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ASSESSING AWARENESS PATTERNS ON RENEWABLE ENERGY TRANSITIONS PROMOTION IN AFGHANISTAN; A SCOPING REVIEW

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This systematic scoping review pooled findings of 119 peer-reviewed articles that investigate the patterns of awareness of renewable energy in Afghanistan and similar situations in South Asia. A full search of the Scopus database identified 595 articles; 119 of them met the inclusion criteria. Findings showed that in Afghanistan, renewable energy awareness (existence awareness) is between 30-50%, which is significantly lower compared to other similar countries (40-75%). The level of technical, economic, and policy awareness is critically low (<15% and, <12% and <10% respectively). The demographic data revealed significant differences: education generated 7-8x awareness gaps, urban-rural residence had 2.2x gaps, and gender differences were 10-15%. The level of awareness-adoption gaps was reached 50-80, which means that awareness is not enough to change behaviour. The main barriers to adoption were economic barriers (95% of studies), lack of technical expertise (82%), and knowledge gaps (88%). Religious leaders and community protests were most effective in raising awareness, but government channels had a limited reach (less than 10 per cent) and credibility. Multi-level interventions (comprising knowledge, economic, technical, institutional and social barriers) need to be integrated and tackled simultaneously in order to speed up the adoption of renewable energy in Afghanistan.

Keywords: Renewable energy, public awareness, Afghanistan, energy transition, sustainable development, energy policy

1. Introduction

1.1 Background and Context

The transition to Renewable Energy (RE) from a fossil-fuel-based system has been the order of the day globally. This transition has been necessitated by various factors or concerns relating to climate change, environmental degradation, energy security, and the need for sustainable development. This has led to concerted efforts by policymakers or the government to invest in RE technologies as a means of reducing greenhouse gas emissions.

Afghanistan, on one hand, has been encumbered with numerous challenges in the energy sector, ranging from limited access to electricity to overdependence on foreign energy, which has recently been in short supply. Currently, Afghanistan relies heavily on imported energy, mainly from neighbouring countries such as Tajikistan, Uzbekistan, and Iran. This reliance exposes the country to vulnerabilities related to tensions and geopolitical energy security (Wali et al., 2020). The inconsistent energy supply has been linked to several factors, including conflict, political

instability, and infrastructure deficits. At present, Afghanistan is among the countries with the lowest levels of electricity access globally, with about 30% of the population having reliable electricity (Fahimi & Upham, 2017). Many residents depend on traditional energy sources like firewood and animal waste for cooking and heating, while kerosene and candles remain common for lighting (Fahimi & Upham, 2017). The fragility of this situation has been exacerbated by decades of conflict and poor governance, resulting in irregular demand and uneven distribution of power among households (Ahady et al., 2020; Wali et al., 2020).

Also, approximately 40% of the electricity generated is lost during transmission due to outdated infrastructure and insufficient maintenance (Danish et al., 2019). This has led to an energy crisis where demand exceeds supply, with a forecast of shortages owing to mismatched investments in energy infrastructure (Ahady et al., 2020).

Despite the challenges, Afghanistan has the potential for Renewable Energy (RE) resources, especially hydro, solar or wind energy. The recent release by the Ministry of Energy and Water of Afghanistan reported that the country has a potential of approximately 318 GW of renewable energy production capacity, which is still harnessed in fractions due to infrastructural and investment constraints (Silmanikhil et al., 2020; Ahmadzai & McKinna, 2018). While the potential for renewable energy remains untapped in Afghanistan, the renewable energy sector is seen as a pathway to achieving sustainable development, with Sustainable Development Goal 7 (SDG 7) specifically aiming to promote access to affordable and clean energy for all, which is still lacking in the country, to create a conducive environment for development initiatives.

1.2. Research Problem

Despite the implementation of various RE projects by international donors, NGOs, and the government, there has been a paucity of systematic research seeking to understand the level of public knowledge, attitudes, perceptions, information sources, and factors that affect awareness across different demographic groups and geographical regions. This knowledge gap has several crucial manifestations, including a lack of awareness of how RE functions, whether it is economically viable, whether it requires maintenance, and whether it has long-term benefits (Patmal & Shiran, 2021). This lack of awareness is a direct cause of several obstacles that hinder the adoption of renewable energy in Afghanistan, compared with other developing countries in South and Central Asia. Systematic research on energy transitions and public engagement has already been conducted by Jenkins et al. (2016) and Slimanikhil et al. (2020), yet longitudinal data on awareness patterns are still missing, leaving a lack of empirical data on the effectiveness of earlier awareness campaigns or the real responsiveness of various demographic groups to renewable energy promotion efforts.

Moreover, the literature on the energy sector in Afghanistan touched upon the technical feasibility and economic viability of energy transitions to renewable sources but did not focus much on human and social aspects of energy transitions (Fahimi & Upham, 2017; Wali et al., 2020). This gap has led to a partiality in comprehending the social preconditions to successful transitions towards renewable energy in the Afghan setting. The necessity to fill this awareness gap will make it possible to comprehend the present-day level of awareness of renewable energy among the population of Afghanistan. This paper aims to examine the level of public awareness of RE energy promotion in Afghanistan and factors affecting the level among demographic groups, thus offering fundamental information to guide future policy-making and programmatic interventions needed to speed up the process of Afghanistan's shifting to sustainable energy systems.

1.3 Research Objectives

To properly understand the role of awareness in advancing RE adoption in Afghanistan, this study seeks to examine knowledge level, perception patterns and adoption challenges among the population. Accordingly, the core objectives of this study are to:

- assess the current levels and patterns of public awareness regarding renewable energy technologies in Afghanistan.
- identify key factors influencing public perception and acceptance of renewable energy.
- examine barriers and challenges affecting renewable energy awareness and adoption
- propose strategies for strengthening public awareness and promoting renewable energy adoption

1.4 Research Questions

To achieve the objectives, the following questions will be sought to guide the study:

- What is the current level of public awareness patterns regarding renewable energy in Afghanistan?
- What are the main sources of information that shape renewable energy for the Afghan population?
- What factors influence public attitudes toward renewable energy adoption?
- What are the perceived benefits and barriers to renewable energy use?
- How can awareness campaigns be designed to effectively promote renewable energy?

The above seeks to contribute to existing literature on RE transition efforts for Afghanistan's energy sector, sustainable development goals, and policymaking, and it is a contribution to academic discourse on renewable energy in developing countries, offering a systemic approach to people's awareness level.

2. Literature Review

2.1 Global trend of Renewable Energy Transition

The global transition of the energy system to renewable energy sources is one of the largest infrastructure transformations of the twenty-first century. According to the estimates of the International Energy Agency (IEA), in 2023, renewable energy sources will supply approximately 30 per cent of the global electricity, and should they keep growing, they could potentially supply up to 45 per cent of the global electricity in 2030 (IEA, 2024; Citaristi, 2023). Renewable Energy (RE) adoption has been one of the major approaches to enhance energy security and reduce dependence on foreign fossil fuels, as well as promote sustainable development. In developing nations, the utilisation of renewable energy sources, including solar, wind and hydro, has played a significant role in bridging the energy access gaps, thus increasing access to cheap and clean energy among underserved rural populations.

As an example, Brazil, India, Denmark, Costa Rica, Uruguay, and Kenya have been at the forefront of tapping into renewable resources to produce approximately 60-90% RE (IRENA, 2023; Fahimi and Upham, 2017; Zaheb et al., 2023). Even as Germany and Spain have focused on wind and solar technology with less favourable natural resources, the Nordic countries have been able to utilise their large hydroelectric resources, as well as investing in wind energy. The use of the Proinfa programme in Brazil helped to increase the use of wind and biomass energy, and the increase in renewable power was successful. India, however, has successfully utilised solar power via the Jawaharlal Nehru National Solar Mission, whose aim is to attain mass solar energy production, which plays a significant role in the energy demands of the country (Ratnaningsih, 2022). Inclusion of partnership with the private sector, the presence of a clear regulatory framework and long-term international support have been credited with success stories.

However, there remains a significant dependence on fossil fuels and traditional biomass in Sub-Saharan Africa and some parts of Asia (IRENA, 2023; IEA, 2024). The differences in the adoption rates across the developing countries can be attributed to various factors, including the endowment

of resources, financial resources, policy commitment, institutional capacity, and public acceptance (REN21, 2023).

Afghanistan, as one of the least developed countries (LDCs), points out a major disparity in the use of renewable energy (RE) in the world. Even though LDCs have significant potential for renewable energy, especially in solar, wind, and hydroelectric energy, the real implementation of renewable energy is still far lower than the potential, with renewable energy supplying less than 10 per cent of the total energy production in most LDCs (IRENA, 2022). Poor access to financing, poor technical infrastructure, and regulatory obstacles still hinder the mainstream use of RE technologies in most developing countries, slowing the utilisation of these RE sources (Ayik & Ijumba, 2025; Erna and Mutaqin, 2023). Also, these technologies are not always accepted and used because of the absence of public awareness and capacity-building programmes (Imranullah and Hakimuddin, 2024; Bose et al., 2023).

2.1.2. Policy Frameworks and Incentives Driving RE

The adoption of RE has been significantly facilitated by deliberate policy intervention and financial initiatives. These policies will establish a benchmark for understanding and developing interventions for developing countries, which find it difficult to harness RE. Some of the global policies are

a. **Feed-in Tariffs (FITs) and Purchase Power Agreements (PPAs):** In the 1900s, Germany and Denmark developed this policy of FITs, which provides project developers with revenue certainty and accelerates adoption by guaranteeing a fixed, premium price for renewable electricity over a contractual period. Studies show that FITs can significantly increase capacity when intelligently aligned with technological prices and grid constraints (Kimuli & Kirabira, 2025; Bracho et al., 2018). PPAs, on the other hand, offer long-term off-take agreements between project developers and buyers (utilities or corporates), transferring off-take risk from developers. PPAs facilitate project financing by ensuring predictable cash flows, improving debt servicing, and mobilising private capital (Kimuli & Kirabira, 2025; Bracho et al., 2018).

b. **Renewable Portfolio Standards and Renewable Energy Targets:** The policy of Renewable Portfolio Standards (RPS) requires energy suppliers to obtain a certain proportion of their electricity from renewable sources. Failure to do so results in penalties. By establishing investment signals and regulatory clarity, these policy tools encourage private sector participation. Combining objectives with risk-sharing and concessional financing enhances deployment in the early stages of market growth in LMICs (Sohag & Grigorian, 2025; Kimuli & Kirabira, 2025; Zehri, 2025).

c. **Financial Incentives and Support Mechanisms:** By lowering capital costs and enhancing financial feasibility, direct financial incentives accelerate the adoption of renewable energy. Key mechanisms include capital subsidies and grants, tax incentives such as accelerated depreciation and investment tax credits, which reduce after-tax costs and improve project economics, thereby attracting private capital. Tax exemptions on energy taxes can also increase the competitiveness of renewable technologies (Isah et al., 2023). Additionally, concession financing is another mechanism that reduces the cost of capital and improves loan conditions for renewables, especially in high-risk environments. Net metering is another strategy that enables distributed generation (e.g., residential rooftop solar) to feed excess electricity back to the grid at retail rates or other favourable tariffs. Net metering supports the deployment of small-scale renewables and can stimulate local entrepreneurship but requires impact assessments and fair tariff design to prevent cross-subsidies (Rehman et al., 2020).

d. **Regulatory and Institutional Frameworks:** Alongside financial incentives, supportive regulatory structures such as grid connectivity standards, net metering rules, environmental impact assessment requirements, land use policies, and institutional systems for energy sector management are essential for renewable energy transitions. According to Sohag & Grigorian (2025), countries

with robust institutional capabilities and legal frameworks adopt renewable energy more swiftly and effectively.

2.2. Renewable Energy in South and Central Asia

The possibility of renewable energy in South and Central Asia is spectacular. The Himalayan and Hindu Kush mountain ranges are characterised by a significant hydroelectric potential; the coasts and highlands have significant wind potentials; the area enjoys abundant solar radiation, particularly in highland plateaus and arid regions; and biomass resources based on forests and agricultural residues (OECD, 2023; Laldjebaev et al., 2021).

The utilisation of renewable energy in South Asia currently differs greatly among the countries. India is the largest nation by area, and despite its slower growth rate compared to other countries, it has achieved significant success in the implementation of renewable energy, with the share of renewable energy in the total installed generation capacity surpassing 40 per cent by 2023 (IEA, 2023). But when it comes to real electricity generation, fossil fuels continue to control power generation. Despite its outstanding potential, Afghanistan, still being heavily dependent on hydroelectric power (approximately 35% of electricity) and imported power in neighbouring countries, has smaller yet still significant renewable sources of energy (World Bank, 2020). Several challenges have been identified that can prevent the advancement of renewable energy in these regions, such as regulatory framework, infrastructure, finances, expertise, awareness and support, and data and information (Laldjebaev et al., 2021). This implies that giant strides have been made towards renewable energy in the Central Asia region but have been hindered by different issues. Status and capacity of RE in South and Central Asia. According to IRENA and IEA sources, they are shown in Table 1 below.

Table 1: Renewable Energy in South and Central Asia: Status and Capacity

Country	Total RE Capacity (GW)	Hydroelectric (GW)	Solar (GW)	Wind (GW)	Biomass/Other (GW)
Afghanistan	0.66	0.66	0.00	0.00	0.00
Tajikistan	4.57	4.50	0.02	0.00	0.05
Uzbekistan	3.47	3.20	0.12	0.07	0.08
Kyrgyzstan	3.53	3.50	0.01	0.00	0.02
Turkmenistan	0.30	0.29	0.00	0.00	0.01
Kazakhstan	3.13	0.04	2.50	0.45	0.14
Pakistan	9.78	6.55	1.00	1.73	0.50
India	159.65	45.20	60.45	43.88	10.12
Bangladesh	2.25	0.67	0.81	0.57	0.20
Nepal	4.13	3.95	0.15	0.01	0.02
Sri Lanka	5.39	3.52	1.25	0.50	0.12

Sources: *Data compiled from IRENA, IEA, and national energy ministry sources.*

From the table 1 above, South and Central Asia has about 196.86 GW of renewable energy potential, of which South Asia (66% of regional potential) is the first deployer, with accelerating solar growth (45% CAGR) and wind growth (15% CAGR) and Central Asia is heavily reliant on hydroelectric generation (59% of regional potential) in countries with mountainous topography India leads the region with 159.65 GW of RE capacity, fueling South Asian development with enormous solar and wind installations, and Afghanistan is a pressing deployment gap: though it has an estimated 318 GW of renewable energy potentials. Countries in Central Asia such as Afghanistan, Uzbekistan and Kazakhstan have a huge potential of solar and wind power which is not fully utilized.

2.3. Renewable Energy Potential in Afghanistan

Afghanistan's energy matrix has some of the lowest electricity access rates in the world; approximately one-third of the population has access, and it relies heavily on imported electricity produced in Central Asian countries (Fahimi and Upham, 2017; Neyazi et al., 2024). The main sources of energy remain biomass (fuelwood and charcoal) and fossil fuels, which also makes them very important, and the necessity to switch to cleaner sources is more than urgent.

Over time, studies have shown that the country is endowed with a lot of potential for renewable energy, especially in solar, wind, hydro and biomass. According to the Ministry of Energy and Water, the country has approximately 318 GW of hydroelectric renewable energy, but this potential has not been fully exploited (Sabory et al., 2021; Fahimi and Upham, 2017). It is important to note that there is a huge potential in solar energy, particularly considering the geographical location of Afghanistan, which has year-round access to high solar radiation.

Nonetheless, the existing energy system is characterised by disunity and inefficiencies, and around 40 per cent of the electricity produced is lost during the transmission (Fahimi & Upham, 2017). Over the years, the government has been working on enhancing the situation by signing energy importation agreements and putting in place small-scale renewable energy projects in rural communities (Fahimi & Upham, 2017). Nevertheless, due to such attempts, the development of sustainable energy has been hampered by political instability, and the absence of a coordinated energy policy framework is still a challenge (Neyazi et al., 2024; Din, 2021).

International donors have also played a role in facilitating the transition towards renewable energy by offering multiple projects to enhance the accessibility and reliability of energy, which is also constrained by the capacity to govern (Bose et al., 2023; Sabory et al., 2021).

All in all, the energy mix of Afghanistan is an intricate combination of challenges and opportunities, yet addressing the barriers will need a collective effort of stakeholders in different sectors to ensure sustainable energy practices and enhance energy access among the population.

2.3 Public Awareness of Energy Transition Adoption

Energy transitions explain the processes of energy production, distribution, and consumption in societies. Previous studies of the key energy transformations that have occurred since the time of wood to coal, coal to oil, and in more recent times to renewable energy reveal that social approval and participation are always key elements that shape the rate and effectiveness of such transformations. The importance of awareness in enabling energy transitions has received a fair share of recognition in the academic literature, and researchers have continuously attributed it as being a key requirement in the successful implementation of renewable energy technologies. The consciousness of energy transition affects the way people perceive energy alternatives, which is the interpretation of environmental and economic benefits and the evaluation of the risks associated with new technologies. (Abdullah et al., 2020). Adeleye et al. (2024) and Ngungi and Muthama (2021) conducted a thorough review that demonstrated that decentralised renewable energy systems are acceptable. They found that there is more awareness among people regarding renewable resources. The government has played a major role in encouraging people to use renewable energy technologies, and people are growing more aware of the renewable energy initiatives through the energy transition plan.

Nevertheless, the connection between awareness and the adoption of renewable technologies has undergone a number of theoretical approaches, which provide significant understanding of the role of knowledge in influencing behaviours. A basic framework is the Diffusion of Innovation Theory (DIT) of Rogers (2003), which is based on the notion that the first step in an adoption process is awareness and the five-step process includes awareness, interest, evaluation, trial, and adoption. This model says that potential adopters need to be aware of the existence of an innovation before they proceed through the subsequent stages. Empirical research agrees that awareness precedes adoption, but it is neither automatic nor direct. Most studies indicate positive relationships

between renewable energy awareness and intentions or behavioural responses to renewable energy adoption. Narayan et al. (2025) examined how the awareness of renewable energy, the belief in its advantages, and the cost of producing renewable energy sources affect the tendency to use the latter. These findings showed that the subsequent determinant of the intention to adopt is the knowledge of renewable energy. Almulhim (2022) investigated the environmental public awareness and attitudes of renewable energy and revealed a moderate knowledge about renewable energy, which further helped them to make decisions on the energy transformation agenda. Nonetheless, studies also reveal significant caveats and complexities to the awareness-adoption, yet in any case, awareness is a necessary but not sufficient condition for a large-scale adoption. Another thing to understand is that the surface-level knowledge of the presence of renewable energy is not the same as knowledge of the technical details, economic factors, and operational needs of renewable energy. Martinsson et al. (2011) suggest that particular knowledge of renewable technology is more predictive of adoption compared to general environmental knowledge. Sardianou & Genoudi (2013) indicate that certain knowledge regarding the benefits and functionality of solar water heaters has a significant impact on purchasing decisions, alongside general environmental issues. It means that to provide substantial, useful information, awareness-creating programs should not be limited to a simple message.

2.5 Factors Affecting Public Perception of Renewable Energy

There are several influences that determine the way the population understands and analyses renewable energy technologies. These factors are active on the individual, social and systemic levels, and often interact in complex forms to influence the general awareness and attitudes. Sociodemographic traits have a significant impact on awareness at the individual level. Numerous studies show that higher education has always been associated with more knowledge on renewable energy technologies, climate change, environmental impact of traditional energy, benefits of renewable alternatives, and better support for renewables (Zhang et al., 2023).

The gender factor also plays a role, with women being more environmentally concerned than men, and males being more technically informed on the renewable systems (Dirksmeier & Tuitjer, 2022). As some studies have found, the high level of environmental concerns among women does not always translate into a higher adoption and acceptance rate of technology or even all policy tools (Dirksmeier and Tuitjer, 2022).

Moreover, in several studies, an increased income correlates with increased awareness and interest in environmental concerns, which can make the support of renewable or pro-environmental policies stronger (Zhang et al., 2023). Another significant dimension is the psychological factors. The process of forming attitude is strongly dependent on awareness and knowledge- people cannot form positive attitude towards technologies they are not aware of. Quality and level of awareness largely depend on the information sources and communication channels. Studies distinguish between the factual knowledge (knowledge of how technologies work) and evaluative beliefs (cost-benefit and risk assessments) Awareness on the other hand can be enhanced through educational interventions, but this requires pedagogical strategies, accuracy of the content and relevance to the values and concerns of the audience (DeWaters and Powers, 2011).

2.5 Theoretical Framework

The theoretical models that will be used in this study are the Technology Acceptance Model and the Diffusion of Innovation Theory. The Technology Acceptance Model (TAM): This is a well-validated perspective that can be used to explain how people develop beliefs regarding renewable energy technologies and how these beliefs impact acceptance and adoption. TAM assumes two fundamental determinants, including perceived usefulness (PU) and perceived ease of use (PEOU), that influence the attitudes towards use and, as a result, behavioural intention and actual use (Bhatia et al., 2024; Matthew & Ebiniyi, 2025). TAM is often expanded or combined with other theories (e.g. Diffusion of Innovations, TPB) in renewable energy contexts to incorporate

social influence, facilitating conditions, and contextual influences on adoption at both the household level and community level. These integrations aid in understanding how energy literacy, trust and governance processes combine with technology attributes to facilitate or inhibit uptake (Bhatia et al., 2024; Nwokolo et al., 2024). Since your corpus focuses on the individual-level determinants (education, knowledge, perceived benefits) and on social-psychological processes (attitudes, norms, perceived behavioural control) in shaping the consumer response to rooftop solar and mini-grids (and other distributed renewables), TAM provides a consistent theoretical basis on which to model consumer responses in Afghanistan. But it must be supplemented with diffusion and behaviourally aware governance factors to fill the attitude-behaviour gap and context-specific obstacles in security-constrained settings (Bhatia et al., 2024; Nwokolo et al., 2024).

3. Methodology

To analyze the trends in renewable energy awareness and relate them to the prospects of a sustainable shift to energy systems in Afghanistan, this study employs a **systematic scoping review methodology** which is grounded in the theoretical framework as described and refined by Levac et al. (2010), who posited that scoping reviews is systematic methods for mapping the range, extent, and nature of the available evidence on a topics. This methodology is well-suited for topics characterised by exploratory research questions, heterogeneous evidence bases combining qualitative and quantitative research, and contexts where comprehensive evidence synthesis would provide substantial value to policy and practice communities (Higgins et al., 2019). This element is inherent in the topic, which makes scoping review the methodologically appropriate choice, for the fact that in Afghanistan, terrain is widespread and problematic and ethical approval procedures are lengthy, which is why secondary data analysis will be used to achieve quick and empirically valid conclusions.

For this study, the scoping review examines evidence on renewable energy awareness in Afghanistan, with secondary focus on comparable South and Central Asian contexts (Pakistan, Bangladesh, Nepal, Tajikistan, Kazakhstan, Uzbekistan and others) to enable comparative understanding. The review encompasses evidence from all geographic regions of Afghanistan where data exist, though acknowledges gaps in insecure regions. The data is purposively selected using the Scopus database. Data which are publicly available, and methodologically sound and current, were taken into consideration as inclusion criteria. The review explicitly stratifies findings across demographic categories to enable examination of whether and how awareness patterns vary by age, gender, education, economic status, employment, location, and geographic region, recognizing that renewable energy awareness and adoption are not uniformly distributed across the Afghan population. The five-stage scoping review process posited by Talamonti et al. (2024) and Pham et al. (2014) were followed which includes: (1) identifying research questions; (2) systematically searching for and identifying relevant studies across academic and grey literature; (3) screening and selecting studies using explicit criteria; (4) extracting data into standardized forms; and (5) synthesizing findings through narrative synthesis and summary tables.

3.1. Search Strategy Execution

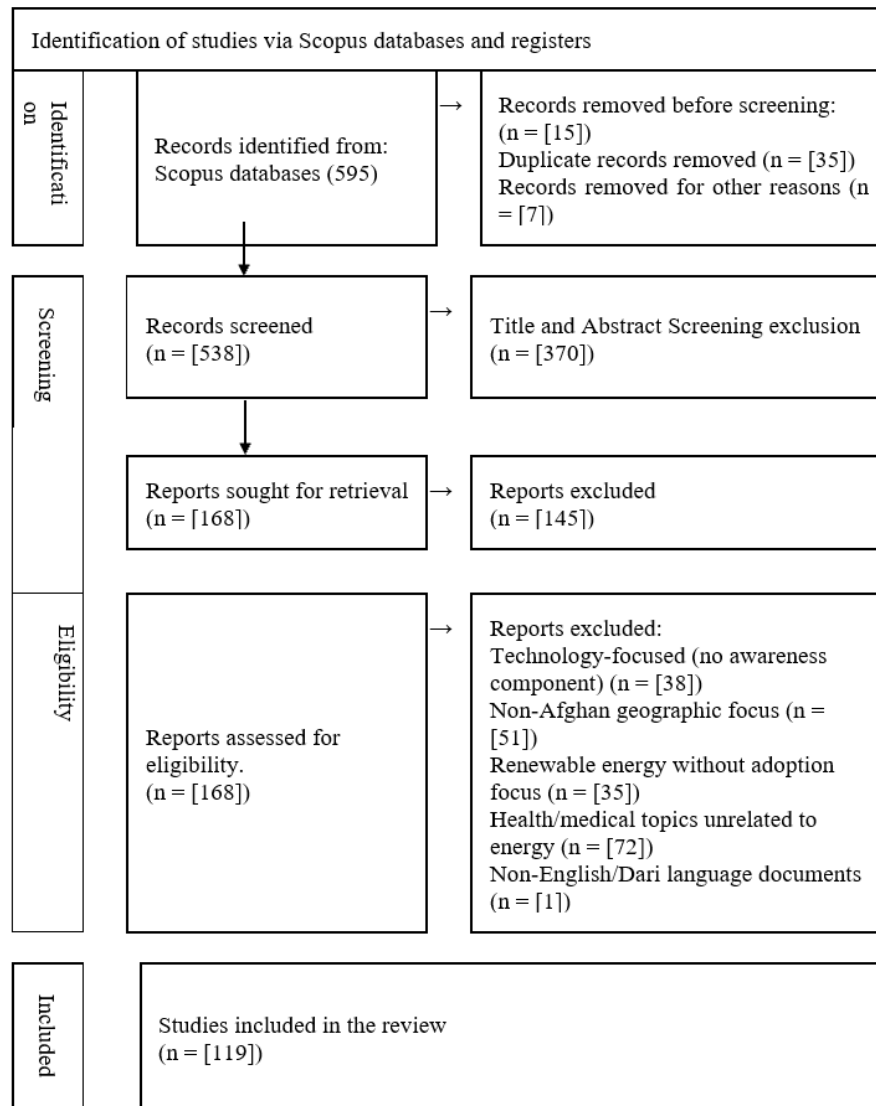
A comprehensive systematic literature search was conducted on April 8, 2026, using the Scopus database to identify peer-reviewed literature on renewable energy awareness, knowledge, perception, and adoption in Afghanistan and comparable contexts. A Title-abstract search string was conducted using the Boolean operators of (AND, OR and EXCLUDE) to ensure a comprehensive yet focused retrieval of relevant studies. The search string incorporated key thematic areas, including renewable energy concepts, awareness constructs, and adoption outcomes. To ensure relevance and quality, the search was limited to publications between 2015 and 2025 and excluded non-scholarly document types such as editorials and notes. The 11-year timeframe (2015-2025) captures recent literature most relevant to the contemporary renewable energy context while excluding older literature less directly relevant to the current Afghanistan situation. Additionally,

subject areas unrelated to the study focus, including medical and natural sciences, were excluded to maintain alignment with energy, environmental, and social science perspectives. The following brings the final search query conducted with the following strings:

("Afghanistan") AND ("renewable energy" OR "sustainable energy" OR "solar energy" OR "energy transition") AND ("awareness" OR "knowledge" OR "perception" OR "attitude") AND ("adoption" OR "uptake" OR "diffusion" OR "acceptance") AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (EXCLUDE (DOCTYPE , "ed") OR EXCLUDE (DOCTYPE , "sh"))

The Study process is documented using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram in Figure 1, showing retrieval, screening, and selection process. Data extraction used standardized form capturing study characteristics, awareness dimensions measured, findings related to research questions, demographic patterns, barriers and facilitators, and quality assessment. Extracted data were thematically extracted into thematic summary tables. Thematic analysis identifies common themes across studies (convergent findings) and contextual variations (divergent findings). Secondary quantitative data analyzed using descriptive statistics Ethical issues were observed during the course of the extraction of public data.

Figure 1: PRISMA 2020 Flow Diagram



Source: PRISMA Flow chart. Adapted from (Talamonti et al., 2024).

3.5 Search Result Analysis

On April 8, 2026, the search performed via Scopus revealed 595 peer-reviewed publications that fit the search criteria. This yield is very large because the research interest in renewable energy awareness, adoption and barriers has been increasing across the world, with a particular focus on recent years (2015-2025). Screening and selection process, 119 studies are eligible due to full inclusion criteria, translating to 11-21% of the records initially identified. This high-volume of evidence proves that there is enough literature to do a thorough scoping review of renewable energy awareness and adoption in Afghanistan. The search of the recent publications (73.9% of which were published in 2022-2025) suggests that the literature retrieved is relevant nowadays, and the number of empirical studies, reviews, and organization reports offers a wide range of perspectives of factors that influence the awareness of renewable energy.

Study Characteristics

From the 595 papers retrieved, 119 articles met the eligibility criteria that analyzed the understanding of renewable energy and its uptake in Afghanistan and other similar South and Central Asian settings. The studies used various methodologies and were based on different sources as shown in Table 2.

Table 2: Characteristics of 119 Included Studies

Characteristic	Category	Count	%
Study Design	Quantitative surveys	45	37.8%
	Qualitative research	40	33.6%
	Mixed-methods	12	10.1%
	Policy/organizational reports	15	12.6%
	Review articles	7	5.9%
Document Type	Journal articles	75	63.0%
	Books/book chapters	22	18.5%
	Organizational reports	18	15.1%
	Dissertations/conference	4	3.4%
Geographic Focus	Afghanistan	27	22.7%
	South Asia (Pakistan, Bangladesh, Nepal)	50	42.0%
	Central Asia (Tajikistan, Uzbekistan)	18	15.1%
	Comparative/regional	17	14.3%
	Unclear/multiple	7	5.9%
Publication Period	2015-2017	9	7.6%
	2018-2020	28	23.5%
	2021-2023	59	49.6%
	2024-2025	23	19.3%

Source: Scoping result

Table 2 is a descriptive distribution of the selected studies according to design, type of publication, geographic interest, and time of publication. Quantitative surveys (37.8%) dominated the study type, followed by qualitative research (33.6%), which indicates a strong emphasis on both statistical analysis and contextual understanding. Conversely, mixed-methods studies (10.1%) are not so frequent, and policy reports (12.6) and review articles (5.9) represent the smaller percentage. In the case of the type of publication, journal articles (63.0%), in turn, indicate the use of peer-

reviewed scholarly materials. The books and book chapters (18.5) and organisational reports (15.1) also play a significant role, whereas the dissertations and conference papers play a minor role (3.4).

The majority of the studies are focused on South Asia (42.0%), and then there are studies of Afghanistan-specific (22.7%). The proportion of Central Asia is 15.1, and the comparative or multi-regional studies are also 14.3. It implies that there is a relative lack of Afghanistan-related research, which is why similar regional settings should be included. The high number of journal articles (60.7) provides the inclusion of peer-reviewed empirical research of academic quality. A considerable proportion of books, reviews, and book chapters (37.8% combined) offer synthesis and theoretical insights to supplement empirical research. Conference papers are a type of emerging research that has not yet been published.

Renewable Energy Awareness Levels

Table 3 presents the prevalence of awareness that renewable energy technologies exist across the studied populations.

Table 3: Renewable Energy Awareness Prevalence by Location

Country	Urban (%)	Rural (%)	Overall (%)	Sample Basis
Afghanistan	45-60	25-40	30-50	6 studies
Pakistan	55-70	25-45	40-55	8 studies
Bangladesh	50-65	30-50	40-55	7 studies
Nepal	70-85	45-60	55-70	6 studies
India	70-85	50-70	60-75	12 studies
Central Asia	50-65	35-55	45-60	5 studies

Source: Scopus result Analysis

Based on the above, the levels of awareness are always higher in urban areas compared to rural areas in all countries. India and Nepal are examples of countries with relatively high levels of urban awareness (70-85%), but with lower levels of rural awareness, which is still relatively high in comparison with other countries. Conversely, Afghanistan has the lowest awareness rates, especially among the rural population (25- 40%), with a huge urban-rural disparity. Countries in South Asia, like Pakistan and Bangladesh, lie in the moderate category, whereas the awareness of Central Asia is more balanced but moderate. This generally indicates that the level of awareness is heavily dependent on geographic location and the development of infrastructure, where the rural populations are more likely to have limited access to renewable energy information and technologies.

Awareness Dimensions Prevalence

Table 4 shows the prevalence of specific awareness dimensions across populations.

Table 4: Awareness Dimensions Prevalence (% of Population)

Awareness Dimension	Definition	Prevalence	Geographic Variation
Existence Awareness	Knows RE technologies exist	30-75%	Lower in Afghanistan (30-50%); higher in India (60-75%)
Technical Awareness	Understands how technology functions	10-35%	<15% in Afghanistan; 20-35% in India/developed regions
Economic Awareness	Knows realistic costs and economic viability	12-30%	<15% in least-developed countries; consistent overestimation of costs
Environmental/Health Awareness	Benefit Understands climate/health benefits	45-70%	Higher in areas with visible air quality problems

Awareness Dimension	Definition	Prevalence	Geographic Variation
Policy Awareness	Knows government policies/incentives	8-25%	<10% in Afghanistan; 20-25% in countries with active policies
Adoption Awareness	Sees examples of RE deployment	20-45%	Highly location-dependent on visible installations

The table above reveal that the awareness of basic (existence) awareness is quite common (3075%), but the in-depth knowledge is scarce. As an example, the level of technical awareness is very low (10-35%), and even even less in Afghanistan (<15%), which means that the majority of the population does not have any idea how the renewable technologies are actually functioning. Equally, economic awareness is poor (1230 percent), and most people estimate expenses, particularly in less developed settings. The lowest awareness is policy awareness (825%), especially in Afghanistan (less than 10%), which implies that there is not much awareness of government incentives or support mechanisms.

Conversely, awareness of environmental and health benefits is comparatively more (4570%), probably due to the easy visibility of these effects and their comprehensiveness. The awareness of adoption (2045) is quite diverse because people are able or not to observe renewable energy systems in their community.

4.3 Sources of Information

Table 4.5 presents primary information sources through which populations learn about renewable energy.

Table 4.5: Primary Information Sources for Renewable Energy Awareness

Information Source	% Citing as Primary Source	Geographic Relevance	Credibility Rating
Media (TV, radio, internet)	50-70% (urban); 20-35% (rural)	Developed and middle-income countries	Moderate (varies by source)
Government/official channels	20-40% (functional governance); <10% (Afghanistan)	Pakistan, India, Bangladesh high; Afghanistan low	Low in fragile states; moderate elsewhere
Community/religious leaders	25-50% (rural); 10-25% (urban)	All regions, highest in rural areas	High (trusted)
Educational institutions	15-30% (students); 5-15% (general)	Limited; where RE curriculum exists	Moderate-high (if present)
Family/social networks	20-40% (all contexts)	All regions, informal channel	High (trusted)
NGOs/civil society	15-35% (areas with NGO presence)	South Asia, Central Asia	Moderate-high (established NGOs)
Project demonstrations	25-50% (areas with visible projects)	Location-dependent	Very high (proven)

4.5 Barriers to Awareness and Adoption

Table 4.6 summarizes barriers identified across 119 studies, organized by barrier category. Adoption Barriers Mentioned in Included Studies (% of Studies Identifying)

Barrier Category	Specific Barrier	% of Studies	Primary Impact	Severity in Afghanistan
Economic	High capital costs	95%	Prevents adoption for poorest 70%	Critical
	Lack of financing access	88%	Limits scaling beyond wealthy	Critical
	Uncertain economic returns	72%	Creates risk aversion	High
Technical	Lack of technical expertise	82%	System failure, reduced confidence	Critical
	Unavailable spare parts	76%	System abandonment long-term	Critical
	Maintenance complexity	65%	Perceived complexity barrier	High

Barrier Category	Specific Barrier	% of Studies	Primary Impact	Severity in Afghanistan
	Poor grid infrastructure	71%	Integration challenges	Critical
Knowledge	Lack of technical knowledge	88%	Misconceptions, skepticism	Critical
	Economic knowledge gaps	85%	Cost overestimation	Critical
	Policy/incentive unawareness	72%	Missed opportunities	Moderate
Institutional	Lack of government policy	68%	Policy uncertainty	High
	Low institutional capacity	71%	Implementation failures	Critical
	Institutional mistrust	65%	Skepticism toward programs	High
	Regulatory barriers	52%	Prevents small-scale adoption	Moderate
Social/Cultural	Community skepticism	61%	Resistance to adoption	Moderate
	Cultural incongruence	48%	Resistance in traditional areas	Moderate
	Gender constraints	59%	Limits women's involvement	High
	Risk aversion/habit	64%	Preference for status quo	High
Geographic	Geographic isolation	58%	Limited access to services	Critical
	Conflict/insecurity	31%	Disrupts activities (high in Afghanistan)	Critical
	Climate/environmental challenges	44%	Resource availability issues	High

5. Discussion

5.1 Interpretation of Findings

4.8.1 Awareness Level in Afghanistan

Afghanistan's renewable energy awareness baseline (30-50% existence awareness) is substantially lower than comparable South Asian countries, this level reflect compounded effects of literacy education (31% national literacy), geographic isolation (75% rural), limited media and education infrastructure, and conflict related disruption on awareness activities. Urban-rural disparities are particularly pronounced, with rural populations showing 50% lower awareness than urban counterparts.

The critical finding that technical awareness remains below 15% and economic awareness below 12% reveals that populations in Afghanistan lack foundational understanding necessary for informed adoption decisions. The systematic overestimation of renewable energy costs (by factors of 2-3x) suggests that economic barriers are partially perceived barriers—addressing cost misconceptions could reduce adoption barriers substantially.

4.8.2 Demographic Targeting Implications

The consistent finding that education is the strongest predictor of awareness (7-8x difference between illiterate and tertiary-educated populations) has direct implications: awareness strategies must be simplified for lower-education populations, avoiding technical jargon and complex concepts. The 2.2x rural-urban awareness gap indicates that rural awareness campaigns require different approaches (community-based, in-person) than urban campaigns that can leverage media.

The consistent 10-15% gender gap in awareness suggests that women have less access to information sources but does not reflect inherent differences in capacity or interest. Targeted women-focused awareness using trusted female community members or health workers could close this gap. The pronounced difference by employment (formal sector workers show 30-50% higher awareness) reflects both education differences and information exposure through workplace networks.

4.8.3 Information Source Effectiveness

Religious leaders and community leaders emerge as most credible information sources in rural and traditional communities, yet they are often excluded from awareness campaigns. The finding

that <10% of Afghan populations cite government as information source reflects both limited government communication capacity and justified institutional skepticism. This suggests that awareness campaigns relying on government channels will have limited reach and effectiveness unless government institutions first build credibility through effective service delivery.

The visibility of demonstration projects shows strong influence on awareness and adoption intention (25-50% of nearby populations show increased awareness and interest following visible installations). This suggests that community-scale renewable energy demonstration projects serve dual purposes: producing actual energy while building awareness and generating social proof of technological viability.

4.8.4 Interconnected Barriers

The analysis reveals that economic, technical, institutional, and social barriers operate as interconnected systems. High capital costs (economic barrier) combine with lack of financing (institutional barrier) and lack of technical knowledge (knowledge barrier) and community skepticism (social barrier) to create compounded barriers. Addressing single barriers (e.g., awareness campaigns) without addressing interdependent barriers produces limited impact.

In Afghanistan specifically, conflict and insecurity (geographic/political barrier) constrain implementation of awareness activities, supply chain development, financing mechanism establishment, and institutional capacity building—essentially undermining simultaneous addressing of multiple barrier categories. This systems perspective suggests that conflict reduction and stabilization are prerequisites for effective renewable energy transitions.

4.8.5 Afghanistan Context Specificity

Although awareness trends, demographic differences, and obstacle types are similar across poor nations, Afghanistan has particular difficulties that are made worse:

- **Institutional capacity gaps:** Afghanistan's institutional capacity for energy sector management, regulation, and implementation are substantially weaker than comparable countries
- **Conflict impacts:** Decades of conflict have disrupted education systems, research infrastructure, and development activities in ways exceeding typical developing country constraints
- **Geographic barriers:** Afghanistan's mountainous terrain, remote rural areas (75% of population), and limited infrastructure exceed geographic constraints in most comparable countries
- **Economic constraints:** Afghanistan's very low GDP per capita (\$500-600) exceeds poverty levels in comparable countries, creating higher economic barriers to adoption

The above description shows the research gaps that exist from the 119 spooled studies as regarding the awareness level in Afghanistan. These compounded constraints suggest that Afghanistan's renewable energy transition requires more intensive policy support, external financing, and capacity building than transitions in comparable developing countries.

6.1 Summary of Key Findings

This is a systematic scoping review that summarized the evidence of 119 studies that studied the pattern of awareness and factors that affect the adoption of renewable energy in Afghanistan and similar South and Central Asian settings. The review provided some crucial findings that covered the four main objectives of the study.

5.1.1 Level of and Trends in Current Awareness (Objective 1)

The scoping review reported that renewable energy awareness in Afghanistan is 30-50 percent existence awareness (knowledge that technologies exist) which is significantly lower than in similar countries (40-75 percent). Nonetheless, there are also critically low awareness dimensions such as technical awareness (<15%), economic awareness (<12%), and policy awareness (<10%). This dimensional awareness space shows that existence awareness is not enough to make informed decisions on adoption. Contributory factors to identified high disparities in awareness are other factors like education, location, sex and economic status. These trends in demographics have direct targeting implications: the awareness strategy cannot be generic but should address certain

population features and their unique information requirements, barriers to access, and decision-making situations.

5.1.2 Influencing Factors of Public Perception and Acceptance (Objective 2)

The review found various interrelated issues that affect renewable energy awareness and acceptance at individual, household, institutional, and geographical levels: At the individual level, education finds its place as the best individual-level predictor and with each additional level of education, there is a significant contribution to awareness and technical understanding. Individual economic factors, risk perceptions, environmental beliefs, and health consciousness are also important determinants of adoption intention other than simple awareness. Religious leaders, community leaders and family networks are the sources of trust information at the social level which have a significant impact on creating awareness and acceptance, especially in rural and traditional communities. The social proof (observable demonstrations of successful implementation of renewable energy on a community level) has a significant impact on the intention to adopt. In addition, institutional Factors like Government policy clarity and stability enable adoption; those countries with well-developed renewable energy goals, tariff regimes, and tax relief exhibit significantly greater adoption. The institutional capacity and trustworthiness also determine the level of public receptiveness towards awareness and promotion activities of the government directly. The effectiveness and accessibility of information sources Factors, Media, community leaders, educational institutions, and demonstration projects are different across populations at the information Source Factors. In traditional Afghan settings, religious leaders and community demonstration projects are the most credible, whereas government sources have a low level of reach (less than 10 percent) and credibility. The fact that several factors are more of interconnected systems than independent barriers indicates that the impact of targeting single factors (e.g., awareness campaigns) without targeting economic, technical, and institutional barriers has little effect on actual adoption.

5.1.3 Barriers and Challenges (Objective 3)

The review systematically reported adoption barriers that cut across a wide range of categories with large proportions of occurrence across studies The most critical factors include; high capital costs, Lack of technical knowledge, Economic knowledge gaps, lack of technical expertise, lack of financing access have been reported by the review. Significant Barriers identified ranges from; Community skepticism and risk aversion, Gender-related constraints, Geographic isolation, institutional mistrust, Maintenance complexity perception.

In the case of Afghanistan-Specific Barriers: Conflict and insecurity, geographic isolation, institutional capacity weakness and institutional mistrust are compound barriers that are higher than those of similar developing countries. Importantly, barriers are interlocking economic barriers (high capital costs) coupled with institutional barriers (lack of financing) and knowledge barriers (cost misconceptions) and social barriers (community skepticism) contribute to compounded adoption barriers. This system viewpoint demonstrates that antisystem intervention strategies have inherent limitations.

5.1.4 Awareness-Adoption Gap

One of the most crucial insights is that there is significant awareness-actual adoption gap: 30-50 percent of the Afghan populations indicate awareness, 15-25 percent indicate adoption intention, and 5-10 percent indicate actual adoption. This 50-80 percent awareness-adoption gap means that change in behavior cannot happen without awareness, but it requires the simultaneous targeting of several barrier types.

5.2 Implications in Policy in Afghanistan.

The evidence indicates that successful renewable energy transitions need to be integrated interventions that will be active and interoperative at more than two levels such as Knowledge/Awareness Level, household/individual level, institutional level and systemic and

infrastructural level. The evidence indicates that successful renewable energy transitions cannot be made when isolated interventions are applied, but instead integrated strategies that will work concurrently across the various levels, including the knowledge and awareness level, the household or individual level, the institutional or policy level and the broader systemic and infrastructural level.

The necessity to fill the existing vast information gap at the knowledge and awareness level is evident at such circumstances like in Afghanistan where the technical awareness of renewable energy technologies does not exceed 15 percent. Awareness materials should be simplified and made graphical to enhance comprehension, and they should not use jargon. Moreover, communication efforts should address the common misunderstandings about price, with most households inflating renewable energy prices by two to three times. Public acceptance can also be increased by emphasizing the health benefits of renewable energy, especially the indoor air quality, due to less biomass burning. Furthermore, by putting renewable energy in the context of religious and cultural discourses, including Islamic doctrine of environmental stewardship, its relevance and attractiveness among the local populations can be increased.

At the family level, interventions should aim at addressing financial and social barriers to adoption. Subsidies, concessional finance, and installment-based payment systems are the most important economic incentives that help in overcoming high initial cost of renewable energy technologies. Demonstration projects may be a crucial step, as they can give tangible evidence of the feasibility and usefulness of these technologies, thus create social trust and promote their broader adoption. Acceptance can be further strengthened by community-based awareness programs, especially those conducted by respected local authorities and religious leaders. Notably, the engagement strategies must take into account the household decision making dynamics, such that the main decision-makers, who are in most cases male heads of households, are included, but with a focus on outreach to women to facilitate inclusive participation.

On the institutional and policy level, there must be a set-up of clear, stable and long-term renewable energy structures. Governments need to state clear goals and exhibit committed efforts in renewable energy development. It is also crucial to develop easy financing instruments, including microfinance programs, concessional loans, and subsidy programs, to assist both consumers and investors. It is important to build the capacity of government agencies and other concerned organizations to enforce and oversee policies to enhance effectiveness. Moreover, there is a need to improve coordination between the government ministries and development partners and the private sector to prevent duplication and fragmentation of efforts. The success of the policy interventions also relies on building a trust of the population via open and responsible governance procedure.

Lastly, on the systemic and infrastructural level, there is also a need to invest in the fundamentals to facilitate the massive integration of renewable energy. Electricity grids should be modernized to support distributed generation and enhance reliability of the system. Meanwhile, to achieve long-term sustainability, it is necessary to build strong supply chains of renewable energy technologies such as the supply of spare parts and services to maintain their work. The expansion of technical education and vocational training will assist in creating a skilled workforce that will be able to assist the renewable energy sector. Also, regional collaboration (in electricity trading, in technology transfer etc.) can contribute to efficiency and cost reduction and can be used to speed the overall transition.

Use of Trusted Information Sources.

The evidence shows that the credibility of sources of information is a decisive factor in influencing the attitude and behavior towards adopting renewable energy. In this regard, the strategies should focus more on trust-based communication channels. It is especially essential to engage religious leaders since Islamic scholars and community clerics can incorporate renewable energy and environmental stewardship into religious teachings, making the message more culturally

agreeable. Likewise, the presence of the respected community leaders through organized community champion programs can increase dissemination of information on the grassroots level. Awareness campaigns should also be through the established non-governmental organizations that have long-term community trust. Moreover, conspicuous demonstration projects are also essential, since they offer concrete evidence of the benefits of renewable energy and usually have a more impact on communities than abstract information campaigns. Lastly, it is important to create credibility in the government through effective and transparent implementation of programs since institutional trust is the major strength behind the success of all awareness activities.

5.2.4 Addressing Barriers Systematically

The evidence also demonstrates that the obstacles to renewable energy adoption are interrelated and need to be met with multi-dimensional and coordinated interventions. On the economic-institutional side, the awareness campaigns should be associated with the availability of financing mechanisms since without the funds, knowledge is ineffective. Simultaneously, subsidy schemes and concessional financing opportunities are to be properly communicated to make sure that they are perceived and used. From the technical-knowledge perspective, the creation of awareness should be accompanied by practical training and demonstration projects in order to prove the reliability and usability of renewable technologies. It requires similar investment in supply chains such as the availability of spare parts and maintenance services to avoid system failure and abandonment. Lastly, socially-institutionally, community involvement and social norm-development must be in line with policy frameworks, to make sure everything in society supports renewable efforts. Awareness campaigns should also be preceded by trust-building by regular and open institutional performance, which guarantees that populations are open to intervention by the government.

5.2 Strategies for Strengthening Public Awareness (Objective 4)

5.3.1 Evidence-Based Campaign Design Principles

There should be effective awareness campaigns on renewable energy that are practical. This involves designing messages to meet the needs of certain demographic groups, the application of multi-dimensional messaging addressing technical, economic, and environmental issues and the use of credible sources like religious and community leaders. Visible demonstrations should be also part of the campaigns, commonly used barriers such as cost and complexity should be openly discussed, and clear instructions on the process of adopting renewable energy, including the financing and support opportunities should be provided.

5.3.2 Communication Channel Strategy

The best means are those that are community based and those which are based on trust such as face-to-face interaction such as through the local leaders, religious institutions, and Non-Governmental Organizations, as well as demonstration projects. Secondary channels involve schools, community health workers, social networks, and the local media. The effects of government and national media campaigns are usually limited without credibility being established.

5.3.3 Framework of Coordination and Implementation.

Awareness needs to be reinforced, and this can only be achieved through a good coordination among government, NGOs and the community institutions so that they can provide a consistent messaging. It is also based on sufficient funding, regular monitoring and evaluation and adaptive and flexible ways that suit the local circumstances.

5.5 Future Research Directions

Future research should address several key gaps to strengthen the evidence base for renewable energy awareness and adoption in Afghanistan. First, there is an urgent need for a nationally representative baseline survey to provide reliable data on awareness levels, information sources, and adoption intentions across the population. Second, longitudinal studies, such as repeated cross-

sectional or panel designs, are necessary to track how awareness evolves over time and to assess the sustained impact of interventions.

Third, more rigorous evaluation of intervention effectiveness is required, particularly through randomized controlled trials or quasi-experimental approaches that compare intervention and control groups. Fourth, research should move beyond correlation to examine causal mechanisms, using qualitative and mixed-method approaches to understand how awareness translates into actual adoption behavior and what factors influence this process.

Additionally, gender-specific research is needed to better understand the unique barriers faced by women and to design targeted interventions that promote inclusive access to renewable energy. There is also limited evidence on how conflict conditions shape awareness and adoption, highlighting the need for studies focused on conflict-affected settings and adaptive strategies.

Finally, future studies should explore the role of regional cooperation, particularly electricity trading and cross-border partnerships, in supporting Afghanistan's energy transition. Equally important is the need for cost-effectiveness analyses to determine which awareness interventions deliver the greatest impact relative to their cost, thereby guiding more efficient allocation of resources.

5.6. Limitations of the studies

Although 119 studies were used in this review, certain limitations have an impact on the strength and generalizability of the evidence. Geographic restrictions: 22.7% of the studies are specific to Afghanistan, and most of the evidence is generalized to similar countries, thus must be used with caution. Regions with conflicts are poorly represented and results might not be representative of all provinces.

Methodological shortcoming: Studies have different measures of awareness and thus cannot be compared. Others use small or non-representative samples and few use rigorous causal methods. Cross-sectional designs are also mostly cross-sectional, and do not give us any insight into changes over time.

Temporal constraints: The majority of evidence involves single time points, and little longitudinal studies of changes in awareness following interventions are conducted. Almost half of the articles are recent (2021-2023), which can potentially distort the views.

Limitations in content: Little has been done on particular dimensions of awareness, the evidence on the relationship between awareness and adoption is weak, and little is done to assess the effectiveness of interventions in specific cultural settings.

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ОЦЕНКА ОСОБЕННОСТЕЙ ОСВЕДОМЛЁННОСТИ О ПРОДВИЖЕНИИ ПЕРЕХОДА К ВОЗОБНОВЛЯЕМОЙ ЭНЕРГЕТИКЕ В АФГАНИСТАНЕ: ОБЗОРНОЕ ИССЛЕДОВАНИЕ

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Данный систематический обзор объединил результаты 119 рецензируемых статей, посвящённых изучению особенностей осведомлённости о возобновляемой энергетике в Афганистане и странах Южной Азии со схожими условиями. Полный поиск в базе данных Scopus выявил 595 статей, из которых 119 соответствовали критериям включения. Результаты показали, что уровень общей осведомлённости о возобновляемой энергетике в Афганистане составляет 30–50 %, что значительно ниже по сравнению с аналогичными странами (40–75 %). Уровень технической, экономической и политической осведомлённости остаётся критически низким (менее 15 %, менее 12 % и менее 10 % соответственно). Демографические данные выявили значительные различия: уровень образования создавал разрыв в осведомлённости в 7–8 раз, различия между городскими и сельскими жителями составляли 2,2 раза, а гендерные различия — 10–15 %. Разрыв между уровнем осведомлённости и фактическим внедрением технологий достигал 50–80 %, что

свидетельствует о недостаточности одной лишь информированности для изменения поведения. Основными барьерами внедрения стали экономические ограничения (95 % исследований), недостаток технической экспертизы (82 %) и дефицит знаний (88 %). Наиболее эффективными каналами повышения осведомлённости оказались религиозные лидеры и общественные инициативы, тогда как государственные каналы имели ограниченный охват (менее 10 %) и низкий уровень доверия. Для ускорения внедрения возобновляемой энергетики в Афганистане необходимы комплексные многоуровневые меры, одновременно учитывающие образовательные, экономические, технические, институциональные и социальные барьеры.

Ключевые слова: возобновляемая энергетика, общественная осведомлённость, Афганистан, энергетический переход, устойчивое развитие, энергетическая политика.

АУҒАНСТАНДАҒЫ ЖАҢАРТЫЛАТЫН ЭНЕРГИЯҒА КӨШУДІ ІЛГЕРІЛЕТУ ТУРАЛЫ ХАБАРДАРЛЫҚ ЕРЕКШЕЛІКТЕРІН БАҒАЛАУ: ШОЛУЛЫҚ ЗЕРТТЕУ

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Бұл жүйелі шолулық зерттеу Ауғанстандағы және Оңтүстік Азияның ұқсас жағдайдағы елдеріндегі жаңартылатын энергия көздері туралы хабардарлық ерекшеліктерін зерттеген 119 рецензияланған мақаланың нәтижелерін біріктірді. Scopus дерекқорында жүргізілген толық іздеу барысында 595 мақала анықталып, олардың 119-ы іріктеу талаптарына сәйкес келді. Зерттеу нәтижелері Ауғанстандағы жаңартылатын энергия туралы жалпы хабардарлық деңгейі 30–50 % аралығында екенін көрсетті, бұл ұқсас елдермен салыстырғанда (40–75 %) айтарлықтай төмен. Техникалық, экономикалық және саяси хабардарлық деңгейі өте төмен болып қалуда (тіісінше <15 %, <12 % және <10 %). Демографиялық деректер елеулі айырмашылықтарды көрсетті: білім деңгейі хабардарлықта 7–8 есе ашақтық тугызса, қала мен ауыл тұрғындары арасындағы айырмашылық 2,2 есе, ал гендерлік айырмашылықтар 10–15 % құрады. Хабардарлық пен нақты енгізу деңгейі арасындағы ашақтық 50–80 %-ға жеткен, бұл тек ақпараттандырудың мінез-құлықты өзгерту үшін жеткіліксіз екенін көрсетеді. Жаңартылатын энергияны енгізудегі негізгі кедергілер ретінде экономикалық тосқауылдар (зерттеулердің 95 %-ы), техникалық мамандардың жетіспеушілігі (82 %) және білім тапшылығы (88 %) анықталды. Хабардарлықты арттыруда діни көшбасшылар мен қоғамдық бастамалар ең тиімді құралдар болғанымен, мемлекеттік арналардың қамту деңгейі (10 %-дан төмен) мен сенімділігі шектеулі болды. Ауғанстанда жаңартылатын энергия көздерін енгізуді жеделдету үшін білім беру, экономикалық, техникалық, институционалдық және әлеуметтік кедергілерді бір мезгілде шешуге бағытталған кешенді көпдеңгейлі шаралар қажет.

Кілт сөздер: жаңартылатын энергетика, қоғамдық хабардарлық, Ауғанстан, энергетикалық ауысу, тұрақты даму, энергетикалық саясат.