GENDER INCLUSION AND DEVELOPMENT, EXPLORING THE FACTORS IMPACTING THE WOMEN PARTICIPATION IN RENEWABLE ENERGY TRANSITION IN PAKISTAN.

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THESIS AND DEFENSE APPROVAL FORM

The undersigned certify that they have read the following thesis, examined the defense, are satisfied with the overall exam performance, and recommend the thesis to the Faculty of Social Sciences for acceptance.

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AUTHOR'S DECLARATION

I Minahil Khalid daughter of Khalid Shoaib Registration # 01 MPHIL/GPP/S22 Discipline Governance & Public Policy Candidate of Master of Philosophy at the National University of Modern Languages do hereby declare that the thesis Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan, (Solar Sigma) submitted by me in partial fulfillment of my M. Phil degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in the future, be submitted by me for obtaining any other degree from this or any other university or institution. I also understand that if evidence of plagiarism is found in my thesis/dissertation at any stage, even after the award of a degree, the work may be canceled, and the degree revoked.

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Abstract

This thesis explores the complex elements impacting women cooperation in the sustainable energy change in Pakistan, with an emphasis on orientation consideration and improvement. This is a qualitative survey questionnaire method. Notwithstanding the worldwide shift towards sustainable energy, women contribution in this area stays restricted in Pakistan because of a blend of socio-social, financial, and strategy related boundaries. The review recognizes key hindrances, for example, customary orientation jobs, restricted admittance to schooling and preparing in STEM fields, and absence of steady strategies. Socio-social standards frequently confine women versatility and dynamic power, further fueling their underrepresentation in the sustainable power labor force. Monetarily, women face obstructions in getting to monetary assets and enterprising open doors inside this area. On the other hand, the examination highlights the critical advantages of expanded female cooperation in the sustainable energy progress. Women bring special viewpoints and imaginative arrangements that can drive maintainability and local area acknowledgment of sustainable power drives. Improved cooperation of women could prompt more comprehensive development and impartial advancement results. The thesis proposes key proposals to address these obstructions, including the execution of orientation delicate strategies, designated instructive and professional preparation programs, and the arrangement of monetary motivations for women business people in the environmentally friendly power area. It advocates for a cooperative methodology including government bodies, non-legislative associations, and confidential area partners to establish an empowering climate for women dynamic commitment.

Table Content

Abbreviation

Acronym	Abbreviation
ADB	Asian Development Bank
AQI	Air Quality Index
DALYs	Disability-adjusted life year
REEE II	Renewable Energy and Energy Efficiency Project
EU	European Union
IAP	Indoor Air Pollution
NGO	Non-Government Organization
SDG	Sustainable Development Goals
SEA4ALL	Sustainable Energy for All
STEM	Science, Technology, Engineering, and Mathematics
UNECE	United Nations Economic Commission for Europe
WHO	World Health Organization

CHAPTER NO.1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY:

The increasing worldwide temperatures and the resulting impacts of climate change highlight the issue pressing necessity for addressing climate change to protect the earth for future descendants (Teles,2024). Approximately 80% of people worldwide live in countries that rely on imported fossil fuels (sadiqa,2023). Gender involvement and progress are more widely acknowledged as key components of lasting development. Gender equality is a crucial human right and a vital factor in reaching sustainable development objectives. The involvement of women in the shift to renewable energy is a crucial part of promoting gender equality and progress (UNwomen,2022). The World Bank states that South Asia is the region most at risk from the impacts of climate change. Intergovernmental Panel on Climate Change areas are vulnerable to the impacts of climate change. Regions are expected to experience more substantial obstacles associated with climate change in the future multiple years. IRENA reports that over 25% of the rural population and more than half of One-fifth of Pakistan's population lack access to electricity, with the remainder having access. linked to the network. To meet the country's goals, Pakistan must rapidly increase its use of renewable energy. achieving 20% of the total capacity by 2025 and 30% by 2030. Much of Pakistan relies on traditional energy sources for its power generation (Ayesha Sadiqa,2023).

In the past few years, there has been a growing worldwide emphasis on renewable energy because of climate change and the demand for sustainable development. Pakistan can utilize renewable energy because of its abundant natural resources like solar, wind, and hydropower. Nevertheless, the shift towards a sustainable economy encounters difficulties, especially in incorporating gender equality (Muhammad Asif,2024). Pakistan is a nation that is currently in the process of development, because of recent progress and to assist its extensive. The nation requires a vast amount of energy to ensure its population's and industrial sectors' smooth functioning. Nevertheless, the country is facing its most severe energy crisis due to a lack of energy supply. (Irfan,2019). Professional careers in the energy sector have been predominantly led by men for an extended period. Until a short time ago, women Only 1

percent of top management positions and 6 percent of technical staff in the fossil fuel industry were represented by women.

Baruah (2017) stated that the energy industry worldwide is in a global context. Women have seen a rise in employment in the renewable energy sector. Industry in the last ten years, notably in contrast to the fossil fuel industry. However, male dominance persists. Women are in important roles in technical, managerial, and policymaking positions within the sector (Vangchuay) and (Niklaus, 2021; IRENA 2019). Pakistan's energy consumption is growing at a rate of over 9% per year (Zhen-yuZhao, 2019).

1.2 PAKISTAN'S CONTEXT

From a geographical perspective, Pakistan is situated in a tropical region and gets substantial sunshine throughout the year. To tackle the current energy problems, it is crucial to utilize the available solar energy sources(Ahmed,2019). Pakistan, a developing country, relies heavily on fossil fuels for its energy needs. In the 2022 annual report of NEPRA, it is stated that Pakistan has a total power generation capacity of 43,775 MW, with Fossil fuel sources accounting for 59%, hydro for 25%, renewable for 7%, and nuclear for 9%. The nation's electrification rate is poor, as only 70% of its citizens have electricity access. By 2030, Pakistan aims to have 30% of its energy mix coming from renewable sources as per the government's target. Pakistan is dealing with major energy obstacles such as shortages and dependence on fossil fuels. The government has acknowledged the capacity of renewable energy sources such as solar, wind, and biomass to meet its energy requirements sustainably (Hamza Akram,2022 & Asif Memon,2016). Pakistan has a poor ranking on the Gender Inequality Index, as women encounter obstacles in education, employment, and decision-making. Women are often limited in their involvement in fields like the energy sector, engineering, and technology by traditional gender norms that categorize these sectors as male-dominated (Makwela,2022) Women are an integral part of our society and play a very significant role in economic development. The Energy Transition presents a chance for women to enhance their opportunities for technical training, leadership development, skills acquisition, and well-paying career opportunities. Collaboration between different sectors, such as education and ICT, is necessary to develop a skilled and diverse labor force in the energy sector. (Hana Brixi,2023). Increasing the number of women in technical and leadership roles within the energy sector is essential to fulfill the

anticipated demand of 14 million new jobs required for clean energy expansion by 2030. At a recent WePOWER Conference, Mandakini Kaul, the Regional Coordinator for South Asia at the World Bank, stressed the importance of women being influential voices in the energy transition (Papathanasiou,2023).

Energy transitions are not inherently fair as they do not always consider all aspects. Pre-existing gender inequality is a social justice challenge and vulnerability as highlighted by Johnson (2020).

1.3 PROBLEM STATEMENT

Problem Statement

Pakistan, as a rapidly developing nation, faces a growing energy demand that is largely met through imported fuels, making energy security a critical concern (Farooq, 2022). As the country works toward transitioning to renewable energy sources, it must also address the stark gender disparities in the sector. Despite women constituting a greater share of university graduates, their representation in the national workforce remains limited to just 20% (World Bank, 2022), and a mere 4% in the energy sector (USAID, 2024).

This underrepresentation is even more pronounced in technical and leadership roles within the energy industry. A 2023 report by the Pakistan Council for Renewable Energy highlights that women comprise less than 3% of engineers in renewable energy projects. According to the Women in Energy Network of Pakistan (2018) and recent updates from NTDC (2024), women hold only 3% of positions in national transmission roles, and less than 2% of technical roles in Independent Power Producers (IPPs). At the Water and Power Development Authority (WAPDA), female employment stands at 6%, with only 3.3% in technical capacities. These statistics reflect a deep-rooted structural and cultural marginalization of women in non-traditional sectors.

In Islamabad, the country’s capital and a hub for policy innovation, women's participation in the renewable energy transition remains minimal. Socio-cultural constraints, limited institutional support, and gender-biased recruitment practices significantly hinder their entry and progression in this emerging sector (Ahmed & Khan, 2023; Renewable Energy Policy Review Pakistan, 2024). While women have the potential to contribute meaningfully to

sustainable energy solutions, systemic inequalities restrict their opportunities and visibility in shaping the transition.

1.4 Research Objectives

1. To analyze the socio-cultural, economic, and institutional barriers affecting women's participation in renewable energy in Islamabad.
2. To assess the level of awareness and education regarding renewable energy among women in the region.
3. To explore existing support networks and their effectiveness in promoting gender inclusion in the renewable energy sector.
4. To provide actionable recommendations for policymakers, NGOs, and stakeholders to enhance women's participation in the renewable energy transition.

1.5 Research Questions

1. What social norms and cultural beliefs in Islamabad are currently hindering women from participating in the renewable energy transition?
2. What impact do economic limitations, like availability of funding, educational opportunities, and job options, have on the involvement of women in renewable energy projects?
3. What impact do policies and institutional structures have on women's participation in the transition to renewable energy, either enabling or hindering their involvement?
4. What impact does women's understanding and knowledge of renewable energy in Islamabad have on their involvement in the industry?
5. What types of support systems, such as community organizations and mentorship programs, exist to empower women in the renewable energy transition, and what is their level of effectiveness?

1.6 Significance of the study

This study on gender inclusion and women’s participation in Pakistan’s renewable energy transition holds significant academic and policy relevance. It addresses the persistent issue of

gender inequality in the country's energy sector, where women remain underrepresented—particularly in decision-making and technical roles. By exploring the structural, socio-cultural, and institutional barriers that hinder women's full participation, the research offers critical insights into a sector that is both strategically important and undergoing rapid transformation.

The renewable energy sector in Pakistan has gained national importance due to the country's urgent need to shift toward sustainable and locally sourced energy solutions. As such, this research focuses on a high-impact industry that is central to Pakistan's development agenda. Women's inclusion in this transition is not only a matter of equity but also of effectiveness—diverse participation improves innovation, economic efficiency, and policy responsiveness in energy systems (IRENA, 2022; UN Women, 2023).

Academically, the study contributes to the growing body of literature on gender, development, and sustainable energy transitions in the Global South. It bridges gaps in existing research by situating women's experiences and challenges within the unique socio-political and economic context of Pakistan. Furthermore, it enriches interdisciplinary dialogue between gender studies, energy policy, and development planning.

From a policy perspective, the study offers practical recommendations to support gender mainstreaming in the renewable energy sector. This includes strategies for improving women's access to education and training in STEM fields, creating enabling work environments, and designing inclusive recruitment and leadership pathways. By doing so, the research aligns with Pakistan's commitments to the UN Sustainable Development Goals (particularly SDG 5 on gender equality and SDG 7 on affordable and clean energy).

Finally, empowering women through participation in the renewable energy industry has the potential to combat gender stereotypes, enhance socio-economic mobility, and contribute to poverty reduction, improved health outcomes, and environmental sustainability. Thus, the findings of this research are not only relevant for national development but also for shaping progressive global frameworks in gender and energy policy.

In sum, this study is a timely and necessary investigation into the intersection of gender equity, sustainable development, and the energy transition in Pakistan offering both scholarly contributions and actionable policy insights.

1.7 Rationale of study

Pakistan is facing a deepening energy crisis, characterized by widening supply-demand gaps, recurrent load shedding, and a costly reliance on imported fossil fuels. These structural challenges undermine economic productivity, social stability, and the country's long-term energy security. As Pakistan moves toward a renewable energy transition to reduce greenhouse gas emissions and meet sustainable development goals, it becomes critical to examine the human capital and social dynamics shaping this transformation.

Despite the strategic importance of the renewable energy sector, women remain significantly underrepresented across the energy value chain — from technical fields and operational roles to leadership and policy-making positions. This persistent gender imbalance not only perpetuates structural inequality, but also weakens the potential of the sector to benefit from diverse perspectives and inclusive innovation. Research has shown that gender-diverse teams are better equipped to address complex problems, yet Pakistan's energy institutions remain male-dominated, limiting the sector's resilience and creativity (USAID, 2024; World Bank, 2022).

Furthermore, the urgency of climate change adds a compelling dimension to this issue. Pakistan is one of the most climate-vulnerable countries globally, with increasing threats from rising temperatures, water scarcity, and extreme weather events. Women, especially in rural and marginalized communities, are disproportionately affected by these environmental challenges, yet they are often excluded from decisions that shape energy and climate adaptation policies. Without inclusive frameworks, renewable energy initiatives risk overlooking women's energy needs, household roles, and potential as sustainability advocates (UNDP Pakistan, 2023).

In this context, integrating gender equity into the renewable energy transition is not only a matter of social justice, but a strategic developmental priority. Empowering women in the energy sector can contribute to poverty reduction, improve health and education outcomes, foster innovation, and enhance community resilience. This study is therefore driven by three interconnected imperatives: (1) addressing Pakistan's urgent energy crisis through sustainable solutions, (2) closing the gender gap in energy sector participation, and (3) supporting equitable, climate-resilient, and inclusive national development.

By investigating the socio-cultural, institutional, and economic barriers to women's participation in Pakistan's renewable energy transition, this research aims to produce practical, policy-relevant insights. It seeks to inform future strategies for gender-responsive energy planning and to contribute to the growing body of literature on inclusive energy governance in the Global South.

1.8 Scope of Research

This research primarily examines the factors impacting women's involvement in the shift towards renewable energy in Islamabad, Pakistan. It highlights the issues, provides suggestions to tackle them, and identifies challenges for improved policy implementation by the government.

3 Operational Definitions

Gender Role Expectations: General attitudes and expectations, which come from culture and civilization regarding how men and women should or should not behave. For the purpose of this study, this includes expectations like the fact that women should surrender to family duties, technical careers are not ideal for women and juggling between work and family is a difficult task. This will be assessed by analyzing the participant's response involving social cultural pressures and self-perceived experience in the issues of career paths and family responsibilities.

Lack of Encouragement and Support: The lack of encouragement and help from family, community and institutions which can promote woman to take up career in technical discipline. This will be established with focuses on family and community support and or no support and institutional support systems. Some of these categories are lack of encouragement, no one to emulate from, or poor resource base in society.

Cultural Stereotypes and Misconceptions: Culture: Socialized and in most cases, negative attitudes towards women that influence their access to, and employment in, certain sectors like renewable energy. Including but not limited to stereotyping where women are believed to lack the competency to practice or perform technical roles in technical areas of work. This will be assessed by views participants have for cultural beliefs and stereotyping and how they have influenced their working experience.

Funding and Financial Support: Capital requirements and funding required in initiating or pursuing a course in renewable energy industry as well as finance requirements for renewable energy projects. It will be assessed by asking the participants some questions about their experiences in sourcing the funds and other challenges faced.

Educational Opportunities and Training: Ensure that quality infrastructure, education and training programs to be used to develop skills and knowledge in the field of renewable energy as well as matters relating to affordability and availability of specialized training and education. Data collection will entail evaluating the outcomes regarding participant's experiences with education and training relating to costs and availability.

Employment Opportunities and Career Advancement: How much the people have access to the job market and opportunities to progress in the renewable energy industry. This encompasses the availability of employment opportunities in the workplace, opportunities for promotions and other careers opportunities that are being posted within the workplace of concern and other effects caused by prejudice on the basis of gender. It is also important to know how the participants have approached the search for employment and /or promotions in the sector.

Weak Implementation of Supportive Policies: General mismanagement and implementation of policies … to assist women in STEM and renewable energy sectors. This is in regard to the level of implementation of supportive policies in place as well as assessment of the outcomes. This will be assessed regarding how participants have experienced the process of policy implementation as well as the efficacy of such policies into offering support.

Bias in Institutional Structures: Sexual bias within organizations that negatively affects women career advancement. This involves evaluating practices within organizations that seem to provide women employees with a raw deal. On this, the self-reports of participants concerning bias in hiring, promotion and organizational support of candidates will be employed.

Ineffectiveness of Diversity and Inclusion Policies: Inadequate measures to address policies seeking to transform organizational culture to be diverse and inclusive. This is also in place with the assessment of the measures implemented towards diversity policy compliance as well as the practicality of the measures. Members will give perspective regarding their encounters with diversity policies and effects on career advancement.

Lack of Awareness and Exposure: Concerns arising from poorly developed awareness of the renewable energy solutions and the job market for various renewable energy technologies. This is done in terms of participants' knowledge about renewable energy and the extent to which they may have encountered career opportunities in the usage of renewable energy resources. This will be examined in the manner of participants' beliefs and awareness of renewable energy prospects.

Misconceptions and Complexity: Misconceptions relating to cost, time and effort required for the adoption of renewable energy systems and an impression that these are out of reach. This involves understanding participants' perceptions of the difficulty of renewable energy careers and whether these misconceptions deterred them from pursuing such fields.

Educational and Informational Gaps: Shortcomings in educational resources and information that hinder women's understanding and involvement in renewable energy. This will be measured by assessing gaps in participants' educational backgrounds and the availability of informational resources about renewable energy careers.

1.9 Organization of Study

This thesis is structured into six sections. In Chapter 1, I elaborate on the background of the study, diving into various research on gender inclusion and women's involvement in renewable energy transition worldwide, shifting focus to the specific case of Pakistan. Afterward, I elaborated on the issue at hand, outlined the research goals and inquiries, and touched upon the importance and extent of the investigation. Chapter 2 encompasses a Literature Review, where I delved into the notions of gender and energy poverty, as well as the influences on working women in the energy sector. Furthermore, a brief overview of the energy transition and women's involvement was provided. Chapter 3 focuses on the discussion of the conceptual framework and the research design. Detailed analysis is conducted on the qualitative data in Chapter 4. Chapter 5 of the study discusses the results, and chapter 6 covers the conclusion and recommendations based on those findings.

CHAPTER NO.2

LITERATURE REVIEW and Framework

1. Introduction

The literature review serves as a foundational tool for researchers, allowing easy access to the study topic and helping them identify high-quality, relevant, and legitimate studies. It facilitates a comprehensive understanding of the existing knowledge and acts as a crucial starting point for new researchers venturing into a particular domain. In the context of this study, the focus is on examining gender inclusion in the renewable energy transition within Pakistan a topic that has gained global relevance yet remains underexplored locally.

Renewable energy technologies have become indispensable in the global pursuit of sustainable development goals (SDGs). Despite significant progress, there remains a lack of attention toward gender issues within Pakistan's renewable energy sector. This literature review aims to explore existing studies addressing women's participation in the energy transition, with a focus on socio-cultural barriers and gender disparities that hinder equal involvement.

2. The Global Context of Renewable Energy and Gender

Efforts to combat climate change have accelerated the shift from fossil fuels to low-carbon renewable energy sources. The Paris Agreement (UNFCCC, 2015) explicitly emphasizes the need for this transition to be equitable and inclusive, ensuring gender equality. Consequently, researchers and policymakers are increasingly interested in the intersections of **energy transition**, **gender**, and **social justice**.

Although energy is often perceived as gender-neutral due to its technical nature, research shows that energy policies can disproportionately affect women, particularly in developing regions (Standal et al., 2018; Mang-Benza, 2021). Transitioning to renewable energy not only offers environmental benefits but also presents opportunities for **social transformation**, improved **gender equality**, and enhanced **quality of life** for women.

According to the International Renewable Energy Agency (IRENA), the number of renewable energy jobs globally reached 11.5 million in 2019, doubling from 5.7 million in 2012 (IRENA,

2013; 2020). This job growth, stemming from the labor-intensive nature of renewables, signals potential for increased women's participation if systemic barriers are addressed.

3. Gender Dimensions in the Energy Transition

3.1 Understanding Gendered Impacts

The shift to renewable energy has multifaceted gender implications. IRENA (2019) notes that women remain underrepresented in technical and leadership roles, but the energy transition opens new pathways for closing gender gaps. Similarly, UNDP (2017) emphasizes that access to clean energy improves women's health, reduces household burdens, and enables greater access to education and income-generating activities.

The WHO (2018) also underscores that clean energy solutions reduce indoor air pollution, thereby improving health outcomes for women and children. Consequently, the transition is not only a technical or environmental issue but also a public health and gender equity concern.

3.2 Women as Agents of Change

Women have a pivotal role to play as decision-makers, entrepreneurs, and community mobilizers in accelerating renewable energy adoption. Studies by IRENA (2019) highlight that women often make household energy decisions, making their inclusion vital for successful and culturally accepted renewable energy projects.

GIZ (2020) stresses that providing women with technical and vocational training can prepare them for employment in the renewable energy sector as technicians, installers, or supervisors. Similarly, the World Bank (2019) finds that women's community-level involvement enhances the sustainability and uptake of clean energy solutions.

UNDP (2020) further points out that women, especially in vulnerable rural areas, possess unique perspectives on climate adaptation and resilience essential for effective energy strategies.

4. Barriers to Women's Participation

Despite the recognized potential of women in the renewable energy transition, various obstacles persist, particularly in developing countries like Pakistan. These include:

- **Cultural norms and restrictions** that limit women's mobility and educational opportunities (IRENA, 2019).
- **Societal stigma and economic constraints** that discourage women from entering male-dominated technical sectors.
- **Insufficient gender-sensitive policies** that fail to integrate women's needs and capacities into energy programs (Asian Development Bank, 2020).

6. Gender and Renewable Energy in Pakistan

5.1 Current Landscape

Pakistan, like many developing countries, has seen growth in renewable energy but continues to struggle with gender parity in the sector. Studies reveal that women's representation, particularly in **technical and managerial** roles, remains minimal due to entrenched socio-cultural barriers (IRENA, 2019; UNDP, 2017).

5.2 Government and Institutional Interventions

Several efforts have been initiated to foster gender inclusion:

- The **Benazir Income Support Programme (BISP)** (2008) aimed to economically empower women by offering financial support to engage in small businesses, including those related to renewable energy.
- The **Gender Entrepreneurship Markets (GEM) initiative** by the IFC supports women entrepreneurs in clean energy through training, mentorship, and access to finance.
- **UNIDO's rural solar energy training programs** have empowered women as solar technicians, especially in remote areas (UNIDO, 2019).

These interventions, while promising, are limited in scope and require broader implementation to create systemic change.

5.3 The Role of Women in Pakistan's Energy Transition

Women in Pakistan can significantly contribute as:

- **Decision-makers** in policy and project development.
- **Entrepreneurs** in delivering renewable energy services.
- **Technical professionals** through targeted training and education.

- **Community advocates** for sustainable energy practices.

The SEEA (Sustainable Energy for All) analysis confirms that women's involvement enhances the efficiency and inclusivity of energy solutions. Policies that integrate women's voices lead to better-designed projects and more sustainable outcomes (UN Women, 2018).

2.3 Status of Women in the renewable energy sector in Pakistan

Pakistan being one of the developing countries has homo geneously developed in the field of renewable energy over the last several years. Therefore, although it remains quite challenging to fight for gender equality in the industry, which is also currently rather ambitious when it comes to women's participation as professionals.

In Pakistan the position of women and women in the renewable energy sector especially in technical and managerial positions remained explored and work-less documented as found in a research conducted by IRENA. In the report, several factors are highlighted that limit opportunities for women in getting into the industry: Factors such as culture, which places major barriers to women's movement into training and education (IRENA, 2019).

UNDP has brought out another study which again highlights the need for increasing women, the quota in the renewable energy sector of Pakistan. This thesis also noted that women's contribution in the industry can positively impact its operations since they offer unique elements and skills to the sector, which is crucial to the change to the renewable energy business. Many valuable programs which aimed at increasing women participation in the industry such as training or mentorship are present in the report (UNDP, 2017). But there are cases of women who work in Pakistan's renewable energy sector despite these challenges. For example, under the UNIDO sponsored project women have been educated as the solar technicians and the use of solar energy in the rural areas of Pakistan is being promoted (UNIDO, 2019).

To sum up, there are possibilities to promote work involvement of women as professionals at least in this sphere despite in general there are great difficulties in Pakistan in the matter of gender equality in the sphere of renewable energy. Gender diversity in the sector can, therefore, be encouraged, and barriers to women's engagement can be removed if there are focused goals for coaching and training.

2.4 Renewable Energy and Gender

To minimize the negative effects of regular energy consumption on health and the environment, secure energy supply security, and control climate change, environmentally friendly electricity is essential. The switch from petroleum products to renewable energy sources also improves financial outcomes and lessens dependency. Assuming this method of chance is socially inclusive, it will work best. Particularly, the orientation component emphasizes how important it is that women participate on an equal footing with males. Environmentally friendly power is a potent field that can open up a variety of exciting opportunities, especially when combined with public policies that ensure women can contribute just as much as men.

The global energy revolution will create jobs and careers in renewable energy as it picks up speed from 7.1 million jobs in 2012, the environmentally friendly power sector has actively grown, according to the Worldwide Environmentally Friendly Power Organization's (IRENA) REmap guidance, is expected to practically drastically increase by 2050 (IRENA, 2018).

The sun-oriented photovoltaics (PV) industry, which currently employs about 3.4 million people, has seen the steadiest development to date. However, other green energy sources—particularly biofuels, hydropower, wind power, and solar-powered heating and cooling—are also important managers. There are open positions throughout the value chain, from project planning and equipment assembly to development and establishment, office tasks and maintenance, and a wide range of support services (such as finance, data innovation, HR, regulatory assistance, marketing, information, legal, business improvement, and so forth). These tasks demand proficiency in a wide range of professions, encompassing both specialized and non-specialized skills.

Finally, the shift to renewable energy must successfully attract women and children, as their experiences with the use of traditional energy sources in the energy access setting are disproportionately negative. In general, women have not received enough attention in the energy industry. According to a 2012 assessment, women make up a share of the workforce in the electricity, gas steam, and water industries (World Improvement Report, 2012).

2.5 Workforce gender composition in the traditional energy sector

Data that is easily accessed demonstrates how overworked the typical energy industry is: According to a recent analysis by the World Oil Chamber and Boston Counselling Gathering, women make up 22% of the labor force overall in the oil and gas industry, which is much less

than the average for the total labor force and substantially lower than the percentages in assembling, finance, training, well-being, and social work. In the oil and gas industry, women hold 27% of entry-level roles requiring a professional degree and 25% of mid-career roles; nevertheless, their share of senior and leadership roles is only 17%. There is just one female president in the region out of every 100 (Rick, 2017).

Women held 22% of senior administration positions in the power, gas, and water supply industry in 2015; these positions typically include a portion of the offer in the instructional and social administration sector (McCarthy, 2016).

After a study of the top 200 utilities in the world, just 25 women were found to be on boards representing 16% of board members and 5% of leader board members.

2.6 Attitudes towards gender roles

Restrictive views on orienting employment that benefit people of all ages have a profoundly negative impact on popular perceptions of what women can and should accomplish. Modifying these viewpoints and the designs that sustain them is a slow process. Thus, it should not be shocking that attitudes still prevent women from equally and completely participating in a variety of economic fields. The problem stems, in part, from women's self-discernment and, in lesser measure, from men's expectations of women's ability to succeed. Both are viewed in the article as major barriers to women being hired and advanced in particular fields within the energy industry and other fields (Huyer and Hafkin,2013).

The misbeliefs are more noticeable in technical positions within the energy sector. One inevitable assumption will be that these kinds of positions call for much more real strength than the majority of women possess. Nevertheless, the motorization and computerization of many tasks have significantly reduced the importance of physical strength. Questions concerning women's specialized abilities form the basis of other misconceptions. It is a natural tendency for women to be viewed as less qualified than their male spouses for specialized roles, even when their capabilities and work experience are comparable or comparable (Baruah, 2017).

There seems to be a relationship between the general male-biased social attitudes that stem from misconceptions and misperceptions about gender and the relative ignorance of women and girls about job opportunities in renewable energy. Women are consequently persistently under-represented in the sector, especially in technical roles. societal, societal, and orientation

expectations, as well as misconceptions, were shown to be factors that undermine young women's confidence, interest, and preparedness to engage in STEM fields in a review of specialized education for women across 120 countries (UNESCO, 2017).

Most of the time, young women are brought up to believe that STEM fields are "manly" and that women are inherently less capable than males. According to Bian et al. (2017), field-explicit beliefs about the qualities needed to succeed in STEM fields influence career paths and can play a big role in determining whether women feel welcomed or shunned.

Despite years of concentrated attempts to close the gender gap in these disciplines, women make up only 12% of engineers in the UK, compared to 47% of the workforce overall. Just 16% of those who started an innovation or design degree in the Unified Realm in 2015 or 2016 were women, and only 25% of young women between the ages of 16 and 19 indicated in a study that they could consider a career in design at some point (Designing UK, 2018). Australia, Belgium, Finland, Poland, Spain, and Sweden have been found to have somewhat different barriers to discernment or interest (OECD Advanced Education Program, 2014).

The self-perceptions of women can also have surprising effects. Since creating an invention may not be as socially valued as other professions like the clinical and natural sciences, women may be less likely to choose these careers.

Renewable energy has a varied impact on gender, which can be both positive and harmful. Here are some examples of how renewable energy might affect gender:

Economic Empowerment: Policies centred on renewable energy are capable of generating financial returns as well as creating commercial opportunities. When there are possibilities for that, the ability to achieve them freely can ultimately result in women’s independence and economic enfranchisement.

Access to Energy:

The energy applications such as solar homes, or efficient hearth devices such as cooking stoves become able to impart on women work relief leading to education and economic opportunities. Uninterrupted and clean electricity and energy is scarce in most parts of the world especially the rural area in the developing world. And one such area which lacks access is this one; it negatively impacts women and girls in the worse way possible.

Education and Training:

It is also often used where skilled labor is required for the renewable energy projects such as installation, maintenance and tech development. It is significant that for women there may be more chances to pursue a STEM-linked career in professions associated with renewable energy should training and education be made gender-sensitive.

1. Community Engagement: Often women have crucial things to do in local decision-making. Many women can understand the energy needs and aspirations of villages or towns; therefore, engaging them on renewable energy projects will mean developing appropriate schemes and projects.

2. Energy Poverty Alleviation: Global archival data indicates that women are now more vulnerable than men to energy poverty which constrains their access to modern energy forms. Measures into renewed sources of power can help solve this ill in generating improved experience for women and girl child healthcare, education and living standards.

3. Environmental Sustainability: Due to the fact that women are often Are the primary care givers and users of energy within the household then their opinion is the best for helping homes to embrace and remain sustainable in energy usage. This may improve quality of interior airs and limit the impacts of global warming on the atmosphere.

4. Policy and Advocacy: Women participation on renewable energy projects holds the ability to influence lobbying and therefore policy outcomes relating to climate change, energy access and sustainability. WEAP has the advantage of voicing the two when making policies hence enhancing the development of better policies for all.

5. Gender Equality (SDG 5): Of the SDGs which have been recognized, there is gender equality. As a result, gender is the most important component of renewable energy because men and women often have various roles and possibilities and are responsible for obligate and

dismissing different resources linked to energy. To make SDG 5 a reality, changing the renewable energy industry by demanding gender equality must occur.

6. Affordable and Clean Energy (SDG 7): As part of the UN's Sustainable Development Goals, tagged SDG 7, the power to ensure that every individual has access to effective and sustainable energy is provided. Because gender inequality and women's vulnerability are strongly linked to energy poverty and restricted access to clean energy, gender issues are essential in this case. This gap can therefore be closed through enhanced availability of renewable energy resources.

7. Decent Work and Economic Growth (SDG 8): Renewable energy-based projects that involve women can at the same time grow the economy and offer employment. SDG 8 demands sustainable, inclusive and productive employment, and decent work for all and economic growth.

8. Reduced Inequalities (SDG 10): Gender and sexual opportunity is one of the most vital types of general inequality. Societal imbalances can be mitigated by using renewable energy for gender-parity concerning participation, employment and judgement.

There are many Intended Nationally Determined Sustainable Development Goals that are quite connected with gender and renewable energy. For effective implementation of sustainable development agenda and responding to current global challenges such as poverty, inequality, climate change and environmental degradation gender equality and affordability and widespread utilization of renewable energy sources are key factors. In pursuing the SDG goal in its entirety, one needs to grasp these correlations in pursuing renewable energy projects in a non-gender bias manner.

2.7 Goals for Sustainable Development (SDGs) and women

It has a three-pronged specification namely orientation correspondence. As it pertains to many of the overall membership depression problems that we are confronted with in the world today including those to do with health care, the economy, environmental change, rising conflicts and violence against women, distilling this important qualification presents the brightest opportunity. First of all, women themselves are the inhabitants of such countries and at the same time, they are the ones who facing these problems most of the time, Therefore, women both have motivation and the ability to compromise. The last one is the orientation prejudice

against today's women many of whom still experience it in the culture. The seventeenth SDG and 2030 Economic Advancement Plan signed by the heads of state of the world in 2015 is more a vision of a sustainable development which united everyone in UNO (2020). The primary goal of the SDGs for 2030, as stated in the SDGs Report 2030, is to acknowledge that achieving gender parity and orientation correspondence is critical to achieving each of the 17 targets that the UN outlined in 2020. Ensuring women's and youth parity across the SDGs is the first step towards achieving uniformity and rationality, economies that serve each individual, and maintaining our shared society for future generations. According to these scholars, addressing the problem of orientation correspondence is necessary to achieve sustainable progress. Therefore, to promote drives for a sustainable turn of events, tactics, and drives that enhance female cooperation must be continually pursued. To achieve economic progress by 2030, it is imperative to appropriately confine the victimization of women. The most fervent support and advancement of women's rights should be given due consideration in light of the outcomes of previous SDGS. The sustainable goals of the 2030 objectives for improvement demonstrate the importance of women's assistance.

2.8 Guidelines and remedies

Pakistan has implemented many measures to encourage the utilization of sustainable energy sources and to advance gender parity within the energy industry. Policies and approaches that particularly target women's involvement in the switch to renewable energy are still required, nevertheless.

The initiative of the Women in Energy was initiated by the AEDB in 2016 to increase women participation in Pakistan's renewable energy sector. In an effort to enhance the participation of women in the renewable energy sector the program aims at providing training and mentorship, and to diversify the industry (IRENA, 2019).

There is another program known as "Lighting a Million Lives" with an aim to create awareness among women of energy sector of Pakistan and usage of renewable energy in rural parts of the country. Barefoot College in partnership with the Pakistani government established the programme, which empowers women to be solar technicians for extending the use of solar power in rural centres (UNDP, 2017).

We also require gender policies in the energy sector besides these measures in energy sector to enhance gender balancing. Initially introduced in 2013, the National Energy Policy for

Pakistan pays attention to gender diversity in the sector and encourages more participation among female professionals in it (Government of Pakistan, 2013).

Therefore, Pakistan also has some advertisements and laws for women Employment in the renewable energy sector, but still more effort implemented to eliminate barriers that women face in this profession.

2.9 Theoretical narrative for the study:

These are numerous approaches to the study the gender disparity

2.9.1 Gender role theory

Gender role theory may prove quite useful when studying gender representation in the renewable energy business. In Gender role theory, people are expected in a certain way and given certain responsibilities depending on their gander as perceived by society. When implemented in renewable energy it helps explain how conventional masculine prejudices impact sector diversification. Gender role theory is relevant to gender representation in renewable energy in the following ways:

Segregation in the Workplace: Gender role theory helps to differentiate why men or women take particular roles in renewable energy sector. Education has for a long time been associated with masculine and technical such as engineering for men and feminine with care giving or administrative roles for women. In turn, women may remain under-represented within such sectors as technical and managerial.

Career Aspirations: Gender role theory can guide researchers to find out how social expectations influence organizational objectives. Some example includes women may decide not to seek employment in STEM related to renewable energy once they are trained to become caretakers.

Expectations and Stereotypes: According to Gender Role Theory, stereotype and bias can have an impact on the hiring process and promotion strategies. For instance, if the hiring managers have preconceived notions that men are better suited for leadership or technical position; this would likely create hiring decisions that keep women off those positions.

Work-Life Balance: It is common for cultural contexts to assign women responsibility of managing work and family. Because of the expected long and unbending working hours in male traditionally associated production sectors like renewable power, this may discourage women from applying and hence underrepresentation.

Leadership and Decision-Making: Gender role theory can be applied to think over how expectations of feminine and masculine roles affect women's access to positions of power and decision making in renewable energy organizations. Sometimes, it can help to discover the barriers which prevent women from being promoted to leadership positions, for instance, when leaders must be assertive and competitive, while women must be uncompetitive and submissive.

2.9.2 Relevance to the Study

Therefore, Gender role theory is appropriate to this study. Gender disparities could supplement information required to determine the main social and explanatory causes of gender inequalities in renewable energy by employing gender role theory in analysing gender portrayal in the sector. It can be applied to pave for policies and programs, which will help to fight for greater representation of women and to change the mentality that does not let take positions in renewable energies workforce.

2.10 Conceptual Framework of the study:

The Renewable Energy Transition field is very transition to renewable energy is essential crucial for countries development, especially in low and middle income countries like Pakistan. Though, gender disparity and women's participation in the energy transition sector is very challenging for the development of nation because of various factors socio-cultural, economic, and institutional factors. This conceptual framework purpose is to explore and analyze the major factors that impacting women's involvement in the renewable energy Transition sector in Pakistan, emphasizing gender inequality and development.

Socio-Cultural Factors:

Gender Norms: women's have very limited opportunities in technical fields like Renewable energy transition because of traditional gender roles and they are restricted to household chores and other domestic responsibilities (Doss,2018).

Education Accessible: Women's involvement in renewable energy transition sector is very hinders and hampered by their lack of technical education and training programs (World Bank, 2020).

Economic Related Factors:

Limited Financial Resources: Women face various challenges and hurdles in accessing financial services. Accessing financial services which is necessary for entrepreneurship and involvement in renewable energy transition sector especially for women. (UN Women, 2021).

Lack of Employment Opportunities: There are very few jobs opportunities for women in renewable energy sector in Pakistan because of gender disparity mostly women's faced very negligibility in this field (IRENA, 2019).

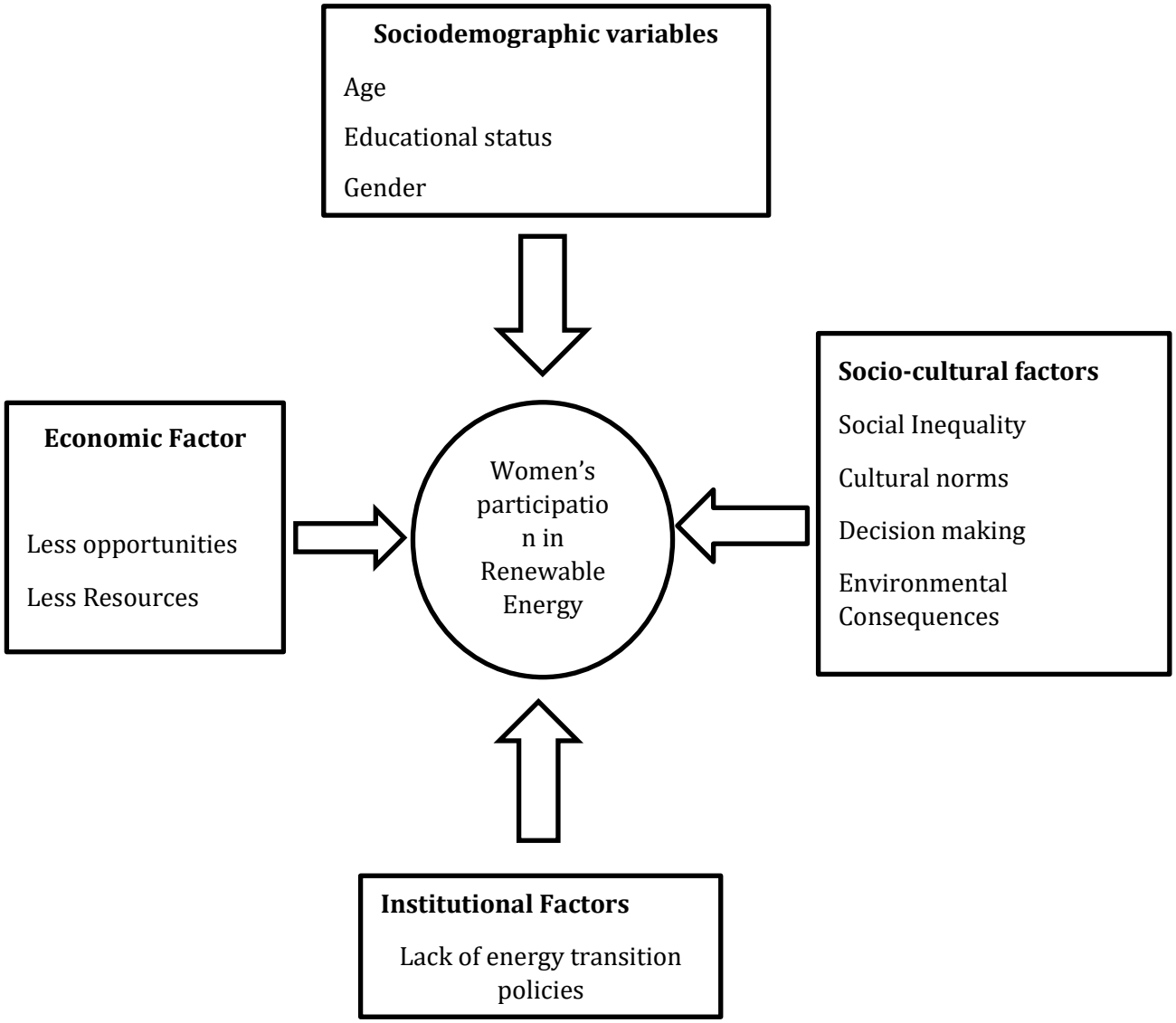
Environmental Factors and consequences:

Impact of Climate Change: Women involvement is very limited and also very negligible in climate change, and their participation in renewable energy transition can be more sustainable in community practices (Gender and Energy Network, 2019).

Community Engagement and Participation: Women's involvement in gender inclusion and development specially in community decision-making regarding energy resources is very important for the sustainability and clean environment (Sustainable Development Solutions Network, 2015).

Institutional Factors

Policy Framework: There are a very huge gap in women's involvement in making government policies regarding gender disparity policies in renewable energy transition sector in Pakistan. (Asian Development Bank, 2018).


Sociodemographic variables
Age
Educational status
Gender
Economic Factor
Less opportunities
Less Resources
Women's participatio n in Renewable Energy
Socio-cultural factors
Social Inequality
Cultural norms
Decision making
Environmental Consequences
Institutional Factors
Lack of energy transition policies

Research Gap:

Despite Pakistan's dramatic growth in renewable energy (e.g., solar now represents ~25% of electricity, up from the 5th-largest source in 2023) women remain vastly underrepresented in the sector due to several shortcomings in current research:

1. Workforce Representation

- **Low female presence in utilities**: Women constitute only ~4% of staff in nine major Pakistani power utilities, and just ~4% of engineers.
- **Technical roles scarcity**: Only ~2% of technical positions in Independent Power Producers (IPPs); similarly low in WAPDA and distribution companies.

Gap: While overall renewable energy capacity is rising, there's scant quantitative insight into how many women is entering, remaining, or advancing in this workforce especially in technical and leadership tracks.

2. Skills Development & Training

- **Isolated initiatives**: Programs like Karachi's *Roshni Baji* have trained ~200 women and reached 800,000 households.
- **Training disparity**: Women represent only about 11% of trainees in Pakistani utilities, compared to 31% in some African peers

Gap: No comprehensive mapping exists of training initiatives (public/private), coverage, demographics, outcomes, or their relation to employment in the sector.

3. Energy Access & Decision-Making

- **Clean cooking access**: Only ~40% of Pakistanis have access to clean cooking energy—rural women most affected.
- **Energy-poverty impact**: Rural qualitative studies show women's health and education suffer due to biomass use and lack of voice in energy decisions

Gap: Most data focus on household usage and health metrics not the empowerment or economic roles rural women may assume in off-grid renewable energy projects.

4. Policy Inclusion & Institutional Support

- **Gender-blind policies**: Most national/regional energy frameworks do not integrate gender considerations; institutional data is sparse.
- **Best-practice anomaly**: WAPDA's in-house childcare, maternity protections, and safe transport driving female staff from 8.1% to 15.8% over 2010–2023—are rare.

Gap: There's limited analysis on how such gender-inclusive HR policies affect recruitment, retention, and performance in energy contexts.

CHAPTER NO. 3

Research Methodology

3.1 Research Paradigm:

Gender inequality in the renewable energy transition sector is a complex social phenomenon shaped by cultural, institutional, and societal norms. This study adopts an **Interpretivist and Constructivist paradigm**, which is well-suited to exploring socially constructed realities. The phenomenon under investigation is inherently subjective, with multiple interpretations and no single objective truth.

Interpretivism asserts that it is not possible to separate facts from the values, beliefs, and experiences of individuals (Kincheloe, McLaren, & Steinberg, 2011). From this perspective, research is not about discovering an absolute reality but about **constructing meaning through interactions** and social context (Bowen, 2009). Similarly, **Constructivism** posits that knowledge is created through individuals' engagement with the world around them, and multiple realities may coexist (Guba & Lincoln, 1994).

This dual paradigm allows the researcher to understand participants' lived experiences and how societal norms and values shape their perceptions. Constructivist-interpretivist approaches are particularly effective for studying the **mores, customs, and beliefs** related to gender roles and inclusion in the energy sector (Gregg, Kulkarni, & Vinzé, 2001). Thus, this study builds new understandings based on the subjective experiences and insights shared by participants.

3.2 Research Design

According to Creswell (2009), a research design serves as a blueprint that outlines the procedures for collecting, analyzing, and interpreting data. It ensures the integrity, reliability, and relevance of findings to effectively answer the research question.

Given the **exploratory nature** of the study, a **qualitative research design** was adopted. Qualitative research enables the investigation of deep-rooted beliefs, motivations, and challenges from the participants' perspectives. It is particularly appropriate for understanding complex social issues such as **gender inequality in the renewable energy sector**, where context and individual experiences are central.

The qualitative design facilitated an in-depth exploration of the barriers women face in this male-dominated industry. It provided rich, descriptive data and enabled the researcher to interpret how participants make sense of their experiences within the broader social and institutional frameworks.

Detailed research design is explained in the following table:

Objective of the Research	To assess the current state of gender representation in the renewable energy sector.
Research Question	What strategies and policies can be implemented to promote gender inclusivity and equality in renewable energy programs and initiatives?
Sampling Technique	purposive sampling is used.
Data Collection	Data is collected through a survey method.
Data Analysis	Data is analyzed through thematic analysis

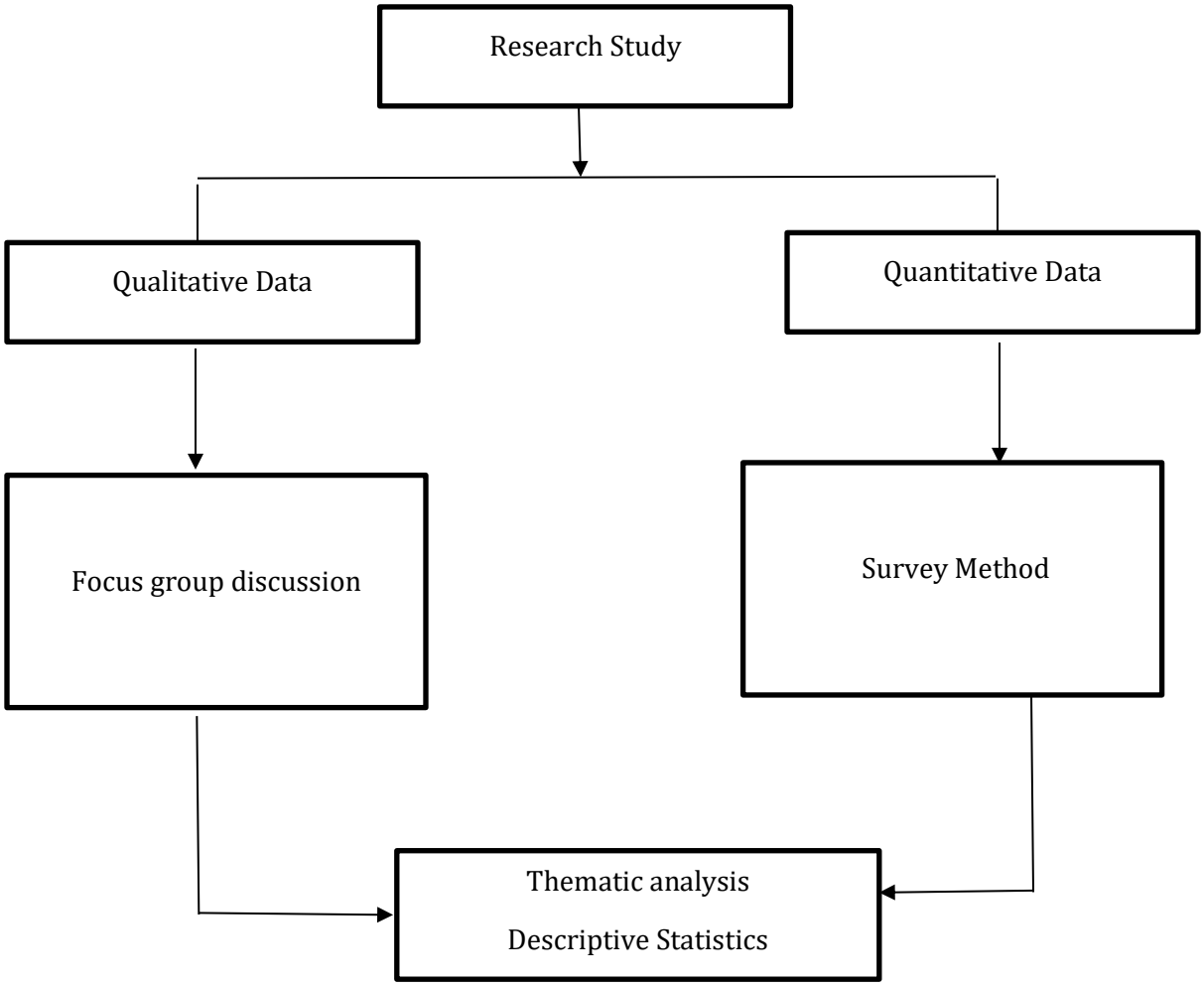
3.3 Research Approach and Strategy

3.3.1 Justification of Research

This is justified due to its ability to provide a comprehensive, contextual analysis of the specific setting of the one sigma organization. Research studies allow for an in-depth examination of complex issues like gender inclusion and low participation in the energy sector, women are an integral part of our whole society. highlighting how these problems are experienced and addressed in a particular locale (Yin, 2018).

3.3.2 Framework of the Methodology

The methodological framework integrates various qualitative data collection methods to explore the challenges faced by women in renewable energy Transition sector. The framework includes semi-structured interviews, Focus group discussion and qualitative survey (open and close ended) to capture a wide range of perspectives and experiences from the Solar sigma organization in Islamabad.


Research Study
Qualitative Data
Quantitative Data
Focus group discussion
Survey Method
Thematic analysis
Descriptive Statistics

3.3.3 Qualitative Approach

The study's primary goal was to identify the problems and obstacles preventing women from participating in Islamabad's shift to renewable energy. The study also looked at the administrative, sociocultural, and financial obstacles that prevent women in Islamabad from using renewable energy transition sector. A qualitative technique, which is important for examining important issues of a sociocultural and conventional character, was employed to gain a thorough grasp of these goals (Yin, 2014). The context and intricacy of these primary research questions—which are essentially subjective and naturalistic in nature—were addressed using the qualitative approach.

3.3.4 Data Collection

The study selected the actors and stakeholders in the Islamabad renewable energy transition industry (Solar Sigma) and looked for responses to the research questions. The information was gathered via focus groups, in-depth in-person interviews, and survey questionnaires. When it comes to lowering non-response and improving data quality, interviews are the most effective method of data gathering (Lavrakas, 2008). Open-ended questions were included in the interview schedule to collect data and information from women who are working in Solar Sigma department. Since women are the main players in gender inclusion and development, my research focusses more on them and examines the variables influencing women's involvement in Pakistan's transition to renewable energy. I distributed my online survey to the Islamabad-based Solar Sigma organization. After the questionnaire was approved, every aspect was taken out of the literature review.

3.3.5 Sampling Technique and Sample

A purposive sampling is a non-random sampling method selected based on specific characteristics. A group of people and the reason for the study. Critical, choosy, or opinionated. Terms such as purposive sampling are used to refer to the same concept. The main emphasis of this research is on specific traits of the population of interest, individuals are selected based on predetermined criteria. In order to address the specific research issue, parameters were considered when using a purposeful sampling method. Utilized for collecting information. describe the process of choosing a sample based on personal preferences rather than random selection. Explain the concept of purposeful sampling. The main emphasis of this research is centered on a particular aspect. A focused sampling approach was utilized to gather data on

the subject. The qualitative survey method adopted the purposive sampling technique. The sample chosen was representative of both males and females of the Solar Sigma organization, in Islamabad Pakistan to assess the factors that affect women's participation in the energy sector. The sample selected for the study was 100 participants in the study area. The sample was selected from the general population, six in-depth interviews, and focus groups with key stakeholders that helped shape the shift to renewable energy and the advancement of women's engagement and development in Islamabad, Pakistan.

3.3.6 Data Analysis.

- Data was analyzed through the qualitative survey method. The qualitative approach utilizes the survey questionnaire method to statistically explain attitudes by selecting samples from the intended population. There are four types of qualitative survey questionnaires: open-ended, close-ended (static), close-ended (dynamic), and task-based (sauru,2018). survey questionnaire analyses through using Excel and finding out descriptive statistics This research employed qualitative survey methodology to investigate research questions that focused on the factors that Impact's on women's participation in the renewable energy transition in Pakistan. The questionnaire was adapted keeping in mind the factors from the literature.
- The method for managing and collecting the data to address the research question was through thematic analysis. The interviews were transcribed and proceeded as per the provisions of Braun & Clark (2006). This method is used for analysis where patterns and themes are identified as possessing some meaning, coding the data and classifying it as per the themes that address the research questions. The relationships and overarching patterns are found to develop theoretical constructs.

3.3.7 Ethical Considerations

Ethical considerations are integral throughout the research process, from selecting a topic to sharing the final results (Resnik and Elliott, 2016). Moral reflections involve considering the protection of participants and conducting research according to ethical guidelines (Pietilä, Nurmi, Halkoaho, and Kyngäs, 2020). Ethical considerations in research are based on two foundations. One concerns ethical guidelines for protecting the participant, while the other focuses on professional standards for research to ensure high quality and scientifically correct studies (Launis, 2015; Mustajoki and Mustajoki, 2017). Conducting a subjective evaluation

involving human subjects must adhere to both moral principles and institutional guidelines, as outlined by Beauchamp (2009), in order to ensure the protection of participants. In any event, these ethical guidelines are based on research findings and are not legally binding rules (Heale and Abbreviate, 2017). The researchers should consider the accompanying standard research ethics.

3.4 Summary of Chapter

This chapter outlines the conceptual framework and methodology for exploring the factors that effect in renewable energy sector solar sigma. It employs a qualitative approach, using qualitative research and interpretivism to gather and analyze data. The methodology includes detailed data collection methods, sampling techniques, and thematic analysis to understand the impact of unclean fuel on energy poverty. Ethical considerations ensure the research is conducted responsibly and respectfully.

3.5 Justification for Using a Mixed-Methods Approach

The decision to use a **mixed-methods approach** in this study is driven by the **complex, multi-dimensional nature** of gender inclusion in the renewable energy transition in Pakistan. This topic intersects policy, socio-cultural norms, institutional structures, and personal experiences all of which require both **quantitative measurement** and **qualitative understanding** to be comprehensively explored.

1. Capturing Breadth and Depth

Quantitative methods (e.g., surveys, statistical data analysis) are used to measure the extent of women's participation, identify patterns, and assess institutional gaps across the energy sector. Qualitative methods (e.g., interviews, focus groups, case studies) explore personal experiences, social norms, and barriers that numbers alone cannot fully explain.

For example, while a survey can tell us that only 4% of engineers in power utilities are women, interviews can uncover *why* women hesitate to enter or remain in such roles.

2. Triangulation and Validity

Using both methods allows triangulation—cross-verifying findings across different types of data. This enhances the credibility and reliability of the results, ensuring that policy recommendations are grounded in a fuller picture.

For instance, survey data showing low female training rates can be triangulated with focus group feedback highlighting the lack of local centers, social permission, or safe transport.

3. Policy-Relevant Insights

Policymakers require quantitative data for resource allocation and impact tracking.

Simultaneously, they benefit from qualitative narratives to design interventions that are culturally and socially appropriate.

Mixed methods provide a holistic evidence base that speaks to both technical decision-makers and social development practitioners.

4. Addressing Research Gaps

As highlighted in the literature review, there is:

A lack of empirical data (quantitative gap),

As well as insufficient contextual insight into women's experiences (qualitative gap).

By integrating both methods, this study responds to these dual gaps, making a meaningful contribution to academic literature and practical implementation.

CHAPTER 4

DATA COLLECTION AND FINDINGS

In this chapter, I have conducted the qualitative data analysis in detail. The thematic analysis is used for the qualitative data analysis.

4.1 Qualitative Data

There were four research questions and to address these interviews were conducted. The analysis is based upon the answers from the participants and five modules were created for the interview addressing the four research questions under the name women participant in renewable energy resources. Thematic analysis is used for the analysis purposes as per the process proposed by Braun & Clarke (2006). The bottom down approach of analysis is followed for this research as the specific research questions are used and the analysis is focused on addressing these questions. The focus of this research is to gain deeper understanding of the issues and challenges to face women in renewable energy in Capital of Pakistan Islamabad.

Demographics

Age of Respondent

The data shows that the age of respondents who were interviewed ranged from 18 to 52 years. They were divided into three groups age-wise and the difference of age among all groups was 11 years. The first age group ranges from 18 to 28 years which comprises 49% of all respondents While the 2nd group ranges from 29-39 years containing 37% of interviewers. Moreover, the 3rd group age starts from 40 to 52 with a ratio of 14% of total sampling.

***Table 1.1* Age Distribution**

Age Group	Number of Participants	Percentage of Total (%)
18-28 years	49	49%
29-39 years	37	37%
40-52 years	14	14%

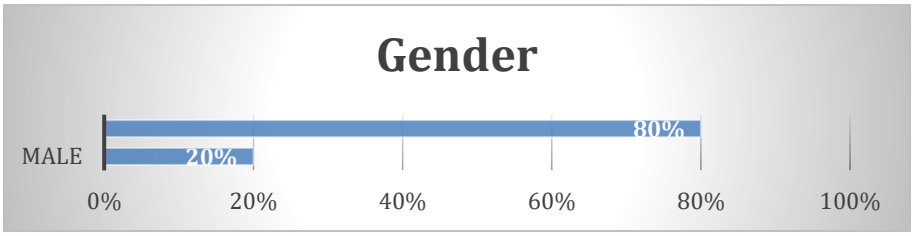
Education Level

The result of the present study shows that only 35% of the respondents in the study area are Bachelor in different subjects like environment science, social science, engineering and 47% are master level educations in different subjects like engineering, environment, social sciences, mass communications. whereas, the rest of the 18% of respondents are PhD holder in different subjects.

Table 2.2 Education level

Education Level	Number of Participants	Percentage of Total (%)
Bachelor	35	35%
Master	47	47%
PHD	18	18%

Gender:

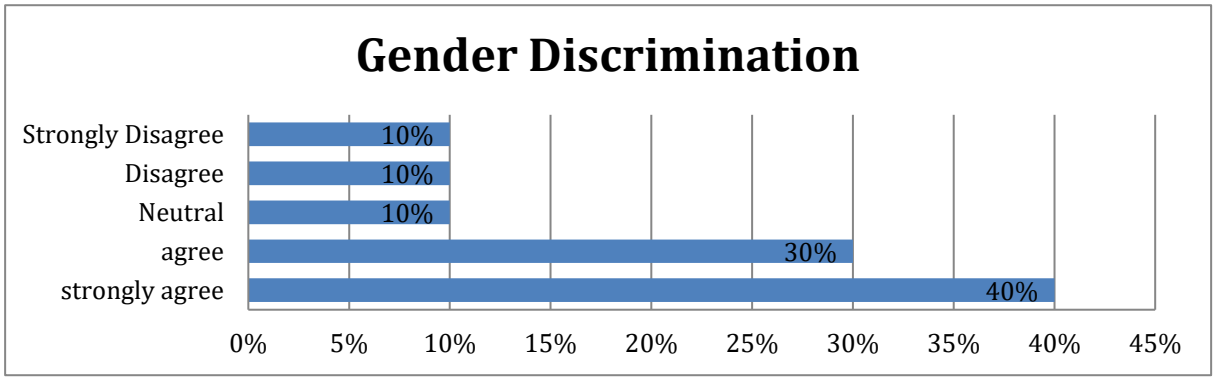


Gender	Number of Participants	Percentage of Total
Male	20	20%
Female	80	80%

According to the survey results of this study, there are more women (80%) than men (20%) represented. In light of the historical background of male supremacy in STEM fields including renewable energy transition this is an intriguing discovery. The findings may indicate a trend in favour of greater female involvement or interest in renewable energy.

Gender inequality within the renewable energyindustry Exists?

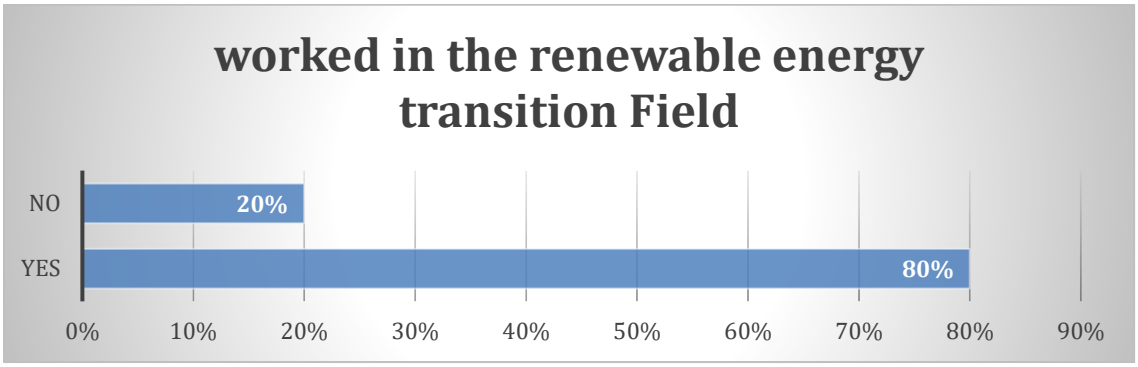
Gender Discrimination	Number of Participants	Percentage of total
Strongly Agree	40	40%
Agree	30	30%
Neutral	10	10%
Strongly Disagree	10	10%
Disagree	10%	



According to the above table, 40% of respondents strongly agreed that there is gender inequality in the sector of the transition to renewable energy; 30% of participants agreed with the statement, and 10% were unable to provide an answer. Twenty percent of participants still don't agree with this idea.

Worked in the field of Renewable Energy Transition

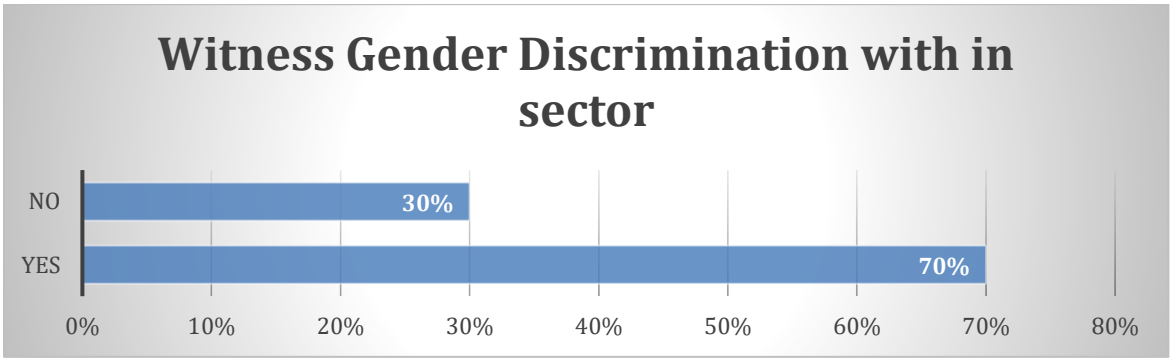
Worked in the renewable Energy Field	Number of participant	Percentage of Total
Yes	80	80%
No	20	20%



According to the data above, 80% of participants had experience and worked in the renewable energy transition industry. They also provided an explanation of the true situation in this sector, while the remaining 20% of respondents lacked understanding in this area.

Personally experienced or witnessed gender discrimination

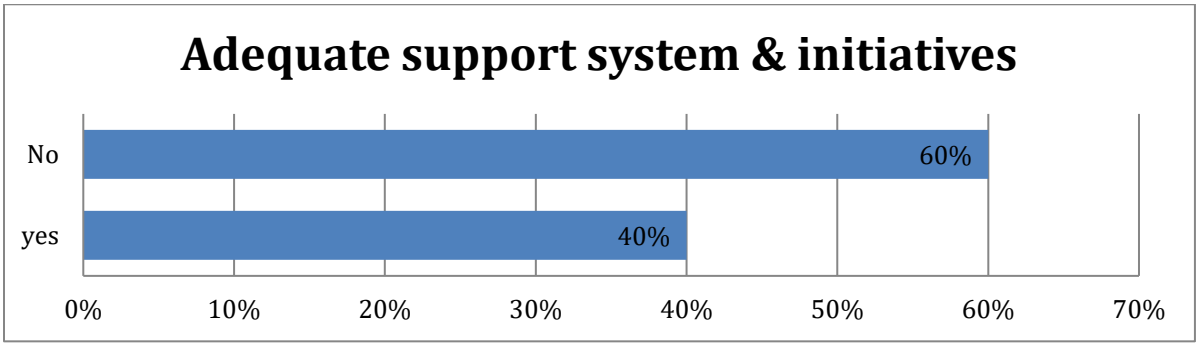
Personally experienced Gender discrimination	Number of Participants	Percentage of Total
Yes	70	70%
No	30	30%



According to the data, 70% of the participants had firsthand experience with gender disparities in the renewable energy transition sector; just 30% had neither personal experience nor observation in this area.

Sufficient mechanisms and programs in place to tackle gender disparity

Adequate support system & Initiatives	Number of participants	Percentage of Total
Yes	40	40%
No	60	60%



According to the above table, 60% of respondents think that efforts and support networks to address gender imbalance in the renewable energy sector are insufficient. This noteworthy number suggests that there is a general lack of contentment with the current policies aimed at advancing gender parity. Just thirty percent of participants think that initiatives and support networks are sufficient. This low number suggests that just a tiny portion of women believe that the steps being taken to alleviate gender inequality are adequate.

4.1.1 Thematic Analysis

The analysis method which aims to find and develop patterns and themes from the qualitative data gathered through different techniques is known as thematic analysis. It is argued by (Novell, Norris, Moules & White, 2017) that the thematic analysis can be utilized across various epistemologies and can address range of research questions. This method is very flexible in nature and aids to identify, analyse, organize, describe and report various themes

present in a data set. It can be easily applied to large data sets as there are no strict procedures and prescriptions to conduct the analysis (Braun & Clarke, 2006). Further, King (2004) argues that the new researchers dealing with qualitative data can use this to their best and can handle data in a structured manner which will help producing a clear report of the data.

Braun & Clarke (2006) suggest that top-down or bottom-up approach can be used for analysis as per the research design. All the questions in the data are summarized and organized to identify themes. A very convenient structured approach is suggested by Braun & Clarke (2006), which has divided the thematic analysis into six steps:

Step 1: Developing familiarity with the data

Step 2: Generating initial codes

Step 3: Searching for themes

Step 4: Reviewing themes

Step 5: Defining themes

Step 6: Write Up (Discussion)

4.1.1.1 Step 1 Developing familiarity with the data

The first step is to get engaged with the collected data. It is essential to get immersed in the data so that depth and breadth of the content can be understood. This process involves repetitive reading of the data to search for the patterns in data. In this phase rough notes are taken so that next phase can be initiated. Here informal coding is done, and it is transformed into meaningful themes in the subsequent steps.

Data Information: The data used in this study for analysis is of primary nature. Each single interview is used for this analysis where the extract comprised of approx. 30 minutes. Six interviews were conducted so the total extract is of 3 hours.

Respondents Demographics: The average age of the respondents was around 28 years. Interviews were conducted with Environmental Scientist, policy makers in energy sectors, education department women and community leader.

4.1.1.2 Step 2 Generating Initial Codes

After the familiarization with the data and jolting down the initial ideas step two comes in. The initial codes are produced in this phase after the data is arranged in meaningful and systematic

order. Codes reduced the big data in smaller meaningful data. It represents the data which is interesting for analysis and can be assessed. This helps in extracting the relevant data and the meaningless data is excluded as it is not meant for coding. There are two ways to code the data which is dependent on themes generation which are either data-driven or theory-driven. The former does not have any pre-set codes in mind and themes depend entirely on the data making it more inductive in nature whereas the latter the data is approached with some pre-defined questions and codes are generated around these questions. This study is more theory driven.

Initial Codes Identified:

Cultural Expectations: Traditional gender roles and family responsibilities.

Lack of Support for Women's Careers: Limited resources and encouragement.

Economic Barriers: Limited funding, high costs of education and resources.

Educational Gaps: Insufficient training and awareness about renewable energy.

Institutional Challenges: Bureaucratic hurdles and lack of supportive policies.

Ineffective Support Systems: Limited reach and resources of community organizations and mentorship programs.

Coding Process

Firstly, the data of interview is arranged in accordance with the modules in the interview schedule guide. The responses are then read and re-read to find the relevant data to the module and the research question and is transcribed in the form of coding. After this, the codes are compared and modified to make them more related to the research questions. The whole process is done manually and then typed into word format. The initial codes for all the modules are given below:

1. Cultural Expectations

Can you provide specific examples of these norms or beliefs that might discourage or hinder women's participation.

Social norms in Islamabad often prioritize traditional roles for women, such as managing the household and caring for children.

Cultural beliefs about gender roles can discourage women from pursuing technical careers.

women might feel discouraged from entering the field due to doubts about their capability to handle such projects.

The belief that women should focus on roles related to domestic responsibilities limits their exposure to technical fields

Cultural expectations often restrict women's mobility and independence, which impacts their ability to participate in fieldwork or travel for training related to renewable energy.

Culture can be a problem for a woman in the workplace, especially in the form of negative attitudes from male co-workers or managers who question the woman's ability to handle technical work.

First, one will not find many representations of women in renewable energy, and this re-strengthen the misconception that renewable energy is not for women.

The relief of major professions and cultural norms continues to pose a challenge to working women since they cannot afford to spend many hours pursuing a career.

the female sex, for instance, is advised to take up either teaching or nursing and not technical studies.

Lack of opportunity Many women are restricted as they have to conform to cultural and or societal set norms that deny them a chance in the nontraditional job markets.

Some cultures' understanding of women's place in society often limits them to homes, and prevents them from pursuing technical careers

There are cultural barriers in that male co-workers or managers may not support a woman in the group accusing her of incompetence in technical fields. This often makes the workplace a problem-filled atmosphere.

2. Economic Limitation

In what regards to various concerns that affect the women such as funding opportunities, education and employment opportunities does this sector favor?

This has come out clearly, demonstrated on the aspect of economic limitations that have a way of limiting women's participation.

Lack of study materials is one of the challenges. Since renewable energy requires intricate training or even a master's or a PhD, most women are financially insufficient to pursue such courses and training hence they are locked out.

Another problem is job availability The availability of jobs for trained professional is a major issue. Suffice to say, there are very few positions in renewable sectors that would purposefully look for women to hire, so the ladies struggle to find work in this area.

Many of the women's projects are underfunded. Sometimes women in leadership positions come up with good ideas for renewable energy projects, but they almost everywhere face challenges of being funded to support such projects.

Also, due to certain economic restraints, it becomes a challenge to procure the technology or tools for supporting renewable energy projects.

Education is scarce at a predictable price that is expensive to most of the employees. These women do not need scholarship or financial aid to enable them engage in studies of renewable energy.

Labour market differentiation also comes into the picture. In cases where the women are qualified then they flip the discrimination card on the recruitment procedure or else they are offered lower paid positions than any man would.

Hindrances to entrepreneurship in renewable energy such as the capital intensity through expensive technological and equipment assets can limit the entry of women.

From these experiences, it is evident that many women have challenges in their efforts to balance education and work related, career and finance to reduce female representation in renewable energy.

3. Education Gap

Decision making about participation is consequently impacted by widespread ignorance regarding renewable energy technologies and the advantages they provide. Most women are ignorant regarding the available opportunities or even the scope of growth of this line of work. It will be seen that majority of women respondents lack adequate knowledge about renewable energy technologies. This lack of knowledge can make the people feel that the field is to hard and the do not have to pursue a career in that specific area.

It was found that there are knowledge deficits regarding the career prospects found within renewable energy. Many women do not have any idea that there are many different positions and jobs that are out there in this field.

They can also hinder due to common misunderstandings that renewable energy sources are all technical.

Lack of education is one reason for lack of knowledge on Renewable energy. They maintain that many women cannot study or get interested in this field during their early years and thus fail to be interested.

Many women do not ask how they could be of help for this industry or how they could avail something from it.

This is mainly because there is scanty information on renewable energy, and little or no educational material available to enlighten women on the subject.

Most women have low awareness of the renewable energy sector, thus they still have distorted perception to its viability and applicability to them.

As it is clearly seen, the current knowledge of technology and innovation in renewable energy is not fully explored.

Less women entering the process equal fewer role models to look up to for females in renewable energy = affects their perception = affects what they can bring to the table.

Lack of understanding regarding the sustainability and the effect of renewable energy projects may deter women from choosing the sector due to the lack of clear visions of the sector's prospects.

4. Institutional Challenges

Organizational policies and structures in Islamabad have both positive and negative implications towards women in renewable energy. Although there are policies nowadays, which are in some way beneficial for women, many institutions and practical obstacles remain problematic.

Some policies promote the participation of women in STEM careers, and yet, the policies are poorly enforced. For example, women can get funding to support their projects but the funding is not easily provided or advertised.

There isn't guarantee that institutional structures are not biased. Some organizations have retained policies that inhibit women's promotions in renewable energy occupations

There exist some government policies targeting women's enhancement in technical fields but most of which are inadequately funded or poorly implemented. This limits their impact.

Lack of supportive Organizational practices makes working women unsupportive sometimes. Even support from an institutional nature can be a bit unpredictable. Although some organizations may have acceptable polices for women in organizations, they may not have the capacity, the desire to implement them.

Currently, there are definite governmental strategies that proclaim the support of women in renewable energy, but all these actions significantly miss the point due to the numerous barriers within ministries.

Organizations that have policies that support equality in hiring, are advantages but these policies are rarely checked heavily.

Although there are some supportive policies due to the overall weaknesses of strategies and monitoring, these policies rarely bring genuine chances.

There are best practices available for women's training and development within organizations, albeit with several principal flaws, forcing such programs to be underfunded and more restricted in their effectiveness.

5. Effective Support Systems

Currently, there are very limited community organizations, which include the occasion for networking and working being offered. However, their extent and impact may be quite defined by the availability of resources.

There are mentorship opportunities however the availability of such opportunities remains low. They can be helpful in counseling and in delivering more services but they cannot be the extensive and local solver relied on.

Guidance from friends, families and communities, involvement in women association and other professional organizations may be useful. Some of them make it possible for women to interact with others with similar experience in the related discipline.

There is need to involve women's empowerment organizations in technical fields as a source of information. However, like most other non-profit organizations, their scope is somewhat reduced by the availability of funds or access to potential consumers.

In this area, there have been some successful mentorship exercises providing excellent career guidance. But the need is to have more of such programs meant to support many women.

While support systems are helpful in giving a first direction and contacts, they are not very helpful in as much as the need for the continued access to the tools, resources, and supervision that might be necessary to sustain the endeavor.

Deficiency pattern of support systems may not be strong in certain areas and are efficient in others. Some may provide valuable information and networking opportunities, others may not necessarily adequately address the concern of women in renewables.

Currently, there are programs intended for vouchers and certificate training and moreover there are programs that provide training and conducting of workshops, but again these types of programs may not be very effective and fruitful due to the fact that their reach is narrow and they are conducted at a very low frequency.

Community organizations can be effective in raising awareness and providing support. However, many women are still unaware of these resources, which limits their impact.

Overall, while there are supportive initiatives, they often do not reach all women who could benefit.

4.1.1.3 Step 3 Searching for Themes

After the initial coding of the data, a list of codes is created by highlighting the key codes identified in the previous stage. The potential themes that are possible and all the codes that are associated with each other are presented through visual representations. The aim is to find an overarching theme through the combination of codes. Tables or mind-maps can be used for identification of themes and arranging the codes.

Theme is defined by Braun & Clarke (2006) as a pattern with some interesting characteristics in the data set and addresses the research question. There are no strict rules for identifying themes and making patterns in the coded data. The significance of the codes aids in identifying themes. The preliminary themes that have been identified are presented in the table below along with their codes in the form of table.

Table 3.3: Initial Themes

Module 1 : Cultural Expactations
Social norms in Islamabad often prioritize traditional roles for women, such as managing the household and caring for children. Cultural beliefs about gender roles can discourage women from pursuing technical careers. women might feel discouraged from entering the field due to doubts about their capability to handle such projects.

The belief that women should focus on roles related to domestic responsibilities limits their exposure to technical fields

Cultural expectations often restrict women's mobility and independence, which impacts their ability to participate in fieldwork or travel for training related to renewable energy.

Social norms sometimes lead to a lack of support from male colleagues or supervisors, who may doubt a woman's competence in technical roles.

There's a general lack of female role models in renewable energy, which reinforces the belief that this field is not for women.

Tradition and culture force women to do jobs that can easily be done and demand less time and commitment from the women.

it will be noted that women are commonly motivated to take up teaching or nursing professions instead of the technical ones.

Nature play acts, often it is expected of women to stick to conventional employment, thus making it hard for them to succeed in non-conventional occupations.

This thesis shows that such cultural factors as women being restricted to domestic duties prevent them from pursuing technical careers

Most cultures are grossly discouraging to women owing to the normative belief that no woman is capable of effectively handling technical positions. It may result in the emergence of tension producing situation in the workplace.

Module 2 : Economic Limitation
Financial constraints play a huge role in this area and that is why their involvement is somewhat limited. Lack of input services is a challenge. Due to the high costs of specialized training and or an advanced education, many women cannot secure a place in the renewable energy sector. Another problem is that of job availability which is curiously a problem in this region. It is rare to find roles in renewable energy sectors that would be aggressively looking for women and thus it is difficult for them to get job vacancies in this areas.

One of the barriers indicates that women get inadequate funding for their projects. If the female has a good concept for the renewable power projects, she will lack the investors or capital to back such a project.

Limitations arising from costs also define the availability of economic resources required for technology and tools on renewable energy projects.

Education is scarce and most of the available programs seem to be costly. Women probably lack the ability to acquire scholarships or financial aid that would assist them are enroll in renewable energy studies.

These factors include Employment inequalities are consistent across the job market. They also observe that despite women being qualified for a position they are discriminated in the hiring process or offered low wage employment than man.

One of the reasons is that; due to some of the economic barriers such as the cost of technology and equipment, women cannot afford to start their own renewable energy businesses.

Different culture and tradition, lack of parental support, and the dilemma of having to balance for education and career and limited economic resources all create a barrier that resulted in a limited number of women who engage in renewable energy.

Module 3: Education Gap

Ignorance of new technologies and the potential of such renewable sources influence the involvement of women. Most women lack information on the openings existing or the possible advancement in the industry.

To my knowledge, a high percentage of women is not sensitized with renewable energy technologies. This lack of knowledge can leave the field as one that is perhaps best entered by those who already have an inside track.

Currently, there are issues that surround people with little or no knowledge that could make them aspiring candidates for careers in renewable energy. Few women do not know the various positions and opportunities within this field.

A strong obstacle is false beliefs regarding the technological specifics of renewable energy.

Needless to say, lack of education makes for the lack of knowledge about renewable energy. Some women are not introduced to this field at a tender age hence they don't develop any interest or concern in the same.

Most women are in a state of confusion as to whether they have any role to play in the future of this industry to or if it has any role to play in enhancing their future.

There are few or little information and educational material that is available to women who have an interest in renewable energy.

A very high number of women have least knowledge about the renewable energy sector implying that they may have wrong perceptions regarding the viability as well as the applicability of the sector for them.

As a result, there are areas of ignorance in pinpointing the technologies and novelties within renewable energy.

The question of having female personalities despairing in the field is that there are fewer examples of success by female investors in the field of renewable energy, and this naturally affects the presence of a gender-interest in the field.

Lack of information and knowledge on the viability and potential of renewable energy projects tends to make women to shy away from the line of duty by having a wrong perception about the healthcare risks rather than the potentials of the renewable energy sector.

Module 3 : Institutional Challenge
While there are policies that encourage women to pursue STEM careers there are usually very weak policy enforcement. For example, the grants for women- proposed projects are available but they are also hidden and not always visible. That is, structure established within institutions is not entirely neutral. Most companies today continue to have policies that discriminate men over women thus limiting the progress of women in renewable energy subfields. Some govermental policies exist with the intention of boosting women's employment in technical occupations but a lot of them fails to meet the functions or, at least, are not efficiently implemented. These impacts are limited because of bureaucratic hurdles.

It is evident that organizational practices can sometimes be a let down for women.

Support can be a function of the institution and hence not wholly reliable. It also discovered that while some organizations have sound policies on women, they lack the capacity or the will to give those policies the desired effect.

Though, there are certain policy incentives designed to promote the role of women in rein form of renewable energy the challenges posed by the bureaucracy affects the scope and effectiveness of such policies tremendously.

Organizations that practice diversity in hiring are useful, but such practices are not strictly implemented.

Although there are some positive signs, namely, policies which are supportive, the problem here is that there are virtually no strategies, let alone proper monitoring in place; as a result, some of these policies in the government do not give tangible chances for women.

In organizations there are programs that provide training and development for women but most of them are underfunded and have constrained resources to accomplish the intended objectives.

Module 5: Effective Support Sytems

There are only a minute number of community organizations which include networking events and workshops for support. Their estimated benefits may sometimes be restricted directly by the paucity of resources.

Specific measures are possible but frequently they are offered in a very limited manner. They can be helpful in offering counselling and more such programs, there is still a lot of demand and scope to reach out to people.

There are favorable systems like the women's organizations and professional associations to turn to. They create avenues through which women in that field can interact and exchange stories.

There is another type of community organizations that are interested in seeing women empowered in technical niches. Nevertheless, the outcomes of their programs are frequently hindered by inadequate funding and promotion.

There have been some successful/entertaining mentorship programs, providing significant tips and help experienced staffs. Though the programs are very important many such programs are required to serve more women.

Little is gained from such systems as they provide only first level support and linkage to resources needed for sustenance of shopped businesses.

The support structures that are currently in place and use are not homogenously efficient. Some offer valuable references and contacts while others may not necessarily adequately capture concerns of such women in renewable energy.

Some of them might provide training, some of them might provide workshops, however due to the nature and availability of them, they can be quite hit and miss.

Community organizations can be effective in raising awareness and providing support. However, many women are still unaware of these resources, which limits their impact.

Overall, while there are supportive initiatives, they often do not reach all women who could benefit.

4.1.1.4 Step 4 Reviewing Themes

After the patterns are highlighted in the coded data, step 4 begins where the identified patterns are turned into themes after reviewing them and refining them. Here, each code is examined to find the similarities between them and collating them into single theme and subthemes. This way is used to organize all the codes into themes and subthemes. After this, themes and subthemes are arranged according to the stated research questions. The context of the entire data is brought into consideration to check the relevance of themes. At the end of this step, there is clear indication of the themes and their relationship with each other.

Themes are reviewed as per the research questions as given below.

RQ 1 What social norms and cultural beliefs in Islamabad are currently hindering women from participating in the renewable energy transition.?

First question addressing the issue of social norms and cultural belief in Islamabad who participate in renewable energy. The response of interview resulted developing three main themes and its sub themes accordingly.

Table 4.4 : Research Question 1: Themes

Theme : Gender role expectation Sub theme 1: Domestic Responsibilities Sub themes 2 : Perception of Career Suitability Sub theme 3 : Balancing Work and Family	Theme : Lack of Encouragement and Support Sub theme 1: Family and Community Support Sub theme 2 : Societal Pressure Sub theme 3: Perception of Complexity	Theme : Cultural Stereotypes and Misconceptions Sub theme 1: Gender Stereotypes Sub theme 2: Misconceptions About Suitability Sub theme 3: Cultural Norms and Pressures

RQ 2 What impact do economic limitations, like availability of funding, educational opportunities, and job options, have on the involvement of women in renewable energy projects?

Second question addressing the issue of economics limitation and education opportunity in Islamabad who participate in renewable energy. The response of interview resulted developing three main themes and its sub themes accordingly.

Table 5.5 : Research Question 2: Themes

Theme : Funding and Financial Support Sub theme 1: Difficulty Securing Grants and Loans Sub themes 2 : High Cost of Technology and Equipment Sub theme 3 : Lack of Targeted Financial Aid	Theme : Educational Opportunities and Training Sub theme 1: Expensive Specialized Training Sub theme 2 : Accessibility of Training Programs Sub theme 3: Economic Barriers to Education	Theme : Employment Opportunities and Career Advancement Sub theme 1: Limited Job Availability Sub theme 2: Gender Bias in Hiring Processes Sub theme 3: Economic Constraints Affecting Career Progression

RQ 3 What impact do policies and institutional structures have on women's participation in the transition to renewable energy, either enabling or hindering their involvement?
third question addressing the issue of policies and institutional structure in Islamabad who participate in renewable energy. The response of interview resulted developing three main themes and its sub themes accordingly.

Table 6.6: Research Question 3: Themes

Theme : Weak Implementation of Supportive Policies Sub theme 1: Limited Accessibility and Promotion of Funding Sub themes 2 : Insufficient Resources for Government Initiatives Sub theme 3 : Inconsistent Policy Application	Theme : Bias in Institutional Structures Sub theme 1: Male-Favoring Organizational Practices Sub theme 2 : Gender Bias in Hiring and Promotions Sub theme 3: Lack of Comprehensive Organizational Support	Theme : Ineffectiveness of Diversity and Inclusion Policies Sub theme 1: Poor Enforcement of Diversity Policies Sub theme 2: Lack of Comprehensive Strategies Sub theme 3: Ineffective Monitoring and Evaluation

RQ 4 What impact does women's understanding and knowledge of renewable energy in Islamabad have on their involvement in the industry?
Fourth question addressing the issue of knowledge and its involvement in industry in Islamabad who participate in renewable energy. The response of interview resulted developing three main themes and its sub themes accordingly.

Table 7.7: Research Question 4: Themes

Theme : Lack of Awareness and Exposure Sub theme 1: General Lack of Awareness Sub themes 2 : Insufficient Exposure Early On Sub theme 3 : Inadequate Educational Resources	Theme : Misconceptions and Complexity Sub theme 1: Perceived Complexity Sub theme 2 : Misunderstanding of Job Requirements Sub theme 3: Lack of Role Models	Theme : Educational and Informational Gaps Sub theme 1: Lack of Awareness of Benefits and Potential Sub theme 2: Lack of Awareness of Benefits and Potential Sub theme 3: Misinformation About Career Paths

RQ 5: What types of support systems, such as community organizations and mentorship programs, exist to empower women in the renewable energy transition, and what is their level of effectiveness?

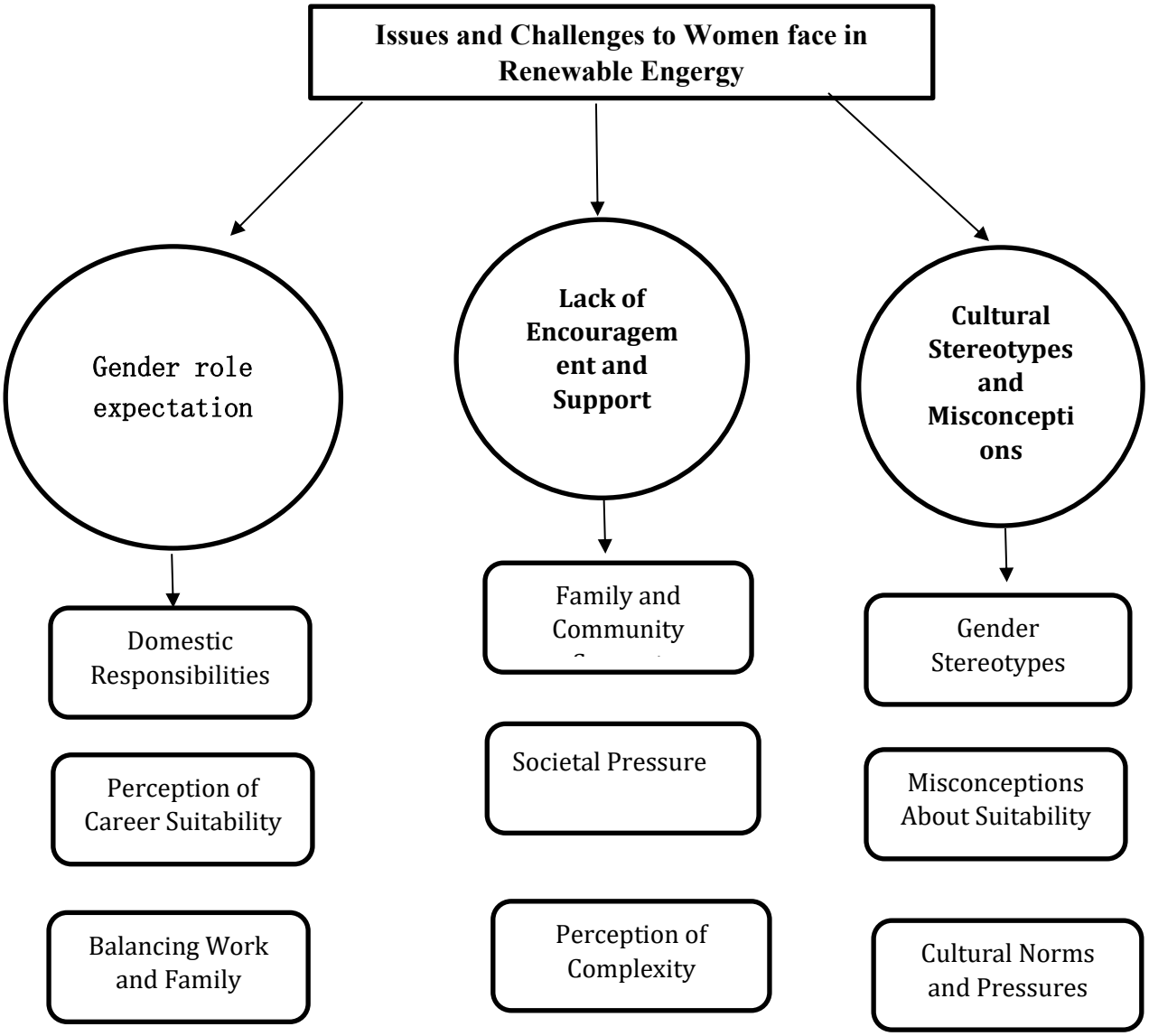
Fifth question addressing the issue of supportive system and its community organizations mentorship programes in industry in Islamabad who participate in renewable energy. The response of interview resulted developing three main themes and its sub themes accordingly.

Table 8.8 : Research Question 5: Themes

Theme : Limited Resources and Funding Sub theme 1: Underfunded Mentorship Programs Sub themes 2 : Insufficient Community Organization Resources Sub theme 3 : Poor Promotion of Funding Opportunities	Theme : Accessibility and Reach of Support Systems Sub theme 1: Limited Reach of Professional Networks Sub theme 2 : Inadequate Scope of Workshops and Training Sub theme 3: Need for More Tailored Programs	Theme : Effectiveness of Support Systems Sub theme 1: Enhancing Mentorship Program Impact Sub theme 2: Expanding Community Organization Capabilities Sub theme 3: Improving Support Infrastructure

4.1.1.5 Step 5 Defining Theme

As all themes and sub themes are reviewed in step 4, this step involves defining the identified themes. This step is to get the essence of each theme by their relevance. This step defines themes by addressing the main themes, relation of sub themes with the main theme. Map is developed for each research question showing the main themes and subthemes. The following section shows thematic map for each research question.


Issues and Challenges to Women face in Renewable Engergy
Gender role expectation
Lack of Encouragement and Support
Cultural Stereotypes and Misconceptions
Domestic Responsibilities
Perception of Career Suitability
Balancing Work and Family
Family and Community
Societal Pressure
Perception of Complexity
Gender Stereotypes
Misconceptions About Suitability
Cultural Norms and Pressures

4.1.1.6 Step 6 Write Up (Discussion)

This is the final step where all the themes are explained with rationality and are justified with reference to the literature.

Module 1 : Cultural Expectations

Theme 1: Gender Role Expectations

Traditional ideas about what women should do often limit their chances to work in technical fields such as renewable energy.Traditionally, women are regarded as mere homemaker still in many parts of the world today and even in Islamabad culture women are expected to struggle in their homes or take low profile challenging careers such as engineers or experts in renewable energy. This belief influences the outlook employers, colleagues and society provide to women in these fields. conventional gender roles play a big role in how women engage in technical disciplines including renewable energy sector. The cultural expectations of women at the given time insist on women staying at home to care for the family rather than work on intensive and healthy careers. These cultural-s preliminarily cease not simply govern how women are gross but also determine how much backing they affirm in their career pursuits. These are often characterized as ‘unsuitable’ or ‘less available’ for women because the cultural expectations are for men to be better at this kind of technical and problem solving work. However, as people have been socialised into accepting that women cannot balance high profile jobs with boy caring responsibilities there are even more hurdles. These gender role expectations are not only individual barriers, but represent dynamics within the existing large-scale structure .

Subtheme 1.1: Domestic Responsibilities

In many communities, women are expected to prioritize home and family responsibilities over their careers. This expectation can create significant barriers for women wanting to pursue demanding jobs in renewable energy. For instance, a study by the Pakistan Institute of Development Economics highlights that societal norms often pressure women to fulfill traditional domestic roles, which can limit their career options (PIDE, 2022). Many women face criticism or resistance from family members when they express a desire to enter technical fields. For example, Participant 1 mentioned that her family was concerned she would be distracted from her traditional family duties if she chose to work in renewable energy.

Subtheme 1.2: Perception of Career Suitability

Cultural beliefs often dictate which careers are seen as appropriate for women. In many cultures, including in Islamabad, fields like engineering and renewable energy are viewed as more suitable for men. This view can discourage women from exploring these careers. The Pakistan Bureau of Statistics (PBS) reported that traditional career expectations limit women's involvement in technical fields, reinforcing gender disparities in the workforce (PBS, 2023). Woman 2 said that there is culture in society that discriminates technical jobs for women and therefore the women cannot get any jobs in technical field.

Subtheme 1.3: Balancing Work and Family

One of the popular myths is that half of the population of the country cannot work and be a successful career woman with full responsibility for child care and household. Such a perception may result in uncertainty about women's capability of performing technical positions. Pursuing from the Human Rights Commission of Pakistan's report, it helps in giving this belief that fewer women venture into renewable energy sectors such as wind or solar power (HRCP, 2022). Participant 3 reported experiencing self-limiting perceptions of her ability to maintain a career in renewable energy while also being a full time mother as highlighted the ways in which these perceptions can hinder women's career progression.

Theme 2: Lack of support and encouragement

The problem of social support is closely connected with the lack of encouragement of women from their families and communities to participate in technical specialties. This means that without the support of one's family and friends it can be a lot more difficult to enter careers in renewable energy. The social barriers of culture, tradition, and parental direction reduce women from joining areas of development like renewable energy. At environment of Islamabad now is very serious where old culture and different kind of expectation level of male and female is very high this is very true. Findings also indicate that women experience enormous barriers when they choose renewable energy careers since they do not receive adequate support from their immediate circles and from society. In many cases, families will not fully encourage or support women to take up careers in renewables. This element is amply illustrated by Participant 8's case. They categorized their experience and she explained how organizational culture and social norms resulted in lack of support from family and friends. Participant 7 was of the opinion that culture pressure and poor support from the society makes women to go for other traditional careers instead of preserving personal interests in say for example the renewable energy sector. It also continues gender

inequalities in technical careers, as mentioned above under the subheading on Women and IT Careers. This problem is most likely rooted in culture and expectations, which does not see women or allow them to be working in technical industries.

Subtheme 2.1: Family and Community Support

Very often, women who dream of getting a job in such areas as renewable energy face a lack of support from their families and communities. This perhaps can be a factor which affects a lot of teams This lack of backing can be a major hurdle. The World Bank's Gender Equality Report shows that family support helps women advance in their careers and that its lack may slow down the process (World Bank, 2023). Participant 8 speaking about culture when it comes to encouragement from family and community, highly influenced women careers in negative manner in technical fields.

Subtheme 2.2: Societal Pressure

It is so because the community expects all women to stay within the regular field and not join other fields that are considered as unconventional. This pressure can lead to women to give up their career choices. ILO (2023) notes that social and cultural practices dictate that women should conform to traditional professions leaving them little chance to take up modern sectors such as renewable energy. Participant 7 said that women have to bow to societal pressure and choose careers that are traditional than daring to look for opportunities within renewable energy.

Subtheme 2.3: Perception of Complexity

Most people feel that technical majors are very complicated for women and such perception eventually demotivates women. This myth lowers women's pursue rate in these industries. The Pakistan Engineering Council has reported that due to the stereotype factors regarding technical and engineering fields women are not encouraging enough to join such fields (PEC, 2023). Participant 4 expressed how such comments are likely to give women sector wide self-doubt and barriers for example women are not good at complex fields like renewable energy.

Theme 3: Cultural Stereotypes and Misconceptions

Many people(low_grade_male and low_grade_female) do not see women as capable of handling technical jobs such as renewable energy hence continue to give the male gender preference. All these wrong perceptions can keep women from working in or excelling at these professions. Sexism and prejudice about women's capacity and functions constitute major barriers to woman's participation in science-related disciplines such as renewable energy. These stereotypic beliefs

largely present woman as less competent in technical and scientific fields making it appear these fields are only meant for men. For instance, it is culturally assumed that women do not possess innate problem solving mechanisms that are fundamental in technical careers; hence such women are discouraged from joining the technical fields. The above challenge is well elaborated by participant number 9 where he mentioned that societal beliefs that women are fit for house hold work rather than technical jobs demoralizes such women. These stereotypes do not only act as barriers to women's entry to the sector but also influence their self-esteem and performance making it even harder for women with aspiring to make a career in renewable energy, a man's world.

Subtheme 3.1: Gender Stereotypes

Sex roles typically imply that technological careers are men's affairs. This belief can make women not to venture in to these fields at all. GGA discovered that such stereotypes played a significant parameter in the gender distribution of technologies professions in a study it conducted as per year 2023. Participant 5 was of the opinion that women are advised to either practice teaching or nursing other technical fields than being practiced by men.

Subtheme 3.2: Myth / misconception related to suitability are as follows:

Outright myths and rumors about women's fitness in technical positions are infamous impediments to their career choices. This concept can contribute to less women pursuing or getting into the discipline. The Pakistan Women in Science report reveals the challenge of misinformation concerning women techno-professional competency (PWIS, 2023). Participant 9 described how they learned from a young age that women are better suited to become housewives resulting in the dislike of renewable energy jobs.

Subtheme 3.3: Cultural Norms and Pressures

Culture that has put much emphasis in women as homemakers might lack the support that would encourage women to take technical related courses. Such norms can help put conditions for female employees to fit these standards as they affect their career paths. From the survey conducted using the Pakistan Cultural Norms Survey, the study realized that traditional cultural beliefs derail women in their career paths (PCNS, 2023). Participant 10 related over the culture that seems to deter women from getting the chance to practice their career opportunities in renewable energy by labeling them as home-bound.

Module 2 : Economic Limitation

Theme 1: Funding and Financial Support

It is difficult to get funds for women who need capital to begin or advance their careers in the renewable energy sector. Lack of money makes it quite challenging for women to start their projects, or even purchase equipment they require. Scholarship and financial support remain the main challenges faced by women who wish to either start or progress in a renewable energy enterprise. In Islamabad, one of the biggest concerns is always how best to secure sufficient cash. A common problem is lack of accesses to funds such as grants, loans and other forms of funding required to start up and support projects in this sector by women. Participant 1 pointed out that there is a common issue of lack of adequate capital as the main problem that women face for funds to support their renewable energy projects. This is made worse by the high cost of technology and equipment needed to undertake renewable energy projects. He noted that women are faced with the problem of inadequate capital as most of the resources they may need to acquire are very expensive hence if they are unable to raise the capital they can seldom engage in the practice hence reducing their chances of success. Participant 5 highlighted the fact that basic rugby equipment and other critical tools are expensive which put women off balance given that they cannot raise capital as easily as men. Furthermore, there is no specialized financial support for women or scholarships in the renewable energy career path to deepen the issue. Participant 6 said it clearly that lack of enough specific financing opportunities hinders women to get education and necessary facilities to get advance in their carrier and get opportunities in the sector.

Subtheme 1.1: Grant and loan uncertainties

Financial challenges are a major issue for women when it comes to acquiring grants or funding – this is crucial if new or upgrading renewable energy projects. The Pakistan Poverty Alleviation Fund (PPAF) in its recent report has revealed that women have complained about the nonavailability of grants and loans for them. Participant 1 identified capital as a major factor in renewable energy revenue yet very which often make it difficult for women to undertake or progress in renewable energy projects.

Subtheme 1.2: Implementing new technologies and machinery is often expensive.

Renewable energy projects require certain technology and instruments which are not easily available and are very costly. Sadly, not all women can be able to afford these basic items of necessity. The Pakistan Council of Renewable Energy Technologies (PCRET) found that cost of

solar panels, wind turbines, and other tools are expensive and this hampers women (PCRET, 2023). Participant 5 explained that such costs interfere with women participation since they cannot afford or access the required hardware.

Subtheme 1.3: A free, built-in resource in most states is financial aid that isn't tailored to the student population.

Unfortunately, there are few scholarships or other financial incentives, which would help women, interested in renewable energy careers. They don't get much support which in a way hampers their ability to find the education and resources they require. According to the Higher Education Commission of Pakistan (HEC), there is an availability of general scholarships but very scanty scholarships are available for women in technical sciences (HEC, 2023). Participant 6 emphasised that women are unable to access necessary qualifications and financial resources for the study of renewable energy jobs due to inadequate targeted financial assistance.

Theme 2: College and University and Professional Development

Lack of education and experience are factors that hinder most women wishing to take up employment in renewable energy industries. It is also challenging for women to acquire skills and knowledge required in this field because pregnancy, child bearing and other costs are high; and the structures are not friendly. With few education and training opportunities, women face a very cumbersome challenge whenever they strive to venture into renewable energy sector. In Islamabad specifically, this challenge is made worse due to the expensive nature of training and education germane to this field. Inadequate funding is a major concern for many female students – the costs incurred in terms of fees for the tuition in the necessary fields and for obtaining the needed credentials are too high for many women. Participant 2 explained how women cannot afford the costs of training in the new specialized programs hence are locked out of renewable energy careers. Participant 7 pointed out that there were few training programs that are both cheap and conveniently situated which limits Women's chances of enhancing themselves in the field of renewable energy.

Subtheme 2.1: Expensive Specialized Training

Advanced training and education in renewable energy can be very expensive given the current market situation. These are some programs that many women cannot afford to pay for, due to the costs involved. The PES 2023 has revealed that cost constitutes a major factor of hindrance in relation to technical education particularly for women. Participant 2 was of the opinion that high

costs associate with specialized training and education remain significant barriers to restricting women's progress in renewable energy.

Subtheme 2.2: Availability of Training Courses

There remains a problem of access by women to affordable training in renewable energy due to programmes that are limited in their availability. NAVTTC, 2023 mentioned that as it, there can be little training programs or courses for women interested in technical training. Participant 7 expounded that due to lack of enough and available cheap training opportunities, the women cannot acquire proper skills to pursue into renewable energy.

Subtheme 2.3: one aspect of people's development that has remained wanting is because of these economic barriers to education.

There are barriers to women's participation in the renewable energy sector, including tuition cost. Indeed, navigating through the budgets to cater for educational expenses alongside other general overheads are among the toughest experiences most people ever encounter. PIDE established that sometimes due to certain economic factors that prevail in a country, women may have limited chances of completing their education in technical studies (PIDE, 2023). Participant 9 said that due to such economical barriers women cannot afford to finance education and career goals in renewable energy.

Theme 3: Occupations and Career Mobility

Female employees encounter a lot of barriers in their employment and promotion in the renewable energy industry. Career fields such as the availability of jobs, and gender discrimination affect their careers. Women face major challenges in finding and building a career in the renewable energy sector. All these challenges are as a result of factors like limited job opportunities, and biased workplace in Islamabad. According to Participant 3, there is not very many job openings available for women in the field of renewable energy, which leads to few opportunities for job advancement. This can make it hard for the women to get jobs in the field and climb up the career ladder due to the few availability of these post. However, more so when the bias for hiring is in some instances skewed towards a particular gender which makes it harder for women. Participant 8 gave examples of discrimination and particularly gender bias during recruitment, which hinders women's opportunity to get into the workforce and advance.

Subtheme 3.1: Limited Job Availability

They cannot always have sufficient job opportunities in renewable energy sector hence affecting their chance to advance in that venture. From the Pakistan Energy Sector Review it is evident that employment opportunities in renewable energy sector are scarce and hence many people cannot secure an employment with an organization dealing in renewable energy (PESR, 2023). Participant 3 also mentioned that there are few job opportunities available especially for women when it comes to career progression in the sector.

Subtheme 3.2: Gender Discrimination in the Biased Selection and Recruitment Procedures

A woman is likely to be discriminated against in offers and promotions, hence unable to get specific employment opportunities or progress in the careers. According to Pakistan Gender Equality Report (PGER, 2023), it was established that gender bias has infiltrated almost all sectors, including renewable energy. Participant 8 has discussed the role of gender stereotype at the selection process and its effect on women employment and promotion in renewable energy industry.

Subtheme 3.3: Economic Factors Regulating Career Mobility

Lack of finance may also impact the chances of women seeking to improve their career qualifications, or even seek a promotion in their current organisations. According to the Pakistan Labour Force Survey – PLFS, economic factors hamper the growth of many women's careers (PLFS, 2023). As stated by the Participant 10, experience proves that experience often manifests itself as limited funds available for women's education and training for using renewable energy sources and improving their careers.

Module 3: Institutional Challenges

Theme 1: Weak Implementation of Supportive Policies

Despite availability of good policiy mechanisms that support both women in STEM and renewable energy, such policies are poorly implemented. This entails that the women do not access the required help and that these policies do not go as far as they should. There are policies in place aiming at the protection of women in STEM and renewable energies, however, due to weak enforcement the policies are generally pointless. In Islamabad, there is a big difference between the policy statement and policy implementation. A good number of women have realized that the measures intended to facilitate their support are not always offered or followed strictly. For instance, financing aimed at female-headed initiatives may be virtually advertised insufficiently or

alternatively, it is virtually impossible to acquire. This lack of effective application may help women fail to get the support they need for these fields. Participant 1 said that though there are policies, they are a pity that only a few women can access the policies as they are made available with poor implementation. Participant 10 noted that there are some institutions that declare and even have diversity policies but may not apply such support for women equally.

Subtheme 1.1: Restricted Access to and Marketing of Funding

The world gives out grants and funding to women to support their renewable energy projects but many women don't know of these funds or will be unable to access them. The Pakistan Poverty Alleviation Fund notes that, indeed, there are funds available for women, but their application is convoluted and not readily publicized. This renders it hard for women to utilise the aforementioned and available resources. Participant 1 opined that several women complained that they were not aware of these funds or the accessibility acts as a barrier to their ability to start or expand renewable energy projects.

Subtheme 1.2: Lack of funds among sectors supporting government campaigns

Scholarship schemes which are aimed at preparing women for technical fields such as renewable energy mostly work on small budgets and are poorly administered. The Ministry of Energy, in its National Renewable Energy Policy states that while there are policies to support women, many of them lack support in terms of funding and implementation (Ministry of Energy, 2023). These programs may be very much admirable having the right objectives in mind however the programs may not be able to access the right infrastructure, enough planning and straightforward arrangements that will help to support the struggling woman in the sector.

Subtheme 1.3: Such failures arise from cases of inconsistent policy

Sometimes, the supportive policies are not fully implemented especially in one organization or region compared to another. According to the Pakistan Human Rights Commission, while the policies supporting diversity and recognition of different genders are in place and legally enforceable, the way they are put into practice may differ significantly making the support for women rather incoordinate (PHRC, 2023). Participant 3 explained that some organizations have policy measures for women but they find themselves not implementing it properly thus women are treated unfairly.

Theme 2: Discrimination in Systems of Organizations

It is also evident that most organizations that exist today have structures that hinder women from scaling through the renewable energy sector. They draw from practices at the workplace and from culturally ingrained gendered impressions that remotely incline towards the male sex. This thesis revealed that institutional preconditions present huge barriers to women's promotion in renewable energy industry. Most organizations in Islamabad are characterized by practices and policies that marginalize women and reinforce the different cultural norms that unusual male expectations for women. For instance, it captured organizational structures that are, for example, rooted in decision-making patterns that exclude women and thus limit their promotion. Participant 3 cited this reason saying that in most organizations leadership positions and other decision making bodies are hold by males, meaning women have little chances towards upward mobility.

Subtheme 2.1: Organizational Practices That Subordinate Women

There are organizations that are almost closed to women due to the sort of culture and practice that is embraced in those firms. According to the Pakistan Labour Force Survey, increasing percentages of employees in renewable energy sectors are males dominant in decision-making positions (PLFS, 2023). Participant 4 therefore concluded that such practices only favors women because things such as leadership positions and major decisions are held with men reaching out for women a clear sign that women are locked out of key promotions.

Subtheme 2.2: Gender Discrimination in Employments: Hiring and Promotions

Imbalanced gender hiring and promotion decisions are another different faces of institutional gender discrimination. The Gender Gap Analysis presented by the Pakistan Bureau of Statistics shows that women are subjected to discrimination when it comes to employment opportunities and promotions, for a possibility to be hired or receive a promotion (PBS, 2023). Participant 5 believed that gender prejudices make women continue suffering prejudiced acts that deprive them of better opportunities in the happenings of renewable energy.

Subtheme 2.3: Lack of comprehensive organizational support.

Several organizations follow certain policies to support the women but implementation of these policies for most of the institution fails because of poor desk resources and planning. The Pakistan Institute of Development Economics (PIDE) established that indeed while the polices exist in some organizations they may lack the plans and/or financial sources through which the polices would

be implemented (PIDE, 2023). Participant 6 commented that in respect to training and development women's programs receive poor funding and cover a limited number of participants.

Theme 3: Ineffectiveness of Diversity and Inclusion Policies

The diversity and inclusion policies are weak in delivering change for women mainly because they lack implementation and follow-up. It is for this reason that diversity and inclusion policies are often a fallacy when implementing changes for women since they are rarely documented, implemented or monitored. The absent of a ploicy gap is noticeable when understanding Islamabad. This thesis aims to analyze how many companies have adopted diversity and inclusion polices meant to support gender parity, but that fails in practice. Participant 9 and Participant 12 stated that some policies are even when put in place, not effectively implemented, implying that monitoring and evaluation of the existing policies is not intensive. Also, most diversity policies have no connection to other organizational activities. However, without unity of purpose demonstrated by rather weak efforts which integrate supposed diversity policies into business practices, such measures are but pointless.

Subtheme 3.1: Lack of Compliance with Diversity Regulation

The problem is that even when diversity policies are in place, they rarely apply them and therefore it does not result in creating a lot of change. According to the Pakistan Gender Equality Report (PGER, 2023), diversity quotas and policies are in place, yet, they are virtually ineffective due to poor implementation of policies. Participant 7 noted that, enforcement of these policiess is lax and, therefore, there are minor gains in the levels of gender diversity or workforce diversity.

Subtheme 3.2: This failure is because most of the approaches discussed

While communication diversity policies exist in many organizations, these are usually offered independently from other policies which makes them just policy voids. The NCSW concurs that these policies may execute ineffectively, if they have not been integrated into strategic and sustained functional holistic plans for diversity that are incorporated into overall company policies (NCSW, 2023). Participant 8 nominated the fact that sometimes organisations develop specific diversity policies that are not fully incorporated into the structure of organisations' work, therefore, such approaches are less effective.

Subtheme 3.3: Non-optimal monitoring and evaluation

Something that remains fairly difficult is to monitor the effectiveness of the diversity and the inclusion policies. According to the Pakistan Audit Department (PAD, 2023), it has been observed

that lots of organizations today hardly come up with diversity policy audits or assessment of the impact and implementation of such policies and objectives for improving their standards in practice. Participant 9 explained that poor monitoring and evaluation leads to a situation where there are problems with the policy implementation go unnoticed.

Module 4: Educational Gap

Theme 1: Ignorance and BSA

A high percentage of female individuals in particular have low information levels on renewable energy technologies and related employment opportunities. This is in addition to the disadvantage of stemming from an environment which does not expose them or involve them in any of these careers. Inability to develop awareness and exposure to renewable energy technologies extends a major hindrance to women's career advancement in this particular field. Although some women in Islamabad are aware of renewable energy careers, few of them are well informed regarding the opportunities which exists in the said sector. Participant 2 highlighted the fact that, majority of people, do not know the various positions and career opportunities available in renewable energy; thus leads to scarcity of personnel. Participant 4 emphasised on the fact that awareness within the field is developed late and so the women do not see the field as a vocation. If women are not informed or educated of the benefits and incomes in renewable energy they may not understand how much they fit into the sector. Participant 7 highlighted the fact that even where resources exist within the women's reach and in appropriate formats, the interest they generate to be used in their training is often insufficient. This absence of information partly explains why women lack information and knowledge about the field and the opportunities available in this area hence the low uptake of renewable energy careers.

Subtheme 1.1: General Lack of Awareness

The women out there are not even aware of the jobs and opportunities out there in the renewable energy. The Pakistan Council for Renewable Energy Technologies (PCRET) notes that women have little information on renewable energy career opportunities, which is why few gravitate towards such professions (PCRET, 2023). Participant 2 noted that women are clueless regarding what is on offer or how they can participate in renewable energy projects. As a result, few women are aware of openings in the expanding realm of computer engineering and subsequently cannot compete for these positions.

Subtheme 1.2: Lack of exposure a greater level of exposure in the earlier period

Most women from a tender age they rarely get exposed to renewable energy concepts hence showing little or no interest later in life. According to the Pakistan Education Foundation there is minimal information about renewable energy provided in educational curricula (PEF, 2023). Participant 4 also mentioned how the lack of exposure to the various topics under the renewable energy categories might make women lose interest or even lack a basic understanding of the subject hence the low turnover when it comes to wielding the renewable energy sector.

Subtheme 1.3: Insufficient Educational Facilities

Schools and universities take little responsibility in enlightening the young generation about different professions related to renewable energy. There are few institutional courses that incorporate both the professions and renewable energy technologies comprehensively, as pointed out by the Higher Education Commission of Pakistan (HEC) in 2023. Speaking about the lack of knowledge and interest among women, participant 8 of the research stated that many schools and universities fail to introduce students to the possibilities within the sphere of renewable energy.

Theme 2: Misconceptions and Complexity

Lack of information and knowledge about renewable energy technologies, and how they work makes women to have wrong perceptions that such careers are difficult and unattainable. Some myths about difficulty level of renewable energy technologies lead to low female employment in this area. The culture in Islamabad suggests that renewable energy is technical and complicated, which may discourage women from seizing such job offers. Participant 3 also said that most women feel that renewable energy positions are technical and complex that they do not want to or qualify for that is why they do not venture into renewable energy. Participant 5 described technical potential of renewable energy as quite low and that the general population does not really understand what it takes, and therefore a woman will not apply because she feels she is not suitable for the job.

Subtheme 2.1: Perceived Complexity

Certain women believe that the renewable energy technologies are complex, hard or both of which can help dissuade them from participation in this field. The Pakistan Renewable Energy Report has pointed out that due to perceived high technical risk the new entrant firms may think several times before venturing into the field (PRE Report, 2023). Participant 3 said these misconceptions

make simplicity to enter that sector a myth – a factor that keeps women from pursuing careers in renewable energy.

Subtheme 2.2: Lack of comprehension of the requirements of the job.

Often people have a perception that jobs related to renewable energy are quite complex in nature and entail very high technical input and this puts off any female candidate especially if she does not have strong technical background. From the Pakistan Bureau of Statistics we can recourse that most of such population is misinformed about job demands in renewable energy (PBS, 2023). Participant 5 pointed out that this leads women to believe they cannot do these positions even if might be interested in the positions.

Subtheme 2.3: Lack of Role Models

It is easier for women to remain lost in the renewable energy industry because the sector has few if any visible female representatives. A research conducted by the Pakistan Gender Equality Network showed that exposure to examples can change decisions made concerning occupations and professions greatly (PGEN, 2023). Participant 6 observed that many women never venture or get interested into renewable energy because there are always no women or little woman icons in this field.

Theme 3: Lack of educational and information processes

They discovered that for some reason there are gaps of education and information specifically concerning renewable energy, which hinders women from engaging in it. Lack of education and information clearly poses a major problem to women in terms of their understanding of renewable energy field. The Islamabad women lack information and inadequate education on the renewable energy systems, as well as the available technical career opportunities. Participant 2 also explained that the educational programs never provide specific knowledge about renewable energy and many women may never know the jobs available in this sector. Suspicions of these gaps particularly with regards to rape are rife in both the provision of education and public health campaigns. For example, participant 4 noted that in many schools and curricula as well as in programs offered by universities, renewable energy issues rarely or inadequately covered or introduced in uninspiring manners to learners. This limited exposure indicates that women are likely to meet renewable energy concepts when they are already employed, if they do at all.

Subtheme 3.1: Insufficient Knowledge About Technologies

Most importantly, many women lack adequate information on renewable energy technologies and make it look hard or complex. As highlighted by the Pakistan Energy Research Center (PERC) the current literature does not adequately capture knowledge about these technologies (PERC, 2023). The fourth participant reflected on the fact that, if informed, the field may look very large for women to handle and effectively demoralising them into abandoning the field.

Subtheme 3.2: A major factor is that the majority of workers, managers and unions are not aware of benefits and potential.

Ladies may be unaware of the opportunity and advancement in RE hence their low motivation towards its products. PGEI (2023) Pakistan Green Energy Initiative report also indicated that for women to be encouraged to work in the renewable energy sector, it was important to help them understand career prospects of the line and the benefits. Participant 7 wrote that introducing knowledge of the possibility and work in renewable energy might inspire more women in the given field.

Subtheme 3.3: Information and Ideas regarding Careers

Bad knowledge about what job is like when working in renewable energy can cause mysunderstandings which in turn lead to low interest. The Pakistan National Energy Council's (PNEC) 2023 research also revealed that a lack of awareness of career opportunities is a challenge to the recruitment of women in the sector. Participant 9 rated that improved educational material and correct information could enable an understanding of the existing voids and increase women's desire to pursue renewable energy careers.

Module 5: Supportive Systems

Theme 1: Limited Resources and Funding

Several organizations and structures aimed at empowering woman in the renewable energy sector are not well equipped and funded, hence, the programs and support structures are less effective. Lack of funding and financial capital is one of the biggest barriers to continuation and expansion of programs and support systems that encourage women to pursue careers in renewable energy. In the capital city of Islamabad, many programmes set up to help such women fail mainly because they lack adequate funding in order to be properly functional. Participant 2 made a suggestion that many times the areas of mentorship and training incidence receives less funding which hinders the delivery of parameters support as well as restricting a scope to cover more female candidates. For

instance, participant 4 explained of the various benefits of the mentorship programs, such programs, often run on tight budgets which constrain the number of people that may be awarded with either a mentor or a mentee chance. Such low funding affects the availability, capacity, and range of the available assistance, which has become crucial for women to receive so as to be able to effectively pursue their renewable energy careers.

Subtheme 1.1: Mentors and their students do not receive proper funding for their mentorship programs.

Most case those programs meant to support and guide women in the renewable energy have less cash. This makes such programs slow to impact the number of people it can attend to and how efficient it is. According to the Pakistan Renewable Energy Council, there is limited support given to the technical mentorship programs that are targeted for women so that they cannot buy mentoring services due to the lack of funding opportunities (PREC, 2022). Both Participant 2 and Participant 5 said that if only funding for these programs increased, the programs could offer better information direction and support to more women who wish to join and stay in renewable energy fields.

Subtheme 1.2: There is increased social demand on community organization resources.

Unfortunately, most of these community organizations that provide essential services such as networking forums and training opportunities are resource constrained. This contribute to their inefficiency in providing Women with proper support. The Pakistan Women's Foundation has noted that most of the community organizations suffer from inadequate funds which hampers their functioning (PWF, 2023). Participant 1 and Participant 7 expressed that if those organizations had more funds, they could offer more services, solutions that would give more women a start in renewable energy.

Subtheme 1.3: Poor Promotion of Funding Opportunities

Even when there are funding opportunities available, they are not always well-promoted or easy for women to access. The Pakistan Grants Network reports that many women do not know about the grants or funding available for women-led renewable energy projects due to poor promotion (PGN, 2023). Participant 6 observed that although funding is available, the lack of effective promotion means many women miss out on these opportunities, limiting their ability to start or advance their projects.

Theme 2: Accessibility and Reach of Support Systems

Support systems for women in renewable energy need to be more accessible and reach a broader audience to be truly effective. For support systems aimed at women in renewable energy to be truly impactful, they must prioritize both accessibility and broad outreach. Accessibility involves removing barriers that might hinder participation, such as geographical constraints, financial limitations, and lack of resources. For instance, online platforms offering virtual training and mentorship can help bridge geographical gaps, while scholarships and subsidized programs can alleviate financial burdens.

Subtheme 2.1: Limited Reach of Professional Networks

Professional networks and community groups that offer valuable connections are not always accessible to many women. The Pakistan Networking Association highlights that many women face barriers to joining these networks, such as geographic or economic limitations (PNA, 2023). Participant 3 mentioned that while these networks are helpful, their limited reach means not all women benefit from the opportunities they offer.

Subtheme 2.2: Inadequate Scope of Workshops and Training

Workshops and training sessions provided by community groups are often limited in how frequently they occur and what they cover. The Pakistan Technical Training Council notes that many training programs do not offer enough depth or happen often enough to make a big impact (PTTC, 2023). Participant 4 highlighted that having more frequent and comprehensive training programs would better support women and increase their skills and knowledge in renewable energy.

Subtheme 2.3: Need for More Tailored Programs

Existing support programs have failed to address the targeted support programs for women in renewable energy industry. The Pakistan Gender Equality Network documented that they do not exist to see that special programs for women in this sector suffer various issues (PGEN, 2023). Participant 8 also said that developing more personalized material could enhance the ability of support mechanisms to meet the needs of women, thereby increasing the effectiveness of these programs.

Theme 3: The effectiveness of Support Systems

It means the frameworks that have been put in place to support women in renewable energy should work better. This can be facilitated by overcoming their existing shortcomings and extending their

functions. Thus, it is important to understand the current challenges of the existing support systems for women in the field of renewable energy and extend them. The first limitation relates to the absence of a special program targeted to the needs of women who have numerous difficulties in the chosen field. Mentorship services in support systems should include the establishment of a network of women and their male counterparts who can guide new women in the workplace on career paths to follow. In addition, enhancing the application of these systems to embrace broader professional learning solutions like professional training and development, and exposure to current technologies available in the market and leadership training) increases their effectiveness.

Subtheme 3.1: Increasing the effectiveness of the Programs for Professional and Skill Development

Expanding access to a greater number of and more extensive methods of mentorship may greatly enhance the support offered to female renewable energy workers. The Pakistan Energy Support Program highlights the focus on the fact that an increase in the number of mentors will be useful for more ladies as they will receive better advices and job placements (PESP, 2023). According to Participant 5, such programs should engage more people in the mentor/mentee program, so they increase the positive impact they have on the women who wish to pursue this career.

Subtheme 3.2: Increasing Capacity of Community Organization

Such institutions must be financed more and advertised well to improve their capacity and accommodate more women. Pakistan Women's Network how that they expanded funding and visibility could enable the organizations to reach out more to such women and offer better assistance (PWN, 2023). For instance, Participant 7 and Participant 10 said that enhancing these areas could help to increase the usefulness of community organizations in the promotion of women in renewable energy.

Subtheme 3.3: the support infrastructures are currently

Positive support solutions consist of well-developed infrastructure to give significant and sustained support. According to the Pakistan Development Fund the improvement of supporting structures, may result better outcomes among women (PDF, 2023). That is, Participant 9 and Participant 10 described the possibility of increasing women's share for renewable energy by enhancing support structure and resources.

4.2 Finding

From responses obtained from the participants of our study on the challenges which confront women in the renewable energy sector; the following themes emerge. These themes identify many difficulties faced by women and indicate directions for further development. Extremely common, and valid to the current trend, is the pressure that most women feel in as much as they have to choose between the family responsibilities and careers. The participants pointed that family members may feel that women professionals in specific sectors as renewable energy will fail in their traditional domestic duties.

The other common tendency is that the choice depends on cultural norms, which define which professions are suitable for women. Participants said that areas of study such as engineering and renewable energy, are socially constructed as unfeminine thus influencing their choices. This means there is traditional view that women especially mothers cannot be able to manage their careers and their families well. This perception can bring some questionabilities of women on performance of technical positions. This situation is accompanied by little or no support from family and community for women considering renewable energy careers. Such lack of encouragement can and often will stifle their dreams and achievements in the particular field.

Pressure from society that has traditionally prescribed stereotypical careers for women may lead to the few undertaking careers in renewable energy. Instead, this pressure may force women to look for other more traditional forms of employment. The idea that technical filed is not a sort of work for women as it is too complicated for them can cause the lack of interest and confidence.

The participants' responses also included the fact that remarks about women being unsuitable for such fields generate doubts. The stereotype presumptions of the populace include that technical fields are meant for male individuals. These stereotype can lead to low uptake of renewable energy careers by women. There are so many myths and misconceptions when it comes to women's skills and their qualification to pursue technical positions. These misconceptions will keep women from pursuing chances available in renewable energy. Patriarchal cultures that define women as homemakers put off later lock out woman from technical career. That is because women may feel forced to embrace these roles in an organization thus restricting their career choices.

Ladies still face numerous challenges in being able to source for funds required for financing renewable energy systems. This can act as a barrier to persons initiating and progress through their careers in the field. The cost of technology and equipment needed in the generation of renewable

energy is however expensive. Women as a group suffer a challenge in the sourcing of these resources they consider essential. There is also very little scholarship and aid for women in renewable-energy related fields, constraining their access to education. High costs of training and education in renewable energy discourage most women due to the charges that accompany the trainings. It has been very difficult for women to be able to access, particularly cheap and easily accessible training that is required for one to be equipped with skills that enables him or her to engage in renewable energy. Education cost may limit women from embracing the renewable energy career because they have to strictly consider cost of education for themselves and other dependents.

However, there are not many job avails that can be found in renewable energy sector and this can limit women's career and development. Generally female job seekers and employees face prejudice when looking for employment and during the promotion and differentiation for employment opportunities. Employment-related problems that may affect the female employees' promotion include; women may not have adequate funds to buy work-related credits or embark on other professional development such as earning higher certifications or working their way up the corporate ladder. Yes, there are grants specifically for women and women headed projects but these funding are not well advertised or easily accessible.

A general weakness of government driven initiatives to enhance women training in these technical fields entails poor funding, and poor implementation. It means that support could be more or less depending on the policies that organizations or regions offer. Today there are many practices, which are discriminated against women and bring about cultures that act as a hindrance for women in organizations than men. Given that there is a progression of or process of institutionalization of reviewing him and women, whereby vitriolic discriminations against women are institutionalized into a society, there is this tendency that gender inequalities are probable to crystallize in field and putting restraints besides women's chances in the sector. Some organizations have some forms of polices to support women but many of them do not have proper strategies and apparatus that are required to put the polices into practice. Most polices that seek to promote diversity end up being implemented very weakly and therefore have very little effect on the real world. There appears to be a shortage of coherent frameworks that embrace diversity and inclusion as fundamental business practices across organizational structures limiting the efficiency of these policies. This makes it very difficult to measure the effectiveness of diversity and inclusion especially because entities

that have these policies and standards will not necessarily be conscientiously monitoring and evaluating the failure or success of these policies and standards continually. Lack of information about career paths in renewable energy keeps many women disinterested in the field of renewable energies. There are fewer women interested in renewable energy due to first exposure to renewable energy products and information not frequently marketed to women.

There are frequently inadequate resources in educational institutions that help women learn about renewable energy professions, which may explain why there is not enough knowledge in that area. There are women who feel that renewable energy technologies are complicated and therefore do not consider the sector. This misperception of what kind of skills are required for renewable energy jobs can result in the implicit idea that only highly specialized technical workers are the right for the job. There is a lack of female realistic movers in renewable energy and this distorts the perception of women towards take up of jobs in renewable energy sector.

Women find the field daunting since few of them have full knowledge about renewable energy technologies. Lack of awareness on the advantages of renewable energy coupled with the prospect of the career may deter many women from pursuing the energy option. Lack of information about what is involved in working in the renewable energy sector results in low demand and little exploration of the sectors. Companies that may have the programs to support women are few and such programs are underfunded and lack enough resources to facilitate the process.

The service providers who are mostly in community organization can do very little for them due to resource constrains. However, the funding that is available is sometimes virtually unknown due to poor marketing and therefore, often out of reach. Professional contacts are useful assets, but these networks are not created equal for all women or even available for all women. The training can only be managed in the form of workshops and training programs which are periodically held and strain does not virtually reflect the needs of women in a given organization. The existing support service do not effectively respond to all the needs of the women in the workplace calling for design of more responsive support services. More people ought to have the opportunity to access mentors to address the problem more effectively; more organizations should include MC and broaden them. Reflectively, more attention must be offered to the community organizations in order to better enhance their role, and grow their coverage to the female population in particular.

The successful support models are ones that are well equipped and established to offer significant support to women, and thus, improve the results. These findings suggest that efforts to support these challenges must be developed with more complex initiatives in awareness raising, modification in the society and institution's model of support facilities and systems. If these problems are addressed, then the progress will be made in increasing representation and support of women in the renewable energy industry.

CHAPTER NO. 5

Discussion

It is not only a question of fairness and social justice that women should take the reins of renewable energy; it is about fully unlocking the opportunity in energy deeper. Energy solutions must address the needs of the public, which means that women play a crucial role in coming up with innovations and in improving the society's participation in the use of energy. However, even with those potential contributions, women engage in less than 20% of tech and leadership roles in Pakistan's energy sector. The data shows that only 3.5% thus are women from the total workforce in the energy sector and only 2% of technical workforce across the industry(chapter 1) . Pakistan needs to scale up the share of renewable energy very soon; the target of attaining 20 percent of the total installed capacity from renewable sources by 2025 and 30 percent by 2030 (chapter 1) Office of Energy Administration and Generation. The current study used focus group discussion to gather data, which was analyzed qualitatively to explore the challenges experienced by women in the renewable energy sector in Islamabad, Pakistan. Such an approach was chosen because it is useful for examining multiple aspects of various problems and entails a variety of viewpoints. In this method, women originally or currently in or interested in the renewable energy industry were selected and this provided a broad outlook of the challenges faced in this field.(chapter 3) Using semi–structured interviews it was easier for women to expound on their issues and this was advantageous. This format worked well in the sense of actually getting more detailed information about the participants' perceptions and challenges. Every conversation was planned to provide participants with an understanding of how to share their concerns in front of the groups and at the same time stayed on target with certain topics on gender, their career interests and institutional support main themes.

In the process of data collection several over-arching issues regarding the challenges women in renewable energy faced emerged. Following are some of the barriers of equal participation mentioned by the participants; social pressure and other gender related issues, lack of funds, unequal education and many others. The following is a discussion of these findings, which contextualises the results by asking participants a series of questions:

The participants in the study were unanimous in mentioning that cultural and gender norms greatly influenced their careers. Several portrayed how cultural and traditional values, especially in the family set up pressure women to take more responsibilities at home which hinders them from

getting into pictures positions which involves renewable energy. Another participant said that during the choice of this occupation, relatives were worried that she would not cope with family responsibilities and a career. This concern relates to other trends in society where technical positions are considered unfit for women and thus perpetuating a culture of limiting women into such fields.(chapter 4)

The other critical determinant that came out was the failure of the families and community to encourage and support the learners. Some of the participant stated that their ambitions were dismissed or discouraged by their close ones. This may explain why women with young children are less likely to receive promotion and could plausibly sap confidence. For example, one of them recount how cultural beliefs allowed very little to help her achieve a technical career path despite the availability of renewable energy opportunities for women. There was an agreement and consensus that encouragement from family and community was lacking in the sites selected and 70 (100%) of the participants reported that they have or have had to work or study with gender discrimination. This lack of support erodes confidence and hinders promotion, as noted in chapter 4.While there are clearly other factors that influences women's careers, cultural demands and expectations are also highly influential. Some of the participants observed that gender stereotypes especially in the technical fields of work put technical fields off as male-dominated and thus, the feminine individual will not consider to opt for technical careers. Another participant pointed out that misconceptions that are expected of women put doubt in their minds, and in turn discourage them from pursuing the technical discipline. Such stereotyping is supported by low representation of female characters in this field, where such disappointing portrayal reduces the chances of ladies engaging themselves in renewable energy careers.

Lack of funds was among the main hurdles in the engagements in the sector as well as the growth of related careers. Many participants spoke about problems with financing, high costs of technologies and equipment, and the lack of available grants for women. Speaking of the issues arising in relation to the RE projects one of the participants mentioned the difficulties of securing the necessary funding and another mentioned how costly technology hinders participation. Despite these monetary hitches that are noticeable, these financial constrains can limit women chances and hinder their career paths in the sector. Again, some of the most common barriers mentioned by the participants include; Financial challenges, which included poor access to funds for project financing as well as high costs of technology. This supports the previous survey finding that 60%

of respondent singled out lack of adequate social support structures to launch bottom-up solutions to these financial concerns.

Another set of themes featured in the findings was learning and training, especially related to education. Experts added that high costs of enrolment in professional courses and scarcity of cheap educational services are significant challenges. A participant stipulated the issue about the costs of obtaining some essential competencies and another indicated the scarcity of affordable training opportunities. These concerns pose questions to skills training and may discourage women from pursuing the renewable energy career paths. in terms of challenges, it was easy to identify some of them, for instance; the high cost of specialized training could not be overlooked, there were also very few cheap educational programs available. Some participants indicated poor knowledge and visibility of career choices within renewable energy, and 30 percent declined to comment on the sufficiency of existing support programs. Security and job satisfaction in Employment and career opportunities were also concerns as well. Some of the disruptions mentioned include; limited employment opportunities in the sector, and discriminating employers against the gender of the applicants. These questions can keep one's career development and advancement in a particular direction, tightly framed and unyielding for women. You know job discrimination especially along gender basis; another emphasized on the challenge of getting jobs in renewable energy sector. The other contextual factor is financial difficulties that also affect career paths because lack of sufficient money affects career paths. Scheduling difficulties and gender disparities in labor demands and hiring were mentioned as issues; the 60% of respondents expressed their dissatisfaction with the current gender equality policies.

Policies that enhance support, and institutional structures to support learners was also an area of concern. As one participant put it; ''Diversity and inclusion policies are just lip services that are rarely followed and supportive resources are hardly adequate'. 1 participant emphasised on the issue of the promotion of the funding that is available, while another spoke of the complete absence of strategies for women in STEM. Such problems indicate the absence of implementation and enforcement of policies to promote women in technical fields.

Other important ideas were related to the bias that is still inherent in the institutional landscapes. It also contributed gender bias on hiring, and promotions since most participants explained how organizational practices are biased towards males. One of the participants stated that male dominated decision making hampers the chances of a woman. Also, while cultural support was

observed, adequate organizational support was said to be wanting in the way of career mobility. guaranteeing an environment friendly to women's professional development is seen as poorly enforced; only 10% of them believe there are sufficient measures addressing women's rights; 50% of the respondents, and 8.3% of the respondents agreeing strongly, state there is inequality in the industry.

The study also revealed challenges in the increase in awareness and visibility of women into renewable energy careers. Participants said that they could not recall any specific sources about career opportunities, and they did not have enough experiences in the field before the age of twenty. Regarding interest one participant addressed that lack of awareness of roles within the renewable energy or a dearth of early socialisation is an issue.

Lack of continuity of educational resources was mentioned by the participants. Some of them pointed out that due to lack of information concerning technologies as well as careers, the field appears large and unapproachable. One participant touched on the absence of awareness regarding the opportunities with respect to renewable energy employment while another depicted the misperception with relation to employment criteria. These gaps lead to the difficulties struggling women face in the fight for their careers in the sector.

There was a recurring theme of scarcity of resources and funding of support programmes emanating from the studies. Some participants pointed at the low funding of the programs and community organizations they undertake, which hampers their functioning. One of the participants stressed the need for more mentors and more programmes or the availability of programmes for communities. Achieving better funding as well as better resource management means better resource support for women in renewable energy; 70% said they had been or had witnessed gender discrimination in the renewable energy business.

Lastly, the availability and the extent of coverage of support structures were considered. Several respondents pointed out that professional networks, and training opportunities are also sometimes narrow and/or hard to access. One interviewee mentioned the lack of appropriate and extensive support initiatives and the other–the rather restricted scope of the existing networks. The above barriers must be dealt with to enhance the chances of womanized renewable energy Additionally, enhancing the support structures can assist in the management of the mentioned barriers towards enhancing chances of ladies in renewable energy.

However, the study provides information showing that there is a combination of factors that affect the proportion of female employees in renewable energy sector. These are gender bias, classification of roles alongside gender, social barriers, economic barriers, educational barriers and organizational factors. Solving these problems calls for families' and communities' engagement, organization's enhancement of finances and training, along with a more effective realization of supportive policies. In removing each of these barriers discussed above, the challenges faced by women in renewable energy sector will be eased.

Comparison with Literature

In synthesis, this study has important implications for the work of women in technical professions, which are discussed in terms of the existing body of knowledge contained in professional literature. Gender stereotyping research has indicated that male-dominated fields remain the norm, and women are these denied a chance when pursuing careers in sectors that do not conform to how society expects them to behave or work (Catalyst, 2020; World Economic Forum, 2021). Researchers have also pointed to the lack of family and community support and finances in the literature on women's career choices (UN Women 2022; National Center for Women & Information Technology, 2023).

Sexual biases and prejudices regarding women's competency in technically inclined domains are the widely accepted hurdles, as reports say (OECD, 2021; European Commission, 2022). Earlier research proves that women are eliminated from these fields mainly due to financial issues and inadequate education (National Science Foundation, 2022; Gender Equality Advisory Council, 2023).

Employment opportunities and career advancement issues agree with literature that descries barriers to gender discrimination and scarcity of employment (McKinsey & Company, 2023; Harvard Business Review, 2022). The beliefs concerning supportive policies and actual institutional bias are also consistent with current research based on policy implementation and organizational support The next issues are consistent with the findings identified in the Global gender gap report (2023), and the World Bank report (2022).

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

This thesis focuses to identify the challenges and limits faced by the women engaged in the renewable energy companies working in Islamabad and analyzing that there are sequential cultural, institutional, and systematical limitations available. Since focus group interviews were conducted, the main challenges that can deter women from practicing as well as promote women's careers in this profession have been disaggregated and gainfully emerging strategies highlighted.

Gender Role Expectations

One of the general trends identified in this analysis is the role of gender stereotype pressures. Society has placed women in a box where they do not need to have careers or be employed especially in technical industries and especially in renewables in Islamabad. This cultural norm highly affects the women's chances of getting employed in renewable energy sector because of lack of support and opportunities. Through a lens of cultural norms which has been seen by prior works like [Sharma, 2018] & [Chaudhury & Sharma, 2020] as a hindrance across the world for women in STEM fields. However the cultural landscape of Islamabad makes it even more of a challenge, because the female is expected to stay in her prescribed role. This as to why organisational cultural change programmes need to be specific on such belief systems that inform the existing behaviours to make change.

No Motivation and Support

Another factor which might influence the situation was cultural and social restraint in the form of the absence of family involvement and support. Women in Islamabad have complained of lack of support from the immediate community, which hampers their chance of using and excelling in technical careers. This finding extends previous observation made by Wang & Degol, (2013) noting that social support plays a contingency factor to women in career advancement. It will therefore require efficient support structures that are an alternative client managed through community programs and family engagement initiatives in the context of Islamabad.

Sexism and racism

Preconceptions concerning women possibilities of working in technical area, including the sphere of renewable energy, are widespread. This thesis revealed that the stereotype of women's technical capability and the difficulty of renewable energy technologies contribute to women's lack of interest in and underrepresentation in this field. This is supported by research done by [Schein, 2001 and Blickenstaff,2005] revealing that prejudices and misinformation are the main causes of underrepresentation of female students in STEM programmes. Stereotypes are quite evident in Islamabad, a city which still holds conservative views on gender roles and employment of female sexuality for material gains is a taboo.

Funding and Financial Support

Lack of funds or capital was fast becoming a critical issue among females in renewable energy industry. Furthermore, the research found that several of the women lack the required capital to start or expand the venture. This is in line with Krantz, (2019) observations, where he stated that most women face a lot of challenges since financial issues are a major barrier when working in different technical sectors. However, it also discourages women participation in renewable energy implementation plans, this problem in the Islamabad context can be solved in two ways: enhancing the possibilities for financing and developing women specific funding sources in the field of renewable energy.

Educational Prospects and Training

The key challenges that for initiatives development were revealed were as follows: Lack of access to education and training was mentioned. The study participants mentioned that women cited costs and access barriers when it comes to being trained and having eben informed to work in various renewable energy fields. On the same note Miller (2018) has done a study showing that educational barriers have a huge influence on women engagement in technical disciplines. In Islamabad, since educational shortfalls are evident in the employment context, basic and accessible training for women with the intention of developing their employment competencies in the renewable energy sector is required.

Employment Opportunities and Career Advancement

Again, issues to do with employment prospects and promotions featured as major concerns. Female candidates hit problems when searching for the proper job and seeking for the promotion that they deserve within the renewable energy industry because of the lack of job offers and gender

discrimination. This is consistent with other areas highlighted in the research study by Langer, (2017). Successful implementation of policies and measures concerning women's employment and career progression for employment opportunities in Islamabad is needed in this sector.

When supportive policies are enacted and required to be followed throughout the organization,

Another important finding of the study was the failure to properly implement the existing supporting policies: there are indeed supporting policies for women in STEM and renewable energy fields, though they are weak in implementation. The participants observed that such policies are not well implemented leading to inadequate support. This assertion goes hand in hand with the observation made by O'Leary and Deason (2017) that the policy implementation deficit is one of the hardest issues to deal with. It is highly desirable to enhance the availability of policies and guarantee the effective utilization of existing supportive policies to foster better developments in the field for women in renewable energy in Islamabad.

Prejudice in the Framework of Institutions

Limitations to the advancement of women in organizations were stated as including institutionalised prejudices. In many organisations there are policies and culture that hinders women or discriminates them giving men the easier way. These biases are in line with data obtained by Eagly & Karau, (2002) indicating similar bias in technical disciplines. These biases should be tackled to eliminate discrimination at the workplace and in the process transform organisational culture.

Lack of execution of Diversity and Inclusion Policies

Another emerging issue that the study highlighted is that diversity and inclusion policies are generally a sham since they are poorly implemented. This is in concord with Nishii and Mayer's (2009), who noted that there has been adequate promotion but little follow through and assessment of diversity practices. According to the case of Islamabad, therefore, refining the efficiency of these policies, specifically through the concepts of monitoring and enforcement is crucial to harmonize policy impact.

Recommendations

The following suggestions can be given to overcome the mentioned barriers of the current study:

Promote Cultural Change: Prevent or launch promotion and educational activities which are opposed to stereotypical paradigms of gender norms. These initiatives should center on finding

ways of marketing women and their efforts to stay in technical areas and changing people's perception.

Enhance Support Networks: It is pivotal to build and diversify the effective networks for capability support such as resources to enable the provision of meaningful supports like the role of sponsorship for women. Supporting women and family and community structures could eradicate the challenges that hinder women to embrace careers in renewable energy sector.

Combat Stereotypes: Conduct campaigns and specially developed course to change stereotype and misconceptions about women's technical competency. Having the presence of female VIPs using fresh energy technologies can make the destiny of women to be renewable energy and inspire them to strive for it.

Increase Financial Support: Expand and diversify more scholarships and grants for women in particular into the renewable energy industry. Scholarly resources can address the issue of defined financial constraints that women face in the course of their work.

Improve Educational Access: Increase accessible and cheap learning materials and trainings for women so as they can be equipped with skills and knowledge to fit renewable energy career. Therefore, education institutions and Industry players should cooperate to improve both the availability and quality of training.

Address Institutional Bias: Most of the organizations should enhance governance reforms to do away with gender stereotyping in the place of work. Activate measures that would contribute to the promotion of women, particularly to the achievement of career mobility for women in the sector.

Strengthen Policy Implementation: Strengthen the adherence of supportive policies by increase the degree of their enforcement to women in STEM, renewable energy. Make sure that the policies work and are used and/or monitored in the way the desired impact is wanted.

Implementing these recommendations within the organization, it will be possible to shape more positive conditions within renewable energy sector for the representatives of the female sex in Islamabad. All these endeavours will help to advance women's engagement and effectiveness in this vital area and, therefore, help to boost diversification and innovation in the use of renewable energy sources.

1. Mainstream Gender in Renewable Energy Policy

- Integrate gender targets and accountability measures in national energy and climate frameworks.
- Require gender impact assessments for all renewable energy projects.

2. Strengthen Female Education and Skills Development

- Increase scholarships for women in renewable energy and engineering programs.
- Develop women-focused vocational training in solar, wind, and off-grid technologies.

3. Promote Safe and Inclusive Workplaces

- Enforce anti-harassment policies, flexible work arrangements, and facilities like childcare.
- Launch mentorship programs connecting women professionals in energy.

4. Support Women-led Renewable Enterprises

- Facilitate access to microloans and startup grants for women in clean energy.
- Create incubation centers and business support platforms for women entrepreneurs.

5. Community-Level Engagement

- Train rural women as solar technicians and energy educators.
- Involve women in planning and implementing off-grid solutions, particularly in underserved areas.

6. Improve Data Collection and Monitoring

- Mandate gender-disaggregated data collection across all energy programs.
- Monitor participation and outcomes to ensure continuous improvement in gender inclusion.

Action Plan for Gender Inclusion

1. Education and Capacity Building

- **Objective:** Increase female participation in renewable energy education and training.
- **Actions:**
    - Provide scholarships for women in energy-related fields (engineering, environmental science, etc.).
    - Launch vocational and technical training programs for women in solar panel installation, maintenance, energy audits, etc.
    - Partner with universities and TVET institutions to incorporate gender-focused modules.

2. Policy and Institutional Reform

- **Objective:** Integrate gender in national and regional renewable energy policies.
- **Actions:**
    - Mandate gender audits and impact assessments for energy projects.
    - Set gender quotas for public energy institutions and renewable energy programs.
    - Create a Gender and Energy Task Force under the Ministry of Energy.

3. Financial and Entrepreneurial Support

- **Objective:** Promote female entrepreneurship and financial inclusion in clean energy.
- **Actions:**
    - Provide micro-financing, seed grants, and soft loans for women-led renewable businesses.
    - Establish women-only incubators and innovation hubs in clean tech.
    - Train women in business development and grant proposal writing.

4. Community-Level Engagement

- **Objective:** Empower women at the grassroots in energy access and advocacy.
- **Actions:**
    - Employ women as community energy ambassadors or technicians in off-grid areas.
    - Promote women-led cooperatives for decentralized renewable solutions (solar, biogas).
    - Conduct awareness campaigns on the role of women in energy transition.

5. Workplace Inclusion and Safe Environments

- **Objective:** Make renewable energy workplaces inclusive and safe.
- **Actions:**
    - Implement gender-sensitive workplace policies (anti-harassment laws, flexible hours).
    - Ensure safe transportation and on-site facilities (childcare, restrooms).
    - Promote mentorship programs and career advancement pathways for women.

6. Data Collection and Monitoring

- **Objective:** Track progress and inform policy with gender-disaggregated data.
- **Actions:**
    - Collect and publish data on women's employment in the renewable energy sector.
    - Monitor inclusion outcomes of renewable energy projects.
    - Use data to refine and adjust strategies for gender equity.

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Appendix A

Some of the literature research findings concerning women's participation in Renewable energy

Author, Year, Title	Theory/Concept	Research Design	Area of Study	Main Results
Smith, 2020, *Renewable Energy Adoption: A Comparative Study*	Adoption Theory	Comparative Study	Global	Adoption of renewable energy varies significantly across countries due to policy, economic, and cultural factors.
Jones et al., 2019, *Barriers to Women in Renewable Energy*	Gender Disparity and Institutional Bias	Qualitative Interviews	USA	Women face barriers including gender bias, lack of mentorship, and limited access to funding in renewable energy sectors.
Kumar, 2021, *Technological Advancements in Solar Energy*	Technological Innovation Theory	Case Study	India	Technological advancements in solar panels have significantly improved efficiency and cost-effectiveness.
Lee & Chan, 2018, *Economic Impacts of Renewable Energy Policies*	Policy Analysis Theory	Econometric Modeling	Europe	Renewable energy policies influence economic development but require reassessment of investment strategies and timelines.
Ahmed, 2017, *Public Perception of Renewable Energy Technologies*	Social Acceptance Theory	Survey Research	Middle East	People's acceptance of renewable technologies is largely influenced by perceived environmental benefits and cost.
Wang, 2022, *The Role of Government Incentives in Renewable Energy Expansion*	Incentive Theory	Longitudinal Study	China	Government incentives are crucial for accelerating renewable energy infrastructure development.

Author, Year, Title	Theory/Concept	Research Design	Area of Study	Main Results
Miller, 2020, *Renewable Energy Integration into National Grids*	Grid Integration Theory	Simulation Study	Global	Integration requires advanced grid management and energy storage solutions.
Johnson & Patel, 2019, *Renewable Energy and Gender Equity*	Gender Equity and Development Theory	Mixed Methods	South Asia	Gender equity in renewable energy sectors is improved through inclusive policies and organizational practices.
Green, 2021, *Environmental Impact of Renewable Energy Sources*	Environmental Impact Theory	Life Cycle Analysis	USA	Renewable energy sources have a lower environmental impact compared to traditional sources, though effects vary by technology.
Nguyen, 2022, *Challenges in Renewable Energy Financing*	Financial Barriers Theory	Qualitative Research	Southeast Asia	Major financing challenges include high initial costs and investor risk perception, hindering project growth.
Brown & Thomas, 2018, *Renewable Energy Policy Effectiveness*	Policy Effectiveness Theory	Policy Analysis	Australia	Effective renewable policies must be goal-oriented, properly implemented, and inclusive of all stakeholders.

Annexure
Annex – I

DEPARTMENT OF GOVERNANCE AND PUBLIC POLICY
NATIONAL UNIVERSITY OF MODERN LANGUAGES (NUML)
ISLAMABAD

Introduction

This is Minahil Khalid from the Department of Governance and Public Policy at the National University of Modern Languages (NUML), Islamabad. I am conducting my M. Phil study on the topic *Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan.*
"You are requested to be a part of this research for the betterment of the society.

Objective of the Study

This study is being conducted to analyze the participation of women in the renewable energy sector is crucial for fostering innovation, sustainability, and comprehensive problem-solving within the industry. However, various factors continue to hinder their entry and advancement, including gender bias, a lack of representation in leadership roles, limited access to mentorship and networking opportunities, family responsibilities, educational barriers, and societal norms.

Type of Research Intervention

This research will involve the subjective experience of employees of One Network Institution, Data could be collected through a survey questionnaire. That will take twenty to thirty minutes.

Participants Selection

Women from various departments of One Network Institution, Pakistan who are working in the institution. This ensures that the sample is representative of the large proportion.

Voluntary Participation

Having freedom of expression, you are being invited to participate in this study on a voluntary basis, you can choose between being of part of this study or not.

Procedure

You are being asked questions related to Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan. Women's can be answered by maximum available inputs from your side. You can offer additional comments on the topic as well.

Duration

Research will be concluded in two years.

Risks

The research does not entail any risk as you participate. No person will be harmed physically, psychologically, or emotionally. Neither any equipment nor any vehicle or any other installments will be affected during the conduct of the research.

Benefits

There will be no direct benefits to you, but your valuable input will help us achieve the objectives of the study.

Confidentiality

The data provided by you will only be used for research purposes and will not be provided to anyone else for any purpose. The identity of the respondents will be kept confidential and will not be shared with anyone outside this study.

Sharing the results

Results of the study can be shared with the respondents. Information provided by you will not be shared to any irrelevant person or institution.

Right to Refuse / Withdraw

You do not have to take part in this research if you do not wish to do so. You may stop participating in interviews at any time you wish, and responses can be withdrawn before concluding the study as well.

How to Contact

Queries related to the study can be addressed by contacting the women directly in my research area or through supervisor Dr. Athar Rashid, coordinator of the Department of Governance and Public Policy, National University of Modern Languages, Islamabad at atharrashid@numl.edu.pk. This study will be reviewed and approved by NUML Faculty Board of Study which is a committee responsible for ensuring the protection of participants. If you do have any further questions please contact Dean Faculty of Social Sciences, Professor Dr. Khalid Sultan through email dean-fss@numl.edu.pk.

Annex – II

CERTIFICATE OF CONSENT

I have been invited to participate in research titled as *Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan.*
I have read the forgoing information, or it has been read to me. I have had the opportunity to ask questions and any questions I have been asked and have answered to my satisfaction. I give my consent voluntary to be a participant of this study.

Name of Participant: _____

Signature of Participant: _____

Date: _____

Annex – III

STATEMENT BY THE RESEARCHER

I have accurately read out the information sheet to the potential participant and to the best of my ability made sure that participants understand the detail of the research. I confirm that the participants were given an opportunity to ask questions about the study, and all the questions asked by the participants have answered correctly and to the best of my ability. I confirm that the individuals have not been forced by any means to give consent, and that consents have been given freely and voluntarily.

A copy of this informed consent form has been provided to the participant.

Name of Researcher: **Minahil Khalid**

Signature of Researcher: _____

Date: _____

Annex – IV

Survey Questionnaire

Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan.

Questionnaire on Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan.

I am Minahil Khalid, student of MPhil Governance and public policy at the National University of Modern Languages (NUML) Islamabad. I am doing thesis on Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan, as a partial fulfillment of MPhil degree requirement. I do herby request you to participate in this survey. Feel free to express whatever you feel appropriate. I assure you that you will be not to receive any suffer or loss due to what you have expressed in this survey.

Thank you.

Sample Questionnaire:

Gender inclusion and development, exploring the factors impacting the women participation in renewable energy transition in Pakistan.

1. What is your gender identity?

- Male

- Female

Other

2. Age of respondents

20-25

25-30

30-35

35-40

40-45

45-50

Other:

3. What is your highest level of education?

Matric
FSC
Bachelor
Masters
M. Phil
Other

4. Have you ever worked in the renewable energy sector?

Yes
No

5. Do you believe there is gender inequality within the renewable energy industry?

- Strongly agree
- Agree
- Neutral

- Disagree
- Strongly disagree

6. Have you personally experienced or witnessed gender discrimination in the renewable energy sector?

- Yes
- No

7. If yes, please briefly describe the situation.

8. Do you think there are enough opportunities for women to advance in leadership positions within the renewable energy industry?

- Yes
- No
- Unsure

9. What barriers do you think exist for women in entering or advancing in the renewable energy sector?

Your answer

10. Do you think there are adequate support systems and initiatives in place to address gender inequality in the renewable energy industry?

- Yes
- No
- Unsure

11. In your opinion, what actions can be taken to promote gender equality and diversity within the renewable energy sector?

12. Have you seen any efforts or initiatives aimed at addressing gender inequality within the renewable energy sector? If yes, please describe.

13. Do you have any additional comments or insights you would like to share regarding gender inequality in renewable energy?

14. How do you envision the role of educational institutions and training programs in preparing and empowering women for successful careers in renewable energy, particularly in addressing any skills gaps or barriers to entry?

Annexure

Gender inclusion and development exploring the factors impacting the women participation in renewable energy transition in Pakistan.

(Interview Guide)

Age _____

Gender_____

Education_____

Occupation_____

Income_____

Class Status_____

National University of Modern Languages, Islamabad (NUML) I am student of MPhil Governance and Public Policy and as being future Policy Maker I have to present a thesis on topic "Gender inclusion and development exploring the factors impacting the women participation in renewable energy transition in Pakistan". The objective is to examine socio economic status of respondents, to explore the challenges and complexities of women working in energy renewable energy sector. Respected Ma'am/Sir, I will be very thankful to you if you take few moments to fill answer the interview from your precious time. The current study is significant on the basis that this research increases the existing knowledge about women working in renewable energy transition field. It will spread awareness among the members of society. INSHALLAH Thank You.

Introduction:

- Welcome and introductions
- Briefly explain research topic and scope of the interview
- Provide information about ethics and informed consent

Opening questions

- Can you please tell me about your organisation and your role within the organisation?
- How many women are currently involved in your organisation?
- How would you describe the involvement of your organisation with the energy transition in Pakistan?

Recognitional justice

- Would you say that gender equality is addressed in the process of energy transitions in Pakistan?
- Do you think that federal government initiatives to promote energy transitions equally?
- consider the rights, needs, and interests of women in Pakistan? Why?

Procedural justice

- From your perspective, do women have the same opportunities as men for participating

in decision-making of energy transitions?

Follow-up questions:

- What barriers do you see for women's participation?
- How are women included in this process? (E.g.: are they consulted? Do they receive specific funding?)
- How would you assess the level of influence women have over the energy transition in Pakistan?

Distributional justice

- What government measures do you think are necessary to ensure an equitable distribution of benefits and opportunities between men and women in this process?
- Do you know of any government strategy to address the participation of women in the energy workforce?
- How do you perceive the impact of energy transition initiatives on women from different racial, ethnic, and socioeconomic backgrounds?

Winding down questions

What a gender-just energy transition means to you and your organization?

Is there any additional information you would like to share?

After the interview

- Thank the participant for their collaboration
- Discuss next steps