural gas meter had broken down concretizes this:

> *"The natural gas meter works with a card system, the loaded balance decreases on the meter display as you use it and eventually runs out. However, it remained broken for a winter and the balance never decreased despite the use. But when this was discovered in the summer, we had to pay for 4 months of natural gas use at once. I took out a loan to pay for it."*

This tendency is also observed in other interviews with this group. They justify this situation by thinking that it is unfair to think so much about energy expenses as a student and to have to take on additional jobs for this. On the other hand, despite all the measures they take and the difficulties they experience, it is observed that the households do not apply for the support provided by the government. They state that they do not want to spend time in the application process because they do not have the hope that support will be provided.

However, the behavioral measures taken often prove to be insufficient due to the lack of energy efficiency in spatial manners. Factors such as the age of the building

being over 50 years old, second-hand old white goods, measures that landlords refuse to take, and inadequate insulation increase energy consumption and thus the risk of energy poverty. It has been observed that the landlords do not want to make any additional expenditures because students live there. In this case, the demands of tenants such as insulation and renewal of windows are not met. Therefore, it is seen that this group, unlike other groups, cannot take permanent and large-scale spatial measures. This situation is clearly determined by the tenant status and financial constraints. Households also indicate that they try to overcome spatial problems with their efforts. The measures taken are, of course, small-scale and temporary. For example, methods such as renewing window silicones or covering balcony doors with bubble wrap are observed.

Especially the floor and the facade of the building directly affect the temperature of the house. Other than seasonal measures, another issue that can be considered as a more permanent method is the choice of housing. There are individuals who pay attention to this when choosing a house. It is observed that they try to prefer buildings that are as insulated as possible. However, this group, which says that the rent amount and the number of rooms are the main determining factors, is observed to have to live in uninsulated and unmaintained houses. In addition, unlike other groups, this group is seen to rent houses in a way that there will be no spare bedroom in the house. This is another reason for the low ratio of energy expenses to income.

The grounded theory approach reveals themes like collective energy management strategies and cost-reducing measures through open coding. Axial coding provides more insight by identifying the relationship between communal living arrangements, income constraints, and energy-saving tactics. Selective coding illuminates a central narrative: a proactive but limited approach to energy management based on communal living experiences and financial limits. The developed theoretical model offers a nuanced framework to understand energy poverty in young adults. It suggests that policy frameworks and support systems need to align with this group's economic realities and living conditions. Some households show adaptable strategies to balance energy costs due to limited incomes, while others in better situations

invest in energy-efficient technologies or choose living spaces that contribute to lower energy consumption for comfort and sustainability. This situation highlights the different levels of action and constraint within the population. Household profiles summarizing the surveys conducted with this method are presented in the Table 4.4 and detected parameters is given in the Table 4.5.

Table 4.4 Detected Profiles of Households composed of Students or New Graduates

Category	**Energy-Saving Strategies**	**Collective Living & Energy**	**Support & Aid**	**Expense Ratio**
Students Relying on Scholarships, part-time job salary, and/or Family Allowances	Utilizing communal areas for heating; minimal personal heating use	Cost-sharing in group living arrangements; energy use as a communal decision	Reliance on scholarships and family; little to no external aid sought	6-10%, reflecting a careful balancing of energy costs against limited income
New Graduates with Entry-Level Wages	Investing in energy-efficient appliances; judicious use of heating	Preferring smaller, more affordable living spaces; if possible moving new home alone	Occasional financial support from family; mostly self-sustained through part-time work	Varies; moderate, influenced by the stability of part-time income and shared living costs
Unemployed New Graduates and Students with	Low-cost weatherization; use of public spaces for	Multiple roommates to reduce per capita cost;	Dependence on government assistance	High and unpredictable; heavily impacted by

Low Family Support	temperature control	shared responsibility for energy management	and community support due to lack of employment	the absence of regular income and reliance on aid

When all these energy consumption patterns are examined, it is seen that students and new graduates stand out as potential energy poor. Efforts to limit energy consumption form an important part of the strategies to reduce bills, while also indicating that households compromise on comfort levels. In conclusion, the profile of energy poverty among young adults is a multi-layered issue that touches on broader matters such as economic stability, employment, social justice, and individual behavior patterns. Access to and consumption of energy are critically important for the quality of life and future perspectives of young adults and require attention at individual, societal, and political levels. In this context, it is important to develop comprehensive and multi-dimensional measurement mechanisms and strategies at both local and global levels to combat energy poverty. The income levels, management of energy expenses, and structural conditions of homes are **key parameters** for understanding and measuring this poverty:

Income Levels and Sources: The financial resources of young adults and students vary during uncertain periods of their lives. The fragmented nature of incomes from scholarships, part-time jobs, and family support places them in a vulnerable position against fixed expenses such as energy bills. For recent graduates, the first steps into the job market are fraught with low wages and high unemployment rates. This limits their capacity to cope with energy costs, often leading them to reduce energy expenditures to compensate for this imbalance.

- **Energy Costs to Income Ratio:** Although the energy costs to income ratio fluctuating between 6-10% may appear acceptable at face value, these ratios do not reflect the true cost of living. Insufficiency of these

ratios as an indicator of how to cope with low income necessitates a more comprehensive assessment.

Household Structure: Shared living spaces are a strategic approach to distributing energy costs. Young people alleviate economic burdens by sharing rent and energy bills. However, this sharing does not completely eliminate the dimensions of energy poverty; it merely reduces the financial pressure on individuals. Such that, as the number of people living in a house increases, energy expenses are temporarily distributed among individuals, providing convenience, yet in the long term, an excess in the number of individuals shows parallelism with the potential of becoming energy poor.

Housing Characteristics and Energy Efficiency: The quality of a dwelling directly affects life quality. Living in a house with low energy efficiency increases the energy consumption and thereby the financial burden for young adults. Lack of insulation and outdated heating systems lead to rising bills.

Consumption and Saving Behaviors: Young adults exhibit distinct behavioral patterns in energy consumption. Practices such as heating just enough to ward off the cold or increasing heating when guests arrive indicate the limits of energy-saving efforts. These practices reflect the direct impact of energy poverty on daily life.

- **Seasonal Measures:** Strategies to avoid cold houses in winter or protect against extreme heat in summer affect the daily routines of young people trying to control energy consumption. The tendency to use public spaces aims to reduce energy consumption at home and holds significant importance in the struggle against energy poverty.
- **Technology Use and Energy Management:** Digital tracking of energy bills and mobile applications allow young people to monitor and manage their energy consumption. These technological tools facilitate a more transparent and equitable distribution of energy expenses, indicating the importance they place on energy costs and how it influences their behaviors.

Therefore, the measurement and combat of energy poverty should be shaped according to the financial, social, and housing conditions of young adults and students. Energy poverty should not only be addressed as a financial issue but also as a matter of social justice, requiring the strengthening of policies and social support systems. Parameters specific to this group that should be considered for the measurement of energy poverty are specifically provided in Table 4.5.

Table 4.5 Parameters to Measure Energy Poverty and Identify Energy Poor Households composed of Students or New Graduates

Parameter	Indicator	Measurement	Threshold
Income Level	Income sources	Scholarship, student loan, family support, part-time job salary	Scholarship or loan needs; part-time job need; family support need after graduation
	Amounts	Monthly income in currency	Below poverty line
Energy Spending	Percentage of income spent on energy	Monthly or annual energy costs as a percentage of income	Above 10% of income
Housing Conditions	Quality of insulation, age of building, type of heating system	Insulation rating, building age in years, type of system	Below building standards

Support Programs	Availability and accessibility of financial aid for energy costs	Number of households receiving aid, amount of aid	Less than required to offset costs
Energy Efficiency Measures	Investment in energy-saving appliances and renovations	Number and type of measures implemented	Fewer than average for similar households
Behavioral Patterns	Usage patterns, temperature settings, awareness of energy savings	Frequency of adjustments, degree of temperature change	Higher than recommended settings
Social Dynamics	Household size, composition, and decision-making	Number of occupants, decision-maker roles	Larger than average household size

4.3.3 Female Households Living Alone: Economic Independence and Energy Utilization Insights from Women's Practices

The phenomenon of energy poverty is not independent of gender. Particularly, women living alone or women with a flat mate face certain challenges that make them more vulnerable to energy poverty. This situation, where gender intersects with economic independence and social structures, demands careful examination and is a multifaceted issue. Consequently, energy poverty manifests in various forms as a

reflection of gender-specific challenges that single women encounter in economic and social contexts. This study conducts in-depth interviews with four different women.

Households consisting of one or two women are significant cases for understanding how they shape domestic energy management while coping with the economic and social demands of life. This situation gains meaning through efforts to optimize energy expenditures within a budget. In this regard, energy consumption patterns are initially examined. In their quest for economic independence, these women struggle to maintain a sustainable life amidst rising living costs with limited resources.

The income levels of the interviewed households range from low to middle and upper-middle. The participant from the low-income group lives alone on a minimum wage. Women from the middle-income group live alone and work as mid-senior level white-collar employees. The so-called upper-middle income household comprises two mid-senior level white-collar women. The results of the interviews are evaluated considering the factor of income level. Furthermore, although they differ according to income level, the behavioral patterns in gender-specific situations show similarities.

Another feature is that the importance they give to their economic independence affects their behavior in managing their energy expenditures. Women vulnerable to energy poverty act with the concern that accepting financial support from their families or relatives would restrict their freedom. Especially when facing financial difficulties, they consider alternatives such as applying for government support programs or, as a last resort, taking out loans or using credit cards. For instance, paying bills with credit cards does not directly affect energy consumption pattern but offers financial flexibility to single women through the advantage of deferred payments. This is a significant factor in the struggle against energy poverty as options for financial aid and borrowing create a critical balance between individual freedoms and independence.

In this framework, the relationship between energy costs and social dynamics is considered with an expansive perspective towards individuals' quality of life and freedoms. The participants' ability to secure their housing rights and social harmony by timely payments of rent and maintenance contributes to factors affecting energy consumption. On the other hand, their capability to manage the relationship between financial difficulties and energy costs reflects their efforts to maintain their position and independence within society. The analysis of these in-depth interviews focuses on how the preservation of individual independence and the achievement of social harmony integrate with energy management strategies, and what these strategies mean not only economically but also for social sustainability. This approach allows for the understanding and evaluation of participants' life practices within a broad societal context.

Women engage in research on energy efficiency regardless of their educational level and integrate this information into their lives, which reflects a general characteristic in their daily practices. The information gained from different channels like internet encourage the adoption of behavioral measures aimed at reducing domestic energy consumption. For example, passive cooking measures in the cooking process and low-income groups' preference for foods with short cooking times, using energy-intensive appliances only when necessary, reflect women's selective and strategic approaches to energy consumption. This indicates a transformation in everyday life practices in the fight against energy poverty, especially for the low-income group.

In addition, women meticulously monitor their energy expenditures, both digitally and by collecting physical bills, increasing savings measures in response to unexpected rises and persisting with these practices during months when bills decrease, demonstrating a proactive approach. An increase in measures when unexpected hikes occur and the tendency to repeat efficient measures when bills decrease highlight the need for conscious financial management and a critical analysis of energy consumption. In other words, it exposes their susceptibility to energy poverty.

"I allocate a portion of my monthly budget for the energy bill and adjust my spending according to this budget. To avoid exceeding it, I take measures like lowering the heat. I also regularly check my energy bills to monitor for any abnormal increases."

In addition to behavior-based measures, when considering temporary spatial measures, women are seen to take various creative measures. For example, covering walls with windows with transparent stretch film, placing aluminum foil behind radiators, using thick curtains, applying silicone to windows, sealing an unused balcony door to prevent air passage, and placing a piece of furniture like a cabinet in front to block it are some of the measures taken. The promising role of insulation in reducing energy costs has become an important strategy for women living alone. They do not hesitate to communicate with landlords and building management to express this need and engage in a form of rights advocacy.

However, the challenges in reflecting energy efficiency measures on bills expose the inefficiencies in the current system. Despite significant reductions in usage, the decrease in bills does not create the financial relief expected, demonstrating women's adaptability in managing costs while also indicating that systemic barriers caused by high-cost energy sources like natural gas persist.

"Even though my energy usage hasn't changed much, I'm charting a decreasing graph in terms of consumption, not price. Initially, I wasn't careful about energy consumption, but as I applied individual savings strategies, my consumption began to decline. I am maintaining a certain stability now. Even though my usage has decreased, my bill continues to rise."

While heating methods generally rely on natural gas, the use of electric heaters when necessary and efforts to balance bills are understood. Another challenge faced in households with central heating systems is the inability to control central system bills. Women living in single or two-person households prefer to heat the home at lower temperatures and even refrain from heating when at work, taking extra measures. On the other hand, these requests are not favorably received by the

apartment community, and they try to adapt by somehow paying the challenging bills.

The increase in income levels is observed to lead participants to heat their living spaces more. This reflects a trend parallel to an increase in individual comfort and well-being. As income level rises, so does flexibility in energy consumption, expanding people's capacity to create a warmer environment in their homes during the cold winter months.

> *"When I was a new graduate, I moved in with a roommate to share expenses. We used a tariff-based electricity bill system. Electricity used in the evening was cheaper. We struggled to implement this with my roommate, especially agreeing on doing laundry late at night. It was a valid point; after all, it caused noise at night. But back then, I was working part-time as a waitress, and my income was limited. I still tried to comply with the tariff usage. Later, I found a job in my field of expertise, and my income increased with my experience. I moved into my own place because I could cover the expenses, but the bills also increased proportionally with the raises. Now I can afford them alone, but I still need to save."*

Tariff-based billing agreements emerge as part of energy management strategies. These agreements, while having the potential to save by shifting energy use to lower-cost time slots, may not always provide the expected benefit due to practical challenges such as inappropriate working hours.

Participants emphasize the importance of keeping workspaces warm in cold weather conditions, pointing to the impact of this on work productivity and comfort. This is particularly significant during the period of increased home office work arrangements caused by the COVID-19 pandemic, where the need for heating, especially during winter months, leads to parallel increases in home energy consumption.

"I could normally live by turning on the gas only in the evenings, but on days when I worked from home, I had to keep it on all day. The cold made me sleepy, it decreased my productivity, or I would get sick. If workplaces are going to continue this arrangement, they should contribute to bills as a side benefit."

These observations demonstrate that individuals' approaches to energy consumption are shaped not only by economic factors but also by social habits, lifestyle, and domestic dynamics. While an increase in income directly affects energy management practices, changes in social interaction and living arrangements have indirect but significant effects on energy consumption. These complex interactions help us understand how social and individual factors in energy management intertwine and how personal strategies evolve in the fight against energy poverty.

Table 4.6 and Table 4.7 are the results of the grounded theory approach, which involves generating theories fundamentally based on collected data, aimed at understanding energy poverty among women. Open coding could identify specific actions and processes, such as distinct energy-saving strategies. Axial coding then links these codes to broader categories, highlighting the relationship between economic independence and energy management. Selective coding transforms this into a central theme, reflecting the adaptability and resilience of single women in managing energy poverty. The theoretical model emerging from this data synthesizes these insights, emphasizing the need for policies that address the unique challenges faced by single women in the field of energy poverty.

Table 4.6 Detected Profiles of Female Households Living Alone

Category	**Energy-Saving Strategies**	**Economic Independence & Energy Management**	**Social Dynamics & Energy Costs**	**Energy Expenditure Monitoring**
Low-Income	Passive cooking, using	Reluctance to seek financial	Financial aid and borrowing	Meticulous monitoring of

	energy-intensive appliances selectively, preference for foods with short cooking times, measures like insulation film, silicone sealing	support to maintain independence from family, use of credit for bill payments	create a balance between independence and managing energy poverty	bills, adjustments to spending, proactive savings measures
Middle-Income	Investing in energy-efficient technologies, careful timing of energy use to cheaper tariffs, measures like insulation film, silicone sealing, using thick curtains for better heat retention	Employment provides financial stability which influences energy use and management strategies	Workspace comfort and productivity become significant, especially during home office arrangements	Digital tracking and physical bill collection to identify and react to fluctuations in energy costs
Upper-Middle Income (Women Sharing Households)		Joint financial management in shared living situations, advocacy for housing rights and insulation	Increased income leads to higher living standards and more comfortable home heating	Persistent application of energy-saving measures, even in times of reduced bills

In conclusion, the research points to the extraordinary adaptability and resource utilization exhibited by women living alone in managing energy poverty. The strategies used by these women—from digital monitoring to behavioral adaptations—signify their resilience. Nonetheless, these individual efforts should be complemented by comprehensive policy measures that recognize and address the unique challenges women face in the realm of energy poverty. Also, while white-collar workers believe that their income will increase as they move up in their careers and they will be saved from this situation, blue-collar workers do not have such a hope, and the strategies and measures to be taken by the state gain importance for them. The study underscores the importance of considering the intricate link between social dynamics and energy management in addressing the unique challenges single women face in the context of energy poverty. This thesis lays out various parameters for a measurement in the local context of Türkiye, which can be the first step for policy measures. The differentiating parameters for this group are presented below and summarized in Table 4.7:

Energy Education: Knowledge about energy saving is vital in combating energy poverty. The parameter of energy education aims to measure the impact of awareness and understanding of energy efficiency topics on adopting saving behaviors. Surveys on energy literacy are intended to unravel the social and economic dynamics underlying this knowledge.

Behavioral Adjustment: The behavioral adaptation displayed by women in their daily practices for energy conservation is a decisive factor in alleviating energy poverty. The regularity and consistency of measures taken to reduce energy consumption are indicative of behavioral adjustment. How these measures are integrated into individual lifestyles and social interaction patterns is analyzed through in-depth interviews and daily energy consumption records.

Accessibility to Energy Efficiency: Access to energy efficiency, especially for limited income groups, is fundamental in preserving economic freedom and independence. The availability of energy-efficient appliances and methods

significantly influences a household's total energy consumption and costs. Assessing the efficiency levels of existing household appliances and evaluating the variations of this efficiency in relation to income is crucial.

Perception of Energy Costs and Thermal Comfort Sacrifice: The perception of energy costs and their impact on the budget is critical in measuring energy poverty. High energy costs can lead households to compromise on comfort levels. The sacrifices made in thermal comfort are identified through interviews and surveys, using this data to understand various dimensions of energy poverty.

Utilization of Support Networks and Community Adaptation: The use of social/support networks in combating energy poverty among women is evaluated as a dynamic reinforcing their position and social relationships within the community. The ability to cope with energy poverty is directly linked to access to external resources such as social support and government aid. The degree of this access can indicate a household's capability to manage energy poverty and the impact of social aids on bill payments.

To conclude, the gender-focused tracking of energy poverty illuminates the unique challenges faced by women and their strategies to overcome these challenges. This section emphasizes the need for a gender-specific adaptation of energy poverty measurement, which can play a pivotal role in developing gender equality and energy justice policies. Future research in this area, framed by these parameters and indicators, will be a significant step in understanding and resolving energy poverty.

Table 4.7 Parameters to Measure Energy Poverty and Identify Energy Poor Households with Female Indivuduals

Parameter	Indicator	Measurement	Threshold
Income Level	Monthly income	Total monthly income	Below poverty line as defined by TURKSTAT

	Source of income	Pension, rental, investments, etc.	Passive vs. active income sources
Housing Quality	Insulation quality	Presence of wall and window insulation	Standards as per Turkish building codes
	Age and condition of home	Year of construction and current state assessment	Above or below average standards
Energy Expenditure	Energy expenditure to income ratio	Percentage of income spent on energy bills	Above 10% of income
	Frequency of energy bill payments	Timely vs. delayed payments	Delays in payment indicate potential poverty
Behavioral Adjustment	Frequency of energy-conscious behaviors	Tracking daily energy-saving actions	Fewer actions than the community average
Energy Efficiency Accessibility	Availability of energy-efficient appliances	Inventory check against a standard list	Less than 50% availability in the household
Energy Cost Perception	Perception of energy costs relative to income	Qualitative assessments from interviews	Perception of energy as a major household burden

Thermal Comfort Sacrifice	Willingness to compromise on comfort for savings	Interviews on comfort versus cost-saving	High willingness to sacrifice comfort
Support Network Utilization	Use of social/support networks for energy needs	Records of engagement with support services	No engagement with support networks
Adaptive Coping Strategies	Use of alternative methods for managing energy	Documentation of unconventional methods used	Dependence on a single energy source

4.3.4 Households with Children: The Interplay of Household Size, Income, and Energy Costs

The importance of addressing energy poverty in families with children is critical, as it directly impacts their well-being and ability to provide a stable and healthy environment for growth and development. Thus, the research investigates the variability of energy poverty based on household structure, income, and social conditions, with the goal of laying groundwork for future studies. Interviews with four households with children from different income levels examine how families with children spend and consume energy.

The study shows that households from various income levels have taken important steps in energy consumption. Each participant has several children aged 2 to 16. Notably, in households with children, the neighborhood location correlates directly with income level. A higher-income family lives in a duplex that is only 10 years old

near Çukurambar District in the İşçi Blokları neighborhood. Middle-income families reside in newer buildings in Çiğdem and İşçi Blokları neighborhoods, while a lower-income family lives in a slum area in Çiğdem Neighborhood. Therefore, responses from participants are assessed by considering both income levels and types of housing.

High and middle-income households use natural gas and electric heaters as primary and secondary heating sources, respectively. The high-income home is controlled by a central heating system, whereas middle-income homes alternate between central and combi systems. The low-income home heats with a coal stove.

Regarding energy-saving measures, the wealthiest family spends only about 4% of their income on energy, indicating they are comfortable with their energy consumption economically. They only unplug unused electronics as a conservation measure. They also have multiple fridges, TVs, and a clothes dryer, reflecting consumption habits that are considered a luxury for their financial level. Their new building and good insulation could also be seen as passive energy-saving measures. It is found that households in the low-income group do not have appliances such as dishwashers, microwave ovens and tumble dryers. It is also stated that the oven is almost never used and is a very old appliance. Therefore, the number of electrical appliances and the level of innovation is a factor in determining energy poverty.

Middle-income households use measures like applying silicone to windows. They tend to choose children's rooms that are smaller but warmer, located on the sunnier southern and eastern sides of the building. Low-income households have been noted to let their children sleep in the room with the stove on for warmth. They try to insulate with aluminum plates behind stoves, renew window seals, and use thick rugs to minimize floor chill. It is observed that the children of the middle- and upper-income group give up the comfort in different rooms in order for the study area to be isolated and warm. On the other hand, children from low-income households do not foresee any other option other than studying in a heated room with a stove, where all other domestic activities continue.

Upper and middle-income families do not receive financial aid, whereas low-income families seek multiple forms of assistance, including direct cash aid labeled as coal help. Middle-income families spend over 10% of their income on energy, increasing natural gas usage to keep their children warm. They aim to improve their financial situation through career advancement and therefore do not seek aid. They acknowledge that while their relatives may seek help, they themselves are better off.

The study notes that in these family structures, women generally manage energy at the operational level, but savings decisions mostly come from the male figure. A woman from a high-income household states energy efficiency measures are decided by her husband:

> *"I don't like the dark, so we keep the lights on day and night. We also receive a lot of food from home, and I keep all of it in the freezer or the fridge. When the fridge was insufficient, we bought another one. One is kept downstairs and the other upstairs. I am also in favor of spending money and living comfortably, so I think we will continue to consume in this way if my husband does not indicate that he wants to take a saving measure."*

Through open coding, specific actions like energy-saving strategies are identified. Axial coding then contextualizes these strategies within the broader socio-economic framework, such as the varying impacts of housing conditions and income levels on energy consumption. Selective coding distills these into a central narrative, showing how economic factors and family dynamics shape energy management practices. The resulting theoretical model encapsulates the adaptability of these families, highlighting the significant role of social support systems and the importance of targeted policy interventions to alleviate energy poverty in households with children. Thus, the grounded theory approach applied to the study of energy poverty among families with children yields, Table 4.8, which brief the diverse strategies and experiences within this demographic.

Table 4.8 Detected Profiles of Households with Children

Category	Heating Sources & Energy Consumption	Energy-Saving Measures & Housing	Financial Management & Aid	Decision-Making & Energy Management
High-Income Family in Modern Duplex	Natural gas with central heating, multiple appliances indicating higher energy consumption	Unplugging electronics, passive measures like good insulation due to newer housing	Approximately 4% of income on energy, no financial aid sought, comfortable economic situation	Operational energy management by women, but tendency for decision-making by male
Middle-Income Families in Newer Buildings	Combination of central and combi systems, selective room heating, energy-conscious appliance use	Applying silicone to windows, choosing warmer rooms for children, energy-efficient housing choices	Over 10% of income on energy, career advancement instead of aid, relative economic stability	Women manage day-to-day energy use, with larger savings decisions influenced by family dynamics
Low-Income Family in Slum Area	Coal stove heating, minimal appliance use, significant energy-saving measures due to	Insulation with aluminum plates, renewing window seals, using thick rugs,	Dependence on assistance such as direct cash aid, high percentage of income on energy, seeking various supports	Energy management is a critical daily concern, with both men and women involved in decision-

	economic necessity	constrained by housing conditions	making due to necessity

In conclusion, this comparative analysis of the four households highlights the complex nature of energy poverty in families with children and its close relationship to income levels, living conditions, and reliance on social support mechanisms. The findings suggest that addressing energy poverty requires inclusive and targeted approaches that consider the diverse needs and specific circumstances of families. The prominent parameters related to energy poverty measurement for this group are summarized below and in the Table 4.9:

Income Level: This parameter is crucial because children increase the household's energy needs. For instance, more laundry and heating may be required. The ratio of energy expenditure to income illustrates how much of the family's budget is consumed by energy costs, which can indicate potential financial stress.

Household Size and Income Ratio: This parameter acknowledges that as the number of children increases, the living space needed typically grows, leading to higher costs for heating and electricity. A larger family may require a bigger home, which in turn can significantly increase the energy required to heat, cool, and power the dwelling, especially if the income does not increase proportionately. The ratio of the number of children to household income helps determine if the income is sufficient to cover the increased energy expenses without causing financial strain. A high ratio would suggest that the household may be at risk of energy poverty due to the additional energy demands placed by a larger family size.

Housing Type: Families with children often need more space, which can impact energy consumption and costs. The quality of housing insulation and the age of the building are significant because they influence the amount of energy needed to maintain a comfortable living environment, particularly important for young children.

Heating Source: The primary heating source used is a direct indicator of energy poverty. Families with children may need to keep their homes warmer to ensure their health and comfort. Dependence on less efficient sources like coal stoves can indicate limited access to cleaner, more affordable heating options.

Energy Consumption: The number and type of high-energy appliances used can be higher in households with children due to the need for constant laundry, cooking, and other activities. This parameter helps to gauge the level of energy use and identify if consumption is significantly higher than average, which can be a sign of energy inefficiency or higher living standards.

Energy Saving Measures: The extent to which families implement energy-saving practices is telling of their energy literacy and financial situation. In households with children, certain energy-saving measures may not be practical, but the lack of any measures can suggest a lack of resources or knowledge about how to reduce energy costs.

Social Support: Access to financial aid for energy costs can be particularly important for families with children, who may have less flexibility in their budget. Applying for multiple types of aid can indicate a high level of need and that the family is experiencing significant energy poverty.

Each of these parameters is intertwined with the presence of children in the household, as kids often necessitate greater energy usage and can exacerbate the effects of energy poverty. The parameters serve to highlight areas where support and intervention can help alleviate the burden on these families.

Table 4.9 Parameters to Measure Energy Poverty and Identify Energy Poor Households with Children

Parameter	Indicator	Measurement	Threshold

Income Level	Monthly income	Total monthly income	Below poverty line as defined by TURKSTAT
	Source of income	Pension, rental, investments, etc.	Passive vs. active income sources
Household Size and Income Ratio	Impact of the number of children on energy costs	Ratio of number of children to total household income	Higher ratio indicates greater potential for energy poverty
Housing Type	Quality of housing insulation and age	Insulation rating / Building age	Poor insulation or building age > 10 years indicates poor energy efficiency
Heating Source	Primary heating source used	Type of heating (central, combi, electric, coal)	Using coal stoves indicates higher energy poverty
Energy Consumption	Number and type of high-energy appliances used	Count of appliances (refrigerators, TVs, dryers)	More than 3 high-energy appliances indicates higher consumption
Energy Saving Measures	Number and effectiveness of energy-saving practices	Count of measures (unplugging devices, silicone sealing)	Less than 2 measures taken indicates poor energy-saving practices

Social Support	Availability and extent of financial aid for energy costs	Number of aid types applied for (coal aid, cash assistance)	Applying for more than 1 type of aid indicates reliance on social support
Housing Type	Quality of housing insulation and age	Insulation rating / Building age	Poor insulation or building age > 10 years indicates poor energy efficiency
Heating Source	Primary heating source used	Type of heating (central, combi, electric, coal)	Using coal stoves indicates higher energy poverty
Energy Appliances	Number and type of high-energy appliances used	Count of appliances (refrigerators, TVs, dryers)	More than 3 high-energy appliances indicates higher consumption
Energy Saving Measures	Number and effectiveness of energy-saving practices	Count of measures (unplugging devices, silicone sealing)	Less than 2 measures taken indicates poor energy-saving practices

CHAPTER 5

UNDERSTANDING ENERGY POVERTY CHARACTERISTICS FROM THE PERSPECTIVE OF STAKEHOLDERS

In the context of this study, interviews are conducted with apartment managers who control building level energy consumption and stakeholders who are involved in energy aid processes and energy poor identification stages potentially in addition to different households. Two distinct groups were interviewed: apartment managers, and employees of NGOs responsible for social aid, as well as municipal workers. During the open-ended interviews, firstly, volunteer participants are briefly informed about the thesis, and participants are asked about their age, gender, occupation. Afterwards the questions are posed to the participants to release their knowledge, awareness, roles and responsibilities. The interviews are structured under the following headings:

- Energy costs and income levels of the community (apartment or neighborhood),
- Understanding knowledge and awareness on energy efficiency and energy poverty,
- Strategies for detecting energy poor,
- Energy management and consumption insights (only for apartment managers),
- Community support, awareness, and energy aids of institutions.

5.1 Understanding Energy Poverty from the Perspective of Apartment Managers

In-depth interviews conducted with another group revealed insights from apartment managers responsible for energy management for multiple households in centrally heated buildings and for the semi-private areas' electricity consumption in buildings with individual heating systems. These discussions aim to provide a foundation for future measurement methods by considering the managers' perspectives on energy and energy poverty, their management of heating systems, building-based heating technologies, and the identification of energy-poor profiles based on the reactions of the apartment residents.

Apartment manager are at the frontline of managing both the collective and individual challenges associated with energy usage and costs. Their roles necessitate a comprehensive understanding of the technical, financial, and social aspects of energy management, making them key informants who can provide valuable insights into the effectiveness of current energy policies and strategies. Their experiences with the demographic and economic dynamics of their buildings equip them with firsthand knowledge of the impacts of energy costs on various income levels, especially on residents vulnerable to energy poverty. This insight is critical for identifying the diverse needs of residents and tailoring interventions that can lead to more equitable energy management solutions. Thus, their inclusion in the study is crucial for developing a nuanced understanding of energy management challenges and for designing measures that can mitigate energy poverty and promote sustainable energy practices at the community level.

Initially, the study examines the understanding and viewpoints of those who control the energy usage for multiple households. Apartment managers perceive energy and energy poverty as critical issues that directly affect the residents' quality of life and require careful management. From the managers' perspective, energy is more than just an expense; it significantly impacts the sustainability of the community and the financial status of the households. A review of the demographic structure of

apartment blocks shows that households generally fall into the middle and lower-middle income brackets. Therefore, energy poverty is perceived as a risk particularly faced by residents with lower incomes, and managers are determined to develop various strategies to mitigate this situation.

Managers implement various strategies to control energy costs and reduce energy poverty. In buildings with central heating systems, these strategies include revising dues to reflect rising energy costs, making decisions on building insulation, carefully managing water distribution to balance energy consumption, and automatically adjusting heating systems based on external temperature changes. In buildings with individual heating systems, strategies are limited to revising dues and making decisions on building insulation. These strategies indicate the managers' proactive approach to reducing energy consumption and increasing energy efficiency. A manager from a centrally heated building emphasizes this with the following statement:

> *"To minimize energy consumption, we, as the management, have taken comprehensive measures in our building. We have strengthened the insulation of our building, preventing heat loss and increasing energy efficiency. Additionally, we have carefully adjusted water distribution to balance consumption; thus, targeting equal heating across different facades by pumping different amounts of water to the less heated northern facade and the southern facade. Moreover, we have transitioned to a new heating system that can be automatically adjusted according to external temperatures. With this system, heating levels can be manually set on a panel based on the outside temperature. We emphasize the importance of energy management in each apartment and expect all our residents to act consciously regarding energy efficiency and to make the necessary effort. In doing so, we aim to reduce our energy costs and create a more sustainable living space."*

Residents' reactions to management strategies can be gauged through concerns and suggestions about energy costs expressed in general assembly meetings. Residents,

directly affected by rising energy costs, approach increases in dues and efforts to reduce energy consumption with caution. While energy-saving measures generally receive positive responses, increases in dues can cause dissatisfaction among some residents. In centrally heated buildings, the manager's role in educating on energy efficiency and management balances these reactions while also creating community-wide awareness in the fight against energy poverty.

> *"Decisions on dues are made at apartment meetings. Of course, calculations based on forecasts are conducted with the dues increase, but we still receive various reactions from the residents. To reduce these reactions, I make dues announcements through a written notice and use justifying statements:*
>
> *To the Attention of Our Apartment Residents*
>
> *The 2023 Ordinary General Assembly of Homeowners met on 08/01/2023 and made the following decisions.*
>
> *Due to our country's economic situation, there has been a 165% increase in energy input prices compared to last winter. In addition, other input prices have also shown a significant rise, and finally, personnel wages have been subjected to an increase of over 150%. Therefore, our dues for the year 2023 have been restructured. Accordingly;*
> *January / February / March / April - 2,000.00 TL*
> *May / June / July / August / September / October - 1,500.00 TL*
> *November / December - 2,000.00 TL will be collected."*

On the other hand, dues in buildings with individual heating systems, which only include electricity and cleaning expenses, are much less, and an increase does not provoke a reaction in the apartment. However, it is observed that energy savings are not a collective goal in buildings with individual heating systems; it is left to the discretion of the households. Collective energy savings are not pursued. Furthermore, in buildings with individual heating systems, the heat loss between floors due to

individual consumption choices has been observed to negatively affect some households.

In buildings with central heating systems, the holistic approach displayed by apartment managers in energy management and their consideration of both technological and social factors in combating energy poverty is evident. Energy management strategies are developed in harmony with the building's infrastructure requirements and the needs and reactions of the residents, demonstrating the managers' commitment to reducing energy consumption and increasing energy efficiency.

To conclude, energy poverty is a multifaceted issue that varies significantly depending on the type of heating system used in an apartment complex (central heating) or individual heating system (stove or combi boiler system). Central heating systems offer the potential for higher overall efficiency and cost-effectiveness due to economies of scale, centralized maintenance and uniform energy distribution. In contrast, individual heating systems, such as stoves or combi boilers, can result in different energy expenditures and efficiencies and lead to a wider range of energy poverty experiences, as they depend on the individual management of each household.

Centralized systems allow for collective measures that can reduce energy poverty. These measures include bulk fuel purchase, which can reduce costs, and the implementation of building-wide improvements such as improved insulation and advanced boiler technology, which are often not feasible or cost-effective for individual households. Furthermore, centralized systems enable easier implementation of innovative technologies such as heat recovery systems and programmable thermostats, which can significantly reduce energy wastage.

In contrast, with individual heating systems, residents have more direct control over their energy consumption, which can be advantageous for reducing waste and tailoring usage to specific needs. But this also means that energy poverty can be exacerbated for less affluent residents, who may not be able to afford the initial outlay

for more efficient appliances or may lack the knowledge or skills to best manage their energy use. Examples of this are also observed in household interviews.

The importance of collective measures taken in apartment complexes with central heating systems cannot be overstated. These actions not only reduce overall energy costs, but also have the potential to address energy poverty in a more systematic way. By improving the energy efficiency of the entire building, management can protect vulnerable households from the full impact of rising energy prices.

Furthermore, collective measures such as energy audits, subsidised energy saving retrofits, knowledge sharing, and collective aim for energy efficiency can equip building occupants with the knowledge and resources needed to better manage their energy consumption, ultimately leading to a more equitable distribution of energy costs and a reduced incidence of energy poverty.

As a result of the interviews, various parameters for measuring energy poverty at the building level, in addition to comparison of centralised and individual level heating systems, are compiled:

Table 5.1 Parameters to Measure Energy Poverty in Building Level

Parameter	Indicator	Measurement	Threshold
Energy Expenditure per Household	Monthly or annual energy bills	Currency amount per month/year	Energy costs >30% of income indicates severe energy poverty
Heating System Efficiency in Individual Units	Efficiency of heating systems	Efficiency ratings (AFUE, SEER, etc.)	Efficiency ratings below regional standards indicate risk of energy poverty

Thermal Comfort Compliance	Compliance with thermal comfort standards	Degrees Celsius inside temperature vs. outside temperature	Indoor temperatures consistently below recommended levels
Energy Debt Ratio	Incidence of delayed or defaulted energy payments	Percentage of households with outstanding energy bills	>5% of households with energy debts suggests vulnerability

5.2 Understanding Energy Poverty from the Perspective of Stakeholders of Energy Aids Processes

This thesis also aims to underline the urgency of identifying energy-poor households and formulating effective policies to improve their plight. Local governments, community centres, humanitarian organisations and elected neighborhood representatives (mukhtars) emerge as important actors in the fight against energy poverty due to their capacity to engage directly with the population. This study argues for leveraging the reach of these actors to facilitate a comprehensive assessment of the problem and the development of effective policies and programmes. Through five semi-structured in-depth interviews, insights are gained into the knowledge of local authorities, community centre staff and elected neighborhood representatives on energy poverty, their methods of identifying energy vulnerable households and their processes of providing energy assistance. These findings provide a valuable basis for future studies focusing on improving the measurement of energy poverty at the level of decision-makers.

The role of these actors in the concept of energy poverty and energy aid processes is shaped around a few basic findings derived from interviews with Ankara

Metropolitan Municipality's social assistance specialist, elected neighborhood representatives of İşçi Blokları and Çiğdem Neighborhoods, specialist in humanitarian aid organisation in direct relationship with the state, and Çankaya House officials. Firstly, although the concept of energy poverty itself is not sufficiently known among elected neighborhood representatives and local authorities, the actors have knowledge and a say in the assistance to households that have difficulty in meeting their energy expenses. Although they do not define energy poverty as a concept, they carry out activities that care about the energy poor.

Regarding energy aids, despite the direct interactions of elected neighborhood representatives and Çankaya House in the field, it is seen that official policies and aid mechanisms exclude these important actors. The support provided by elected neighborhood representatives in the energy assistance process is informal. Households that cannot reach the local and central government or aid organisations request assistance from elected neighborhood representatives. With this demand information, elected neighborhood representatives can convey this request for assistance through their own contacts. On the other hand, in the absence of a request, elected neighborhood representatives do not have any consumption and income data to identify energy-poor households. Therefore, although elected neighborhood representatives do not have a role in proactively identifying energy poverty, they informally play a role in identifying energy poverty with a demand-based approach.

For instance, the elected neighborhood representative, whose office is next to the natural gas stations, is seen asking citizens about their energy assistance needs; this points to an informal, demand-based approach to identifying those in need. So, elected neighborhood representatives, while not officially recognized in the aid process except providing Poverty Certificate, become critical connectors in the community, offering support on a case-by-case basis without access to concrete data on household energy expenditures. One of the elected neighborhood representatives explains their role in the process and their knowledge about the process as follows:

“2023 Coal Aid is an important support program offered during the winter months for families in need. This program focuses specifically on meeting the heating needs of families. Applications are generally made through local Social Assistance and Solidarity Foundations and the application process can be followed through the e-Government Gateway. There are some basic conditions to apply for coal aid. The applicant must be a citizen of the Republic of Türkiye, be over 18 years old, and must not have applied for any other aid in the last 15 days. In addition, the applicant must not have an individual with SSI in the household, must not have any current or past tax records, and must have a residence address that matches the Population and Citizenship Affairs information. Criteria such as having a current "Poverty Certificate" approved by the elected neighborhood representative or the applicant having a file in Social Assistance and Solidarity Foundations are also required. Once applications are approved, coal shipments are planned. The shipment is made taking into account the amounts determined by the Ministry of Treasury and Finance and the needs assessments on a provincial basis. This shipment is made to the families whose applications are accepted, taking into account their climatic conditions and heating needs. Coal aid is reserved for use only for heating purposes and is not suitable for use other than this purpose. Coal aid is provided to each household in the amount of 700 kilos, or an average of 25 bags. Here, our only role as elected neighborhood representative is to provide Poverty Certificate and support those who have difficulties in applying. Apart from this aid, municipalities also provide aid. We can also support them in their applications.”

Community centers such as Çankaya House do not have a direct energy assistance role but provide services to reduce domestic energy consumption. Examples of these services include free food service and laundry facilities. This assistance saves energy needed for cooking, washing, drying and ironing clothes. The catering service is used by about 750-800 students per day. There are also study halls. There are approximately 350 students per month who come regularly to use the computers in

these lounges or to study in these lounges with their own devices, which are open 24/7. This service provides a measure to support the reduction of excessive computer-related energy consumption in student households.

Local governments and humanitarian organizations offer energy support in similar steps. First of all, the concept of energy poverty is not clearly accepted in both institutions and the staff is not familiar with the concept. Aid processes are entirely demand-based and there is no proactive measurement method or even measurement initiative. For example, the municipality's online system is used to apply to the municipality. Aids are deposited via Başkent Card. In order to have a Başkent Card, you must be below the poverty line. For this, the income per person in the household must be 1/3 or less of the minimum wage. This aid system, which was launched in 2023, first became operational in the pilot region and the process started by providing support to 14 thousand students within the scope of the application. Ankara Metropolitan Municipality personnel working in the field of social aid explains the amount of aid provided as follows:

"I would like to give information about the details of our aid programs carried out in 2022. Last year, within the scope of our social aid programs, we provided natural gas aid to a total of 253,103 families. The total amount of this aid was 161,258,215.41 Turkish Liras. These aids covered the heating needs of families, especially during the winter months. In addition, we provided coal aid to 19,391 families in 2022. The total cost of this aid was 74,052,000.00 Turkish Liras. Coal aid was also an important support for families to meet their heating needs during the winter months."

On the other hand, humatarian organization provide assistance to households in need of aid by taking into account various factors in the incoming requests. In general terms, these factors include income status, ownership of real estate, household size, number of elderly and children in the household. In addition, in order to provide support, aid organizations visit the household and pay attention to the condition of the dwelling, the housing environment, and the household's household appliances.

In addition, particularly problematic for aid providers is the difficulty in determining whether a household receives assistance from more than one organization. It is possible that the same household may have received support from both local and central governments and humanitarian organizations. While the humanitarian organization employs a team that conducts big data-based analysis to identify households that should receive assistance and households that receive more than one form of assistance, there is no similar work in public institutions. For example, they identify that households repeatedly apply for assistance through various methods such as divorce and applying twice in order to receive more than one aid. Local governments requesting information on households receiving assistance from other institutions cannot always be transferred between institutions due to the fact that this request contains personal data.

To conclude, although important steps have been taken to identify the energy poor, support is only provided according to incoming requests due to lack of data, lack of inter-institutional integration, and the fact that the concept of energy poverty is not officially defined as a strategy issue and there is no know-how for its measurement. This thesis advocates for a paradigm shift towards a more inclusive, informed, and proactive engagement of local actors in the fight against energy poverty, emphasizing the need for education, systematic policy development, and the implementation of objective criteria in energy assistance programs.

Accordingly, in addressing the challenge of energy poverty, it is imperative to establish a robust framework for its identification and assessment. The table provided encapsulates a multifaceted approach to delineate and quantify the presence of energy poverty within a community by authorities. Each necessity is a critical component of this framework, representing a specific aspect of energy poverty. These necessities are compiled for the purpose of generalizing the deficiencies identified in interviews with authorities and the parameters identified in interviews with households and apartment managers.

Table 5.2 Necessities for Detection of Energy Poor Households for Aid

Necessity for Detection	Description	Required Action or System	Implementation Benchmark
Education on Energy Poverty	Authorities must understand the concept and implications of energy poverty.	Implement training programs and workshops.	All relevant authorities trained and awareness campaigns conducted.
Standardized Identification Methods	Use consistent and reliable methods to identify energy-poor households.	Develop and employ a standardized identification protocol.	Protocol in use and regularly reviewed for effectiveness.
Monitoring Energy Expenses	Track the energy spending of households relative to their income.	Establish systems for monitoring and analyzing utility data.	Systems in place to flag households above the energy cost threshold.
Demographic Data Analysis	Analyze household demographics to identify those at risk of energy poverty.	Utilize census data and conduct targeted surveys.	Comprehensive demographic profiles linked to energy poverty risk.

Housing Quality Assessment	Assess the energy efficiency and insulation of dwellings.	Conduct home energy audits.	Energy audit results inform policy and assistance programs.
Accessible Energy Assistance Programs	Ensure that households are aware of and can access energy assistance programs.	Increase program visibility and streamline application processes.	Measurable increase in program uptake and beneficiary satisfaction.
Energy Consumption Tracking	Monitor the types and amounts of energy used by households.	Implement household energy monitoring systems.	Accurate consumption data collected and analyzed for patterns.
Coordination of Assistance	Prevent overlap in assistance and ensure efficient aid distribution.	Create a centralized database for aid tracking.	Database operational and inter-agency coordination achieved.
Community Service Utilization	Observe the impact of community services on household energy savings.	Monitor service usage and correlate with energy bills.	Services optimized based on their impact on reducing household energy needs.

Support Network Engagement	Recognize and integrate informal support networks in the formal assistance framework.	Engage with community leaders to formalize support mechanisms.	Informal networks recognized and supported by formal policies.
Public Engagement and Behavior Analysis	Understand public behavior regarding energy use and conservation.	Conduct public surveys and educational outreach.	Strategies developed based on public behavior insights.

CHAPTER 6

UNDERSTANDING ENERGY POOR HOUSEHOLDS' CHARACTERISTICS IN RURAL AND URBAN AREAS THROUGH SURVEYS

The data are obtained from a comprehensive survey conducted in 1,304 households within the scope of Samsun Urban Spatial Planning Project. The data that were not used within the scope of the aforementioned project are evaluated within the scope of the thesis. The survey aimed to capture various heating methods, energy consumption habits and possible energy poverty profiles by ensuring the representation of different socio-economic and geographical segments of Samsun. This approach underlines our commitment to understanding the spatial distribution and accessibility of energy resources. The in-depth interviews conducted in the Çiğdem and İşçi Blokları neighborhoods in Ankara are in line with the results of the energy consumption related parts of the household survey conducted in Samsun.

The results of the analysis reveal a variety of heating methods reflecting the socio-economic heterogeneity of Samsun. The predominant use of natural gas heating (observed in 788 households) indicates a shift towards modern energy sources. However, the persistence of traditional heating methods such as wood and coal (used in 428 households) underline a parallel narrative of energy inequality.

This dichotomy becomes even more apparent when we overlap the data with socio-economic indicators. The fact that low-income regions predominantly rely on solid fuels is an indicator of both financial constraints and lack of access to cleaner energy sources. In contrast, higher income regions significantly favour natural gas, in line with global trends towards cleaner energy.

The spatial analysis of heating methods reveals a pattern of energy segregation that reflects socio-economic divisions in Samsun. Urban areas with better infrastructure

support largely favour natural gas, while peripheral regions grappling with infrastructure deficiencies continue to rely on traditional, less efficient sources.

The question on households' energy concerns reveals a multi-layered narrative of energy poverty, a condition that emerges through inadequate access to energy services necessary for a dignified urban life. A significant majority of households emphasise that energy costs are overly burdensome. This element of economic stress is not just a matter of market prices; it reflects broader socio-economic inequalities that manifest themselves spatially in the urban landscape. Furthermore, the reported power outages of 197 households point to infrastructural vulnerabilities that disrupt urban rhythms and reveal spatial differences in the distribution of energy infrastructure. The fact that on-site energy production was reported by 113 households points to spatial limitations in urban dwellings and the urgent need for spatially adaptable renewable energy solutions.

When the data considered in terms of income levels, the diverse landscape of household concerns about energy costs is depicted with a nuanced understanding that these concerns are not evenly distributed across income brackets or spatial boundaries in urban settings. The data shows that high energy prices are a common concern across all income groups, but with a significant emphasis on lower- and middle-income groups. This points to a gradient of energy stress deeply linked to socio-economic status and illuminates a spatial pattern of energy affordability that is disproportionately skewed against the economically disadvantaged. The incidence of power outages appears to be less dependent on income, but the slightly higher percentages in lower-middle income categories may indicate that energy reliability is also a differentiated spatial phenomenon, potentially associated with economically marginalised urban areas. Concern about poor renewable energy infrastructure resonates more loudly in lower- and middle-income categories, pointing to a socio-spatial discrepancy in access to sustainable energy options that are crucial for long-term energy security and affordability.

Analysing the use of heating methods reveals the differences in households' access to traditional and modern energy sources, while also illuminating how this access varies according to socio-economic and geographical factors. In this context, the prevalence of natural gas use indicates a preference for modern energy sources, while the frequency of wood and coal use is an indicator of economic and infrastructural constraints. While the frequency of energy interruptions is a reflection of infrastructural inadequacies, the direct effects of these interruptions on the quality of life of households constitute one of the focal points of our research. In particular, how infrastructural vulnerabilities affect energy access and reliability is considered as an important finding.

Table 6.1 Energy Poverty Dynamics and Household Types

Household Type	Heating Method	Energy Cost Concerns	Power Outages	On-Site Energy Production	Energy Affordability Pattern
Urban Middle-Income	Natural Gas	Medium	Occasional	Solar Panels	Moderate affordability
Urban Low-Income	Coal/Wood	High	Frequent	None	Low affordability
Peripheral/rural Middle-Income	Wood	High	Frequent	Solar Panels	Low affordability
Peripheral/rural Low-Income	Coal	Very High	Very Frequent	None	Very low affordability

When the survey results are analysed, it is seen that the results parallel to the findings obtained in in-depth interviews. According to the survey results, households' concerns about energy costs emphasise the subjective dimension of the economic burden created by energy bills, which shows how socio-economic inequalities are manifested in the context of energy access. The impact of socio-economic status and

spatial analysis on energy poverty is analysed in relation to factors such as household income, employment, education and housing quality. This provides a detailed picture of the impact of spatial and economic differences in energy access and consumption on energy poverty. Finally, energy debt reveals the financial stress of energy costs on households, which provides a more comprehensive picture of the energy poverty addressed in our research. In light of these findings, the need to adopt multifaceted and comprehensive strategies to tackle energy poverty emerges. The prominent parameters are presented in the Table 6.2.

Table 6.2 Prominent Parameters for Detection of Energy Poor Households based on Household Surveys

Parameter	Indicator	Measurement	Threshold
Heating Method Utilization	Type of heating method used	Number of households using each method	High reliance on traditional methods
Energy Expenditure Ratio	Percentage of income spent on energy	Income percentage	>10% of income
Incidence of Power Outages	Frequency and duration of power outages	Number of outages reported per year	>2 significant outages per year
Energy Source Accessibility	Availability of different energy sources	Number of accessible sources per region	<2 modern energy sources available
Infrastructure Quality	Condition and capacity of	Infrastructure rating scale	Below standard rating

	energy infrastructure		
Household Energy Concerns	Level of concern about energy costs	Survey results	High level of concern
Socio-Economic Status	Income, employment, education, housing quality	Statistical data	Low-income brackets
Spatial Analysis	Geographic distribution of energy access	Gis mapping	Clear disparities in access
On-site Energy Production	Presence of household-level energy generation systems	Number of installations	Low percentage of households
Energy Affordability Gradient	Variation in energy cost concerns across income levels	Survey results, statistical data	High concern in lower-income brackets
Renewable Energy Infrastructure	Availability and usage of renewable energy options	Number of installations, energy produced	Low penetration of renewables

Energy Efficiency of Housing	Energy efficiency rating of dwellings	Energy performance certificates	Below standard efficiency level
Energy Debt	Instances of overdue energy bills	Number of households in arrears	Overdue by 60+ days

CHAPTER 7

SUMMARY OF FINDINGS

The theoretical framework of the thesis is constructed taking into account the main aim of the research, which is to investigate and understand the characteristics of energy poverty in Türkiye. The study examines the idea of the right to energy as a fundamental element of a dignified standard of living and situates energy poverty in the broader context of social and economic inequalities; and also, addresses the complex and multidimensional nature of the issue of energy poverty, which is becoming increasingly important on the agenda of international organizations and governments.

As Thomson et al. (2016) emphasize, adopting an inclusive and multifaceted approach to defining and understanding energy poverty is critical to designing effective policies and interventions. To do so, the thesis focuses on exploring the dynamics of energy poverty, exemplifying the different experiences of energy poverty of different household types and measurement parameters that reflect the socio-economic and spatial characteristics of the locality.

In this way, the study is intended to provide a preliminary study for decision makers and researchers to effectively address energy poverty in future measurement and policy development focus. The study emphasises the crucial need for policy interventions and support systems that are finely tuned to the diverse realities of different demographic groups, with a particular focus on the elderly, students, families with children and single-woman households. This nuanced understanding of energy poverty underlines the need to adopt a comprehensive and empathetic approach to policy-making and urban planning to ensure equitable and sustainable energy access for all urban residents. In other words, the research reveals the need to establish a measurement infrastructure and regional development policy on energy

poverty that holistically captures different energy poor profiles and energy poverty characterizations of local.

The methodology of this thesis is rigorously designed to examine the energy characteristics of households from different demographic groups in Türkiye, with a focus on exemplifying the parameters and indicators of energy poverty. This methodological framework is constructed as a comprehensive and intensive research guided by the philosophy of critical realism that informs the entire research process.

The initial stage involves an extensive literature study initially assesses varying definitions of energy poverty within the existing literature, different projects' outputs on energy poverty, and policy frameworks, exploring the causes and consequences of energy poverty, identifying vulnerable groups as energy poor, and evaluating the approaches and policies of Türkiye and various institutions and international organizations in addressing energy poverty. This literature review highlights significant gaps, particularly the lack of a universally accepted definition of energy poverty and a comprehensive methodology for its analysis in the Turkish context. Furthermore, the literature review illuminates the process of selecting a sample for in-depth interviews and energy poverty-related factors based on the impacts of this type of poverty on different household types and individuals identified as vulnerable to energy poverty. The results of the literature review are given in Chapter 2 and 3 in detail.

Building upon the foundation provided by the literature review, in-depth interviews are designed to understand the landscape of energy poverty in Türkiye. 27 semi-structured and in-depth interviews are conducted with participation of a mix of household types, including households with members over 65, young women living alone, student or newly graduated households, and families with children; additionally, apartment managers overseeing building-level energy consumption, and stakeholders involved in energy aid processes and the identification stages of the energy poor are included. For case study, Çiğdem and İşçi Blokları neighborhoods are chosen for their socio-economic and spatial diversity. Interviews conducted here,

with the support of civil society organizations, focus on energy consumption patterns, experiences of energy poverty, and strategies for addressing it. The study employs purposive sampling, a technique where individuals or scenarios with specific characteristics are intentionally chosen for an in-depth exploration of a specific issue. This approach is crucial for illuminating the attributes of a particular demographic or situation, ensuring a broad perspective on the impact of various factors on energy consumption and poverty.

The primary focus of these discussions revolves around **energy costs, income stability, social dynamics, health, dwelling quality, tenancy relations**. Conducted as an intensive study, these in-depth interviews meticulously present findings on income levels, insights into household energy management and consumption, the measures taken, building infrastructure, community support and awareness, energy aids, understanding of energy poverty provided by institutions. The results of case study and discussion presented in detail in Chapter 4 and Chapter 5.

Besides, this thesis contains a detailed analysis of the energy-related data obtained from a household survey conducted within the scope of Samsun Urban Spatial Planning Project as a basis for interviews. With the inclusion of these survey results in the study, **heating methods** and **energy consumption patterns** are evaluated. This approach aims to elucidate the **spatial distribution and accessibility of energy resources** according to infrastructure in different regions of the city. Together with this survey in addition to the interview study, this dual approach allows the dynamics of energy poverty as well as the changing profiles of energy poor households in urban and rural settings to be included in the thesis. The results are presented in detail in Chapter 6.

In summary, the research evaluates energy poverty characteristics in Türkiye by looking for answers the following questions: How different sample households in Türkiye are affected by energy poverty, what causes poverty and how they cope with poverty?

Within the scope of the study, energy consumption patterns of different types of households are evaluated according to the research conducted. Depending on these patterns, the coping mechanisms of households that can be characterised as energy poor, the factors triggering energy poverty and their consequences are discussed. In other words, the characteristics of energy poverty that vary according to socio-economic, demographic, and spatial factors are examined.

Consequently, **the main outcome** of this thesis is the recognition that **energy poverty is a multifaceted issue deeply intertwined with socio-economic, demographic and spatial factors**. This research firmly establishes **that energy poverty is not experienced in the same way across different households**, but instead **varies significantly** depending on **different causes** such as age, income level, household type and housing conditions. These variations emerge as different consequences of energy poverty, difficulties in paying energy bill, energy consumption habits including coping mechanism(s), and the pattern of receiving external aid.

As mentioned afore, in order to pursue the main aim of the study, **energy poverty characteristics** in Türkiye are analysed **in consideration of different factors** deployed according to the literature review. These factors are **income level and energy expenditures, energy consumption patterns and coping mechanism(s), energy aids and utilization of households, fuel type and heating and cooling methods, and dwelling quality and tenancy**. Accordingly, the findings about both energy poverty characteristics and exemplified parameters and indicators based on the characteristics summarised below:

i. Income levels and energy expenditures

In Türkiye, the landscape of energy poverty is intricately tied to income levels. A detailed examination reveals that the income of energy-poor households significantly influences various aspects including heating methods and systems, tenancy, social dynamics such as difficulties in paying energy bills, energy consumption habits, and access to energy aids. Specifically, income level dictates behavioral changes in

energy saving, the struggle to cover energy expenses, levels of anxiety related to energy costs, energy-saving styles, the number and types of electrical appliances owned, as well as choices in fuel and housing types. Thus, income emerges as a critical variable against which other factors are evaluated.

A striking difference in Türkiye's energy poverty landscape, compared to European countries, is its prevalence across a broader income spectrum. While energy poverty in Europe is mainly concentrated in the lower and lower-middle income brackets, in Türkiye, it is a significant concern for both lower and middle-income groups, and notably, even for some households in the upper-middle-income bracket. This widespread occurrence, especially when considered alongside conventional energy prices, underscores the extensive impact of energy poverty across diverse income levels in Türkiye.

Income level remains a fundamental parameter in this context. The assessment of total monthly income and its sources (such as pensions, rent, or investments) against the poverty line is crucial to identify households at risk. The ratio of energy expenditure to income is a direct indicator of energy poverty, with a high ratio indicating a disproportionate energy burden. This study extends beyond simple income-expenditure ratios to include factors like housing quality, the prevalence of energy-saving measures, and reliance on social support networks, highlighting the multifaceted nature of energy poverty.

In addition, when energy poverty characteristics are analysed in terms of the level of **households' inability to pay energy bills** and **their level of anxiety**, there are generally two types of households: The first is those who have difficulty in paying bills, and the other is those who are completely dependent on outside sources for bill payments. The first group generally has no hope of escaping energy poverty, and they can be defined as trapped in the energy poverty. When the distribution of this group among different household types is examined, all energy poor elderly people, families with children living in slums - because they cannot find a secure job, and women working as blue-collar workers and living alone - because they do not have

a career hope that will increase their income level. The second group consists of students who will start their business life, new graduates who are looking for a job, women who expect to advance in their careers, newly graduated employees, middle-aged middle-income group with children. The factor that households or individuals believe in to eliminate payment difficulties is the career and employment factors.

This expanded analysis offers a deeper understanding of how income levels in Türkiye are intrinsically linked to the experience of energy poverty, illustrating the complexity and multifaceted nature of this issue. The results of analysis are given in Table 7.1. It underscores the need for policies and interventions that are sensitive to the varied and nuanced experiences of different income groups in addressing energy poverty.

Table 7.1 Relationship Between Income Levels and Energy Poverty

Income Bracket	Impact On Energy Poverty	Description
Low Income	High Energy Poverty	- Higher percentage of income spent on energy bills. - Limited ability to invest in energy-efficient appliances. - Greater reliance on external aids and support. - May have to forego other essentials to cover energy costs.
Middle Income	Moderate Energy Poverty	- Better ability to manage energy costs than low-income households.

		- May still face challenges in affording energy-efficient solutions. - Energy costs are a noticeable but manageable part of the budget.
Upper-Middle Income	Low Energy Poverty	- Relatively comfortable in managing energy expenses. - Can invest in energy-saving measures and efficient appliances. - Energy costs are a smaller portion of the budget.
High Income	Minimal to No Energy Poverty	- Energy costs constitute a small portion of the budget. - Able to invest in high-quality, energy-efficient solutions. - Less likely to experience stress related to energy bills.

Additionally, the relationship between income level and energy consumption patterns is elucidated through the results of comprehensive interviews, which include frequency counts from various households, as seen in Table 7.2.

Table 7.2 Relationship Between Income Levels and Energy Consumption Pattern with Frequency Counts

Income Level	**Energy Consumption Pattern-related Factors**	**Frequency**
Low, Medium	Budgeting	12
Low, Medium	Credit Utilization for Bills	8
Low, Medium, High	Lighting Management	20
Medium, High	Temperature Adaptation	4
Low	Efficient Appliance Use	8
Low, Medium	Leak Sealing	8
High	Enhanced Insulation	6
High	Energy-Efficient Appliances	6
Medium	Maintenance	8
Low, Medium	Decrease in heat	3
Low	Zone Heating	5
Low	Aid Programs	6
Medium	Community Support	7
High	High-Efficiency Systems	5
Low	Window Treatments	16
Low	Draft Blocking	6
Medium	Shared Housing	6
Low	Supplementary Heat	8
High	Routine Changes	2

Low, Medium	Hot Water Usage Minimization	9
Medium	Usage Adjustments	4
High, Medium	Landlord Negotiation	3
Medium	Efficient Cooking	2
Low, Medium	Off-Peak Electric Usage	4

ii. Household energy consumption patterns and coping mechanism(s)

Energy poverty remains a critical issue, especially in regions where economic inequalities are pronounced. We examine the coping mechanisms adopted by households in Türkiye to mitigate the effects of energy poverty and the dynamics governing these strategies. Through the analysis of household behaviour, spatial strategies and behavioural changes, the complex web of responses to energy poverty is explored.

Energy consumption behavior captures the daily practicalities of energy use, including heating and cooling hours and the types of energy sources utilized. **Energy saving measures**, both behavioral and through investment in living space and technology, reflect a household's response to energy needs and conservation efforts. Thus, **behavioral adjustment** and **energy efficiency accessibility** focus on the household's proactive steps towards managing energy consumption. Energy cost perception and thermal comfort sacrifice are qualitative assessments that offer insights into the subjective experience of energy costs and the impacts on daily life. **Thermal comfort compliance** checks if indoor temperatures maintain standards for health and comfort, while the energy debt ratio reflects the financial stress on households due to energy costs.

The research underscores the critical role of energy efficiency knowledge in addressing energy poverty. Awareness and understanding of energy efficiency are essential in fostering energy-saving behaviors. The study reveals that energy literacy

is not merely an individual concern but a social and economic one, with community-wide education initiatives proving effective. For example, in residential buildings with central heating systems, the active role of managers in educating residents about energy efficiency has been crucial. Their efforts not only balance the reactions to increased dues but also contribute to building a community that is informed and engaged in the battle against energy poverty.

When spatial and technological measures are analysed, households at different income levels exhibit a variety of energy management strategies. Income level of households influences the **extent and nature of energy-saving measures** adopted by households, as seen in Table 7.3. Low-income households, due to financial constraints, often adopt basic, cost-effective solutions such as improving insulation with affordable materials. In contrast, middle-income households can invest in more substantial changes like coplete insulation and energy-efficient appliances, reflecting an increase in financial capacity. However, structural challenges such as inadequate housing insulation can significantly undermine these efforts.

Table 7.3 Relationship Between Income Levels and Coping Mechanism in term of Spatial and Technological Manners

Income Level	Coping Mechanism	Example
Low Income	Basic Insulation with Affordable Materials	Improving insulation using cost-effective materials to reduce energy costs.
Middle Income	Investment in Complete Insulation and Energy-Efficient Appliances	Upgrading to energy-efficient appliances and better insulation for long-term savings.

In addition to spatial measures, daily energy consumption behaviors are reflective of households' proactive steps towards managing energy demands. Adjusting heating

and cooling schedules, utilizing energy-efficient bulbs, and investing in high-efficiency appliances are common strategies. These measures reflect a household's adaptive response to immediate energy needs and long-term conservation goals, as seen in the examples below:

- Elderly households from each level of income display a heightened sensitivity to energy savings, stemming from fixed income constraints and a longstanding ethos of frugality. This demographic's propensity to save energy is as much a financial compulsion as it is a cultural disposition. Their situation is further complicated by the need to maintain thermal comfort without compromising on health standards, highlighting the delicate balance between cost-saving and maintaining a decent quality of life.
- The presence of children in a household directly escalates energy demands, particularly for middle-income families. Despite concerted efforts to manage energy consumption, such households find it challenging to significantly cut down heating costs while catering to their children's needs. This dynamic presents a unique challenge and underscores the intersectionality of family structure and energy poverty.
- Females reveal a distinct pattern in energy poverty, where financial autonomy becomes a compelling factor in energy consumption behavior. Women in energy-poor circumstances often make deliberate choices to minimize energy expenditures, maintaining their financial independence by resorting to governmental assistance or loans rather than familial support. This proactive attitude towards energy management is emblematic of their struggle to balance economic self-sufficiency with the realities of limited budgets.
- There are distinctive strategies employed by student and recent graduate households facing energy poverty. These households often embody a minimalist approach to energy use, borne out of necessity due to unstable or insufficient incomes. These individuals directly combat energy poverty by reducing energy consumption and minimizing the time they spend at home

to reduce energy consumption or by studying in an environment where the temperature is comfortable, such as a library; they also harbor desires that career advancement or employment will alleviate energy concerns.

Coping mechanisms in the face of energy poverty are as varied as the households themselves, as briefed in Table 7.4. From austerity in energy use to strategic investments in efficiency, the dynamics of energy poverty elicit a range of responses that are indicative of broader socioeconomic and cultural factors. As Türkiye continues to grapple with these issues, it becomes increasingly evident that addressing energy poverty requires a multifaceted approach, recognizing the diverse needs and capabilities of affected populations.

Table 7.4 Relationship Between Household Type and Coping Mechanism

Household Type	Coping Mechanism	Causes	Example
Elderly Households	Frugality And Maintenance Of Thermal Comfort	Cultural Disposition & Health Standards	Elderly households prioritize energy savings and maintain health standards despite financial constraints.
Middle Income (With Children)	Managing Increased Energy Demand	Family Structure	Families adapt their energy consumption to cater to children's needs without compromising on comfort.

Female-Headed Households	Minimization of Energy Expenditures & Seeking Governmental Assistance	Financial Autonomy	Women minimize energy usage to maintain financial independence, using government support as needed.
Students and Recent Graduates	Collective Living & Minimalist Energy Use & Utilizing Public Spaces	Unstable Incomes & Career Aspirations	Adopting minimalist energy habits and using public spaces like libraries to avoid high home energy costs.

iii. Energy aids and utilization of households

Energy poverty is a dynamic challenge that intersects with various social and economic factors. The study suggests that while community support and informal aid networks provide a safety net, they are not enough to address the systemic issues that contribute to energy poverty. It highlights the need for structured, formalized support systems that can proactively identify and assist energy-poor households. This includes integrating energy poverty knowledge more deeply into community initiatives and ensuring that energy aid mechanisms are inclusive and accessible to all who need them.

The findings point to a gap in the formal mechanisms for energy assistance. Elected neighborhood representatives and local organizations, such as the Çankaya House, often engage directly in the field, providing informal support to households that are unable to access local and central government aid. These representatives become critical conduits for assistance, relying on demand-driven requests to aid energy-poor households. However, the absence of proactive measures for identifying energy

poverty among these actors due to a lack of consumption and income data is a significant limitation. This indicates an area where policy and operational improvements could enhance the effectiveness of energy aids.

The findings from this study suggest that while coal and natural gas aids play a role in cushioning the impact of energy costs, they fall short of addressing the foundational issue. These measures are not robust enough to provide a sustainable solution to the inherent vulnerability of these households to energy-related financial strain. Instead, they act as stopgap arrangements, providing temporary relief without tackling the root causes of energy poverty. In addition, it seems that the personnel in the energy aid processes do not have knowledge about the concept of energy poor, and the aid is provided directly to households whose poverty is dependent on demand and whose poverty can be registered.

Moreover, policy frameworks need to address the adequacy of energy assistance, ensuring that it aligns with the actual living costs and energy requirements. It is essential to foster an environment where institutional support is not only available but is also perceived as accessible and appropriate by those in need. This might involve community-based outreach programs that work to destigmatize the use of energy aids, especially among the elderly who are caught between the notions of self-sufficiency and the harsh realities of energy poverty.

In addition, the utilization of energy aids presents a complex picture, particularly among the middle-income and elderly households that fall into the energy poverty bracket. A notable pattern among these groups, especially the elderly, is a marked ambivalence towards seeking energy assistance, coupled with a tangible struggle to afford energy costs. This hesitation often stems from a deep-seated sense of pride and a cultural inclination towards self-reliance, which discourages them from tapping into available institutional support systems. The propensity to depend on family resources rather than formal aid highlights a significant obstacle in addressing energy poverty through public assistance programs among the elderly demographic.

Conversely, while lower-income groups exhibit no such reluctance to seek energy assistance, the effectiveness and sufficiency of such aid are subjects of scrutiny. These households often question whether the aid they receive is adequate to meet their energy needs, pointing to a disconnect between the provision of aid and the actual energy demands of the economically vulnerable.

The persistence of energy poverty among middle-income and elderly populations underscores the necessity for a comprehensive understanding of the dynamics at play. It calls for an integrated policy approach that transcends mere financial aid, focusing instead on creating a multi-tiered support system. Such a system would account for the psychological, cultural, and social factors that influence the acceptance and utilization of energy aid.

Ultimately, the pathway to overcoming energy poverty lies in a holistic approach that combines financial support, energy education, and cultural sensitivity. By recognizing and dismantling the barriers to accessing energy aids, and by ensuring that such aids are both sufficient and socially acceptable, policymakers can make significant strides towards eradicating energy poverty.

iv. Fuel type and heating and cooling methods

The spatial dimension of energy poverty is a key focus of this study, with pronounced differences in energy access and efficiency between neighborhoods and housing types across Türkiye. The investigation into fuel type and its correlation with energy poverty has revealed significant insights. It is evident that the type of fuel a household utilizes is not just a matter of choice, but also a reflection of broader socio-economic conditions and infrastructural realities. In Türkiye, the reliance on traditional fuels such as wood and coal in rural and peripheral areas underscores the disparities in energy access and affirms the pressing need for infrastructural development that can provide cleaner and more efficient energy sources.

The characteristics of energy poverty are markedly influenced by the available fuel types, with households that depend on less efficient fuels facing higher energy

expenses and the consequent financial strain. These expenses are compounded in settings where modern heating systems are inaccessible or unaffordable, highlighting the stark contrast in energy poverty levels between communities with access to different types of fuels.

Moreover, the type of fuel used has implications beyond mere financial considerations—it affects health outcomes due to varying levels of emissions, the environmental impact due to carbon footprints, and the sustainability of communities' energy consumption patterns. Households stuck in the cycle of energy poverty due to reliance on inefficient fuels are also trapped in a system that perpetuates health risks and environmental degradation.

In addition, a household's choice of heating method and the efficiency of their system play critical roles in energy consumption. Modern, efficient systems like centralized gas heating are often beyond the financial reach of lower-income families, who may resort to less efficient space heaters or traditional stoves. The reliance on such methods not only affects energy expenses but also has broader health implications due to indoor air quality issues.

Therefore, addressing energy poverty requires a multi-pronged approach that not only focuses on transitioning to more efficient fuel types and heating methods but also ensures that this transition is equitable and inclusive. Policy interventions must prioritize the expansion of access to modern energy sources, provide financial and educational support to facilitate the switch to more efficient fuels, and consider the unique needs of different communities to tailor sustainable solutions.

v. Dwelling Quality and Tenancy

The study has illuminated the intricate connection between the characteristics of housing and tenancy and the prevalence of energy poverty. It is abundantly clear that the type of housing—its quality, insulation, age, and the tenancy situation—has profound implications for energy consumption and the resultant financial burden on occupants. **Housing quality** is crucial as a parameter, assessed by the presence of

insulation and the building's state, dictating the household's energy needs and expenses.

In the context of Türkiye, the contrast between well-insulated, energy-efficient homes and older, poorly insulated ones has created a divide in energy affordability. Tenants, in particular, often find themselves at the mercy of their landlords' willingness to invest in energy efficiency improvements. This predicament is exacerbated for those in lower-income brackets, who may not have the financial freedom to choose their housing or invest in upgrades, thus perpetuating the cycle of energy poverty.

The tenancy dynamic introduces additional complexity to energy poverty. Renters may lack both the incentives and the means to improve the energy efficiency of their homes, leading to elevated energy costs and an increased risk of falling into energy poverty. Conversely, homeowners may have more control over their energy usage and efficiency but still face barriers such as the upfront costs of making their homes more energy-efficient.

Consequently, the findings indicate that the characteristics of energy poverty in Türkiye are **not monolithic** but vary significantly **based on socioeconomic status, demographic factors, and spatial dynamics**, revealing a spectrum of energy poverty profiles each marked by its own set of challenges and necessities. The **overall picture** of energy poverty in Türkiye reveals a **complex interplay of financial constraints**, lack of **renewable and affordable fuel type** options, behavioral adaptations and spatial measure as **inadequate coping mechanisms** in household level, and **structural inefficiencies** converge. The current methodology for identifying households afflicted by energy poverty predominantly **relies on informal, reactive approaches, which lack a strategic and systematic framework**. Through a detailed investigation of various energy-poor household profiles, this study underscores the imperative for a **spectrum of tailored solutions that reflect the specific needs and profiles of energy-poor households**. Tailored strategies to mitigate energy poverty that takes into account the specific needs and

consumption behaviour of each household type can more effectively address the multifaceted nature of energy poverty.

CHAPTER 8

CONCLUSION

This thesis firmly establishes that energy poverty in Türkiye is not just a challenge, but a critical and multidimensional crisis, deeply intertwined with socio-economic, demographic and spatial factors. It is a testament to the diverse and profound impacts of energy poverty on different types of households, shaped by factors such as age, income, family structure and living conditions. The consequences of this crisis are far-reaching, affecting everything from the ability to pay energy bills to the adoption of different energy consumption patterns and dependence on foreign aid.

The thesis defines energy poverty in Türkiye as a dynamic and multifaceted situation characterised by the struggle to afford sufficient, reliable and sustainable energy. It is complexly shaped by **three main factors as socioeconomic inequalities, demographic diversity and geographical divisions** and **it uniquely affects vulnerable groups such as the elderly, children, students and women**. This phenomenon reflects not only a lack of energy resources, but also a deeper narrative of inequality and resilience in the face of changing energy needs and socioeconomic challenges.

Thus, the thesis significantly extends the traditional concept of poverty by illuminating the complex and often overlooked dimensions of energy poverty in Turkey. By examining the characteristics of energy access and affordability, it goes beyond traditional monetary measures of poverty and emphasises a more nuanced understanding of deprivation. First, the thesis takes a layered view of poverty, recognising that the lack of reliable and affordable energy services is as much an indicator of poverty as the lack of financial resources. This perspective recognises that energy poverty is not just a symptom of economic hardship, but a distinct and critical aspect of living standards, profoundly affecting quality of life and well-being.

Secondly, by exploring the different profiles of those affected by energy poverty - including the elderly, families with children, students and women - the thesis underlines the multifaceted nature of poverty. It reveals how energy deprivation intersects with a variety of demographic factors, thus broadening the poverty narrative to include **age, family structure, gender and urban-rural divide.**

The thesis also challenges the traditional urban-centred view of poverty by highlighting the unique energy struggles faced in rural areas. Incorporating spatial dynamics into the understanding of poverty will lead to more comprehensive and inclusive anti-poverty strategies. In essence, this thesis does not reduce the concept of poverty to only its energy-related aspects, but instead broadens the poverty dialogue to include a critical element that is often overshadowed by other socioeconomic indicators. In doing so, it calls for a more holistic and empathetic approach to understanding and tackling poverty that recognises the fundamental role of energy in shaping the human experience.

In concluding this thesis, it becomes clear that the energy poverty landscape in Türkiye is as complex and diverse as the stories of those living in it. This complex phenomenon does not follow a monolithic pattern; instead, it is uniquely shaped by the interweaving of socioeconomic status, demographic nuances and sharp contrasts between urban and rural life. This multifaceted scenario reveals a range of energy poverty profiles, each distinguished by its own challenges and requirements.

At the centre of this narrative are the factors that shape the contours of energy poverty. The prominent features are deeply rooted in the fertile soil of low-income levels, household structure, inefficient housing and different pathways of urban and rural dynamics. Like chapters in a larger story, energy poverty touches the lives of the most vulnerable groups - the elderly, children and the people with health issues - and each group represents a poignant sub-story in this complex story.

One of the most important implications of this research is the undeniable link between income levels and susceptibility to energy poverty, and the considerable disparity across the economic spectrum. This study breaks the misconception that

energy poverty is confined to the lower echelons of society, revealing its widespread impact on middle and even upper-middle income households in Türkiye. This insight calls for a paradigm shift in policy and intervention strategies, demanding solutions that recognise and respond to the unique challenges faced by different demographic segments.

It also exposes glaring inadequacies in current methods for identifying and assisting those trapped in energy poverty. The widespread reliance on informal and ad hoc solutions is a critical flaw. A transformative approach - a strategic and systematic framework that can skillfully identify and support those affected by energy poverty - is sorely needed. Especially, older people with fixed incomes and health-related energy needs face the fluctuating tides of energy prices, their lives underlining the need for stable and affordable energy. Also, families with children, whose homes are a mosaic of energy demands for heating, cooling and sustaining daily life, illustrate the struggle between providing comfort and balancing the tightrope of financial constraints.

Besides, students and recent graduates find themselves at a crucial juncture as they grapple with the uncertainty of limited income and inefficient housing. Their current solution, communal living, is a temporary refuge on their journey, leaving a question mark over their future in the energy poverty narrative. Often bearing the double burden of multiple financial responsibilities on a single income, women find their narratives intertwined with the challenge of maintaining financial independence amid high energy cost.

In rural areas, the lack of access to modern and efficient energy sources and the further complication of infrastructure problems add another layer to the narrative of energy poverty in Türkiye.

From the conclusion of this thesis, it is clear that energy poverty in Türkiye is not a single story, but a set of intertwined stories, each requiring recognition, understanding and action. The way forward requires a multi-faceted approach that recognises the different characters in this story and creates solutions as unique as

their experiences. This research calls for bespoke solutions that are appropriate to the different needs and circumstances of energy-poor households, recognising their different consumption behaviours and challenges. The results underline the urgent need for a bold and holistic strategy that brings together a deep understanding of the complexities of energy poverty, the formulation of sensitive and inclusive policies, and the implementation of effective, tailored interventions.

8.1 Intentions, Limitations, and Recommendations for Further Studies

While this research offers baseline for energy poverty view in Türkiye, it has several limitations. The neighborhoods and household types chosen for field studies might not fully represent the broader national picture of energy vulnerability due to the fact that Türkiye has a very heterogeneous socio-demographic structure at the urban and neighbourhood scale and that this structure varies with various external and internal dynamics. Furthermore, the study's temporal aspect and its focus on a fixed period may not fully capture the potential fluctuations over time, especially considering the evolving energy policies and environmental shifts in Türkiye.

The inherent methodological subjectivity in gathering interview-based data presents a limitation, as respondent biases might affect data integrity. Additionally, the external validity of the study's findings and interpretations might be limited to the Türkiye context due to its distinctive energy policies and socio-economic circumstances, offering restricted comparability internationally.

While in-depth interviews are conducted for this thesis, some participants did not want to directly share their household income levels. For this reason, the income levels of some households cannot be learned directly as numbers, but are expressed with definitions such as lower, middle, upper middle. Therefore, the ratio of energy expenses to total income was learned with the rates given by the participants.

There is a great need for interdisciplinary interaction for a holistic understanding of energy vulnerability and the development of comprehensive strategies. Future

research should explore the interaction between energy vulnerability and various academic fields and improve understanding of its multidimensional nature. Data limitations, particularly with regard to the availability of quantitative income and energy consumption data, pose significant barriers. The robustness of research findings is highly dependent on the quality and accessibility of data. Constraints in data availability may hinder the collection and dissemination of energy consumption data, affecting the scope and applicability of the study. Longitudinal data collection methods be implemented to track changes in energy poverty over time, providing insights into the effectiveness of policy interventions. A broader geographic scope be considered, including rural and semi-urban areas, to understand the full spectrum of energy poverty.

In conclusion, this study serves as a critical supplement to existing methodologies, challenging researchers and policymakers to consider a broader range of factors to understand energy poverty dynamics in Türkiye. The parameters and indicators presented in this thesis are expected to provide a base and contribute to the processes from data collection to analysis in the future. It underscores the necessity for a dynamic, inclusive approach that better reflects the realities of those living on the margins of energy security. This work calls for an evolved understanding, one that recognizes energy poverty not just as an economic condition, but as a social and spatial phenomenon that requires a concerted, multifaceted response.

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APPENDICES

A. Applied Ethics Research Center Approval

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

DUMLUPINAR BULVARI 06800
ÇANKAYA ANKARA/TURKEY
T: +90 312 210 22 91
F: +90 312 210 79 59
ueam@metu.edu.tr
www.ueam.metu.edu.tr

19 HAZİRAN 2023

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof. Dr. Mehmet Melih Pınarcıoğlu

Danışmanlığını yürüttüğünüz Elif Çora'nın ***"Türkiye'de Enerji Yoksulluğu Problemine Yönelik Yaklaşımların İncelenmesi ve Ölçüm Yöntemlerinin Geliştirilmesi"*** başlıklı araştırmanız İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek **307-ODTUİAEK-2023** protokol numarası ile onaylanmıştır.

B. Interview Control Card

Information provided about the research
This research was conducted by METU Regional Planning Department Master's student Elif Çora under the supervision of Prof. Dr. It is carried out within the scope of the master's thesis under the supervision of Mehmet Melih Pınarcıoğlu. This form has been prepared to inform you about the research conditions. **What is the purpose of the study?** The aim of the research is to determine the factors affecting energy poverty, methods and policies to combat energy poverty. **How will we ask you to help us?** If you agree to participate in the research, you are expected to answer the questions posed by Elif Çora. In this meeting, which is expected to last approximately one hour, you will be asked a series of questions. **How will we use the ınformation we collect from you?** Your participation in the research must be entirely voluntary. No identifying information is requested from you in the study. Your answers will be kept completely confidential and will be evaluated only by the researchers. The information obtained from the participants will be evaluated collectively and used in scientific publications. **What you need to know about your participation?:** The interview generally does not contain questions or practices that may cause personal discomfort. However, if you feel uncomfortable during the interview due to questions or any other reason, you are free to abandon the workshop and leave. In such a case, it will be sufficient to tell the interviewer that you want to leave the study. **If you would like to get more information about the research:** At the end of the workshop, your questions about this study will be answered. Thank you in advance for participating in this study. To get more information about the study, contact Prof. one of the faculty members of the Department of Urban and Regional Planning. Dr. You can contact Mehmet Melih Pınarcıoğlu (E-mail: melihp@metu.edu.tr) or graduate student Elif Çora (E-mail: elif.cora@metu.edu.tr). **Obtaining permission to record the conversation**

A. General information about the participant
Age, gender, occupation

B.1. For households

Understanding energy consumption patterns: how households manage their energy consumption in relation to various factors, including hh types, income levels, choice of heating and cooling systems, challenges faced in energy expenditure management, and the impact of support from governmental or societal organizations.

Household type	
Income level and employment	
Energy expenditures (monthly)	
Heating method(s) and system(s)	*Fuel type, heating methods (stove, central heating system, cooking methos (electiricity, natural gas, gas tube)*
Difficulties in paying energy bill	*Main reason(s), delay, debt (family or friends, bank, credit card, etc.), period of difficulty, anxiety level about bills etc.*
Energy consumption habits	*Health and energy consumption, main activities that consume energy, knowledge and awareness on energy efficiency, needs and habits that change over time etc.*
Coping mechanism(s)	*Behavioral and spatial measures taken*
Housing type	*Age, type, insulation, ownership*
Energy aid	*Yes/no* *If yes, how and from which institution* *If no, why is it not preferred or not approved from aid giving institution?*

Other:

B.2. For apartment managers

Explore their approach to energy management: how they manage the energy consumption of multiple households, their level of knowledge and strategies about energy efficiency, their relations with apartment residents, collective energy saving awareness

Building features	*Age, heating system, cooking systems, number of home owners and tenants, insulation, household number, socio-economic types of households in general*
Knowledge and awareness on energy efficiency	
Control mechanism of management	*Responsibilities of manager, regular board meetings*
Energy expenditures (monthly/yearly)	
Difficulties in managing energy expenses of apartment	Change in monthly dues, Deciding temperature, Reactions of apartment residents
Energy consumption habits	*Energy consumption patterns* *Main activities that consume energy*
Coping mechanism(s)	*Spatial measures taken* *Raising awareness strategies for residents*

Other:

B.3. For stakeholders

Role of stakeholders including local governments, community centres, humanitarian organisations and elected neighborhood representatives (mukhtars) in energy aids, their awareness on energy poverty, their relation with energy poors, information about energy aid process

Knowledge about energy poverty	
Role in energy aid process	*Responsibilities, methods, steps of process, energy poor household detection for aid*
Relation with energy poor households	
Energy poverty case(s) encountered	
Energy efficiency trainings/campaigns provided	

Other: