Understanding the Role of Social and Environmental Concerns on Solar Photovoltaic Adoption: A Systematic Review

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Abstract

This paper aims to uncover the role of social and environmental issues play within the assimilation of photovoltaic energy infrastructure based on a systematic literature review and different studies results analysis. In alignment with Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) reporting standards, data for this systematic review were curated, yielding 66 qualifying articles demonstrating considerable variability in empirical findings. The analysis finds that the influence of social issues on how widely we adopt solar photovoltaic systems is crucial, while environmental concerns are mixed. Several studies have highlighted the critical role of social issues such as social interaction, leadership engagement, and community norms in shaping the willingness to adopt solar PV systems. In contrast, the impact of environmental issues is more ambiguous. While some studies highlight environmental awareness as a key motivator for adoption, others suggest it holds limited or negligible influence, with economic benefits often taking precedence. This points to a complex and sometimes counterintuitive relationship between environmental concern and solar PV adoption. To address these inconsistencies, it is essential to examine mediating variables that could clarify the connection between environmental attitudes and adoption intentions. Understanding these dynamics will help identify the principal determinants of photovoltaic assimilation from both social and environmental perspectives, thereby supporting more effective and strategically informed deployment of solar PV systems in pursuit of broader sustainability goals.

Keywords: social issues, environmental concerns, solar photovoltaic adoption, systematic review

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1. Introduction

Solar photovoltaic (PV) technology acts as a catalyst for decarbonized energy ecosystems and serves as a major mitigator of the consequences of climate change [1]. With renewable energy sources playing an ever-widening role in future energy paradigms [2], the extensive adoption of solar photovoltaic technology has gained considerable momentum, mostly due to favorable economic [3–9], and technological advantages [10–15]. Despite its significant diffusion across energy infrastructures, the multifactorial dynamics underlying its adoption has not yet been fully characterized. While economic and technological aspects have been widely studied and are often embedded within market-driven analyses, growing attention is now being directed toward the social [10,16,17] and environmental [18,19] dimensions of solar PV adoption. These two factors increasingly appear as critical yet underexplored elements in understanding user behavior and community-level acceptance.

Social factors are increasingly recognized as key enablers in shaping household and business decisions to adopt solar PV systems. These social dynamics not only enhance public awareness and trust, but also contribute to behavioral diffusion through community participation [16,20]. Furthermore, a study in China by Jin & Ialnazov [21] illustrates how solar PV initiatives can simultaneously promote income generation and improve social capital through community-driven implementation. At the same time, global studies also underscore that social acceptance remains a key barrier, influenced by cultural resistance, limited public participation, and aesthetic concerns, highlighting the need for more inclusive and participatory approaches [22].

In addition to social dynamics, environmental concerns have also emerged as a key motivator among the many determinants that influence adoption [18,19]. It reflects growing public awareness of climate change and the ecological impacts of conventional energy sources. Furthermore, life cycle assessments of solar PV technology also confirm that the system emits significantly lower greenhouse gases compared to fossil fuels, reinforcing its environmental appeal [23].

As the transition to low-carbon energy systems becomes more urgent, understanding the social and environmental drivers of solar PV adoption has critical implications for developing effective and inclusive policy interventions. A holistic analysis that integrates both dimensions is essential for crafting targeted strategies that accelerate solar PV diffusion and strengthen long-term energy resilience.

This article seeks to disentangle the roles of social and environmental concerns in shaping solar PV adoption through a systematic literature review, drawing from a wide range of empirical studies to enhance theoretical and practical understanding. The findings will inform the development of more nuanced solar PV market mobilization strategies that support sustainability imperatives and contribute to a decarbonized energy future. The research question (RQ) that guides this study is: "To what extent do social and environmental concerns influence the adoption of solar PV technology?". Consequently, the objective of this review is to provide a comprehensive analysis of these factors and offer information on the state of the art in energy transitions, particularly in terms of the integration of solar photovoltaic systems at a time when green energy policies are increasingly prioritized.

2. Method

Following the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) guidelines [24], this systematic review employs a structured approach to address the research question using methodologically sound procedures. The PRISMA framework provides a comprehensive structure for conducting systematic reviews, ensuring that the process is transparent and

rigorous in its execution. Adherence to these rigorous guidelines curtails selection bias, ensuring a more methodologically robust and empirically sound synthesis of review findings.

The guidelines offer a methodical structure for carrying out systematic literature reviews. Scholars can guarantee a transparent and rigorous technique that reduces bias in the selection of pertinent studies and data by adhering to the PRISMA principles.

2.1. Information sources

Articles were retrieved from two major academic databases: Scopus and Web of Science. These two databases are considered two of the main databases for academic research and scholarships. Scopus is particularly recognized for its extensive collection of scientific literature, including journals, conference proceedings, and books selected through stringent evaluation processes [25]. In contrast, as one of the oldest and best-established databases, the Web of Science provides a rich repository of research publications and citations, establishing an academic pedigree of bibliographic data [26]. They are excellent databases that allow researchers to access a limitless range of scholarly literature and strive towards the pursuit of knowledge.

2.2. Search strategy and keywords

In this research, we seek to examine the impact of social and environmental facilitators on technology uptake, focusing primarily on solar PV technology. Due to the multidisciplinary character of this field, performing a systematic and methodologically robust literature retrieval is crucial. Therefore, we developed an extensive and carefully considered list of search terms that represented a wide variety of synonyms and related terminology. This method was implemented to ensure comprehensiveness while decreasing the chance of missing out on essential discourse contributions. In this way, by embracing such an inclusive strategy, we also ensure that the corpus of literature that we survey is not overly limited by terminology and thus strengthens and enhances the validity and applicability of our findings.

In order to allow a systematic and methodologically sound literature review, we used a comprehensive set of defined search strings (Table 1) in two major academic Scopus and Web of Science databases. We chose these repositories because they cover extensive high-impact peer-reviewed research with the goal of providing a comprehensive dataset of high scholarly merit. The search terms were fine-tuned to an optimal combination of relevant studies while limiting the number of irrelevant or marginally relevant results to exclude. This methodological temperance not only fortifies the epistemic merits of our review, but also guarantees that the proposed theory building reflects the most pertinent theoretical and empirical developments in the adoption of solar photovoltaic technology.

2.3. Eligibility criteria

The review was conducted using clear inclusion guidelines to allow the relevance, rigor, and applicability of the literature on the adoption of solar photovoltaics. We focused on studies that directly analyzed aspects of solar PV adoption using social and/or environmental concern as a predictor variable, as this allowed for a more direct analysis of the relationship between social and/or sustainability awareness and technological uptake. Using a survey allows for a broad analysis of a range of behavioral, policy, and market-based factors that shape the diffusion of solar photovoltaic technology.

Table 1: *Search string*

Database	String
Scopus	(TITLE-ABS-KEY ("factors" OR "aspects" OR "antecedents" OR "causes" OR "elements" OR "precedents" OR "motivators" OR "enablers" OR "predictors" OR "drivers" OR "impediments" OR "determinants" OR "enablers") AND TITLE-ABS-KEY ("affecting" OR "influencing" OR "determining" OR "affect" OR "influence" OR "determine" OR "alter" OR "altering" OR "inspire" OR "inspiring" OR "stir" OR "stirring" OR "trigger" OR "triggering" OR "examine" OR "examining") AND TITLE-ABS-KEY ("willingness" OR "intention" OR "preference" OR "tendency" OR "motive" OR "impulsion" OR "eagerness" OR "behaviour" OR "attitude") AND TITLE-ABS-KEY ("to adopt" OR "to use" OR "to accept" OR "to purchase" OR "to buy" OR "to install" OR "adoption" OR "usage" OR "acceptance") AND TITLE-ABS-KEY ("solar PV" OR "solar photovoltaic" OR "solar PV technology" OR "solar photovoltaic technology" OR "photovoltaic" OR "solar power generation" OR "solar rooftop"))
Web of Science	((((ALL=("factors" OR "aspects" OR "antecedents" OR "causes" OR "elements" OR "precedents" OR "motivators" OR "enablers" OR "predictors" OR "drivers" OR "impediments" OR "determinants" OR "enablers")) AND ALL=("affecting" OR "influencing" OR "determining" OR "affect" OR "influence" OR "determine" OR "alter" OR "altering" OR "inspire" OR "inspiring" OR "stir" OR "stirring" OR "trigger" OR "triggering" OR "examine" OR "examining")) AND ALL=("willingness" OR "intention" OR "preference" OR "tendency" OR "motive" OR "impulsion" OR "eagerness" OR "behaviour" OR "attitude")) AND ALL=("to adopt" OR "to use" OR "to accept" OR "to purchase" OR "to buy" OR "to install" OR "adoption" OR "usage" OR "acceptance")) AND ALL=("solar PV" OR "solar photovoltaic" OR "solar PV technology" OR "solar photovoltaic technology" OR "photovoltaic" OR "solar power generation" OR "solar rooftop")

Empirical and theoretical studies of adoption drivers were considered to provide a more exhaustive perspective on this area. Qualitative and quantitative empirical research provides evidence of the status of adoption, hindrances, and enablers to usage, whereas more theoretical work provides concepts and frameworks through which adoption may be understood. Integrating dual perspectives improves the understanding of the determinants of solar PV adoption.

The temporal scope was restricted to 2014-2024 to maintain relevance, registering recent technological, policy, and environmental changes. In addition, older studies were not included, as both solar PV technology and solar adoption behavior have evolved over the years. Moreover, only peer-reviewed journal articles and recognized indexed sources in English were included in the review to maintain methodological quality; thus, ensuring global access to information. These criteria ensure that the literature review is focused, up-to-date, and academically rigorous in nature.

2.4. Selection process

After retrieving an initial set of studies, duplicates were removed. The relevance of the titles and abstracts was then screened, the full text articles were reviewed to ensure that they met the inclusion criteria, and the quality assessment was performed applying the 'Mixed Methods Appraisal Tool (MMAT)' [27]. Finally, a total of 66 studies were selected for final review and analysis (Figure 1).

3. Results

3.1. Year of publication

The results show a strong increase in the number of publications from 2014 to 2024 that have considered social and/or environmental concern as an independent variable in predicting the adoption of solar PV technology. The results demonstrate a clear upward trend in scholarly publications examining environmental concerns as an independent variable in solar PV adoption.

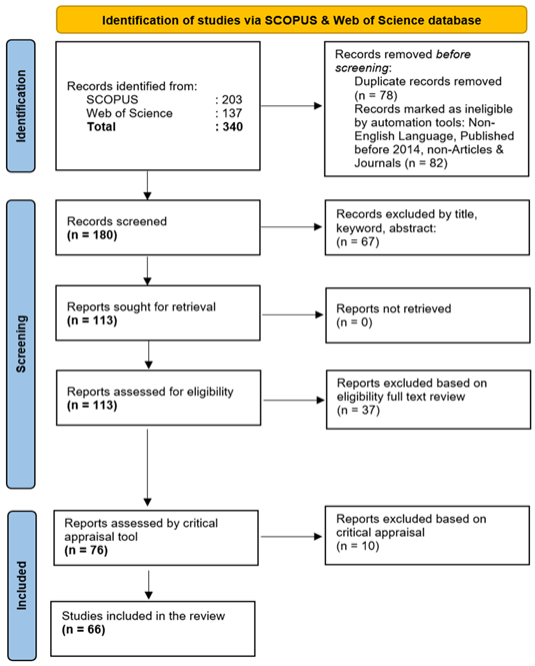

Figure 1: *Flow diagram of study selection, following the PRISMA reporting framework [24]*

Between 2015 and 2019, the number of studies remained relatively low, with only 16 publications over five years. In contrast, the period from 2020 to 2024 saw a significant increase, with a total of 51 studies published. This surge reflects growing global awareness of social issues and/or environmental sustainability and a growing academic interest in understanding how social and environmental values influence behavioral intentions and decisions related to renewable energy, particularly in the adoption of solar photovoltaic systems.

3.2. Country

The results reveal that a significant majority of the research on solar PV adoption, specifically concerning social and/or environmental concern as an independent variable, is concentrated in high-income and upper-middle-income countries. Approximately 76% of the studies originate in these two income categories. High-income countries such as Germany (7 studies), the United States (6), Poland (4), Australia (2), and others contribute a substantial share of the research. In particular, Germany and the United States stand out for their consistent academic output in this domain. Meanwhile, upper-middle-income countries like China (14 studies), Malaysia (3), Brazil (1), and Mexico (1) also demonstrate strong engagement, with China leading significantly in terms of publication volume. This concentration underscores the fact that much of the academic focus on the environmental drivers of solar photovoltaic adoption comes from regions with greater institutional, financial and infrastructural capacity to support the transition to renewable energy. However, it also reflects a persistent gap in research from lower-income and lower-middle-income countries where solar energy could play a transformative role in sustainable development but remains underrepresented in scholarly discourse.

3.3. Research context

The result shows that the vast body of literature on solar PV adoption that has used social and/or environmental concern as an independent variable, is located in the household level. Of 66 studies, 57 focus on residential contexts, demonstrating a significant emphasis in the research on the uptake of renewable energy technologies in terms of individual and family decision making. Conversely, only nine studies explore the commercial, industrial, agricultural, or public institution non-household sectors. This excessive emphasis on the residential sector is indicative of an academic consensus on the importance of household behavior in determining the adoption of renewable energy. In contrast, the relative neglect of non-residential contexts indicates a gap in the literature. The results of this study indicate that expanding the research agenda through the inclusion of broader sectors of the solar PV system would provide a more holistic understanding of the varied drivers that influence the adoption of solar PV, yielding greater support for inclusive and effective policy interventions.

3.4. Research methodology used

This finding underscores that the most widely used research approach in studies of solar photovoltaic adoption that examines social and / or environmental concerns as an independent variable is quantitative. Of the 66 studies included, 48 (approximately 73%) used quantitative methods. Mixed methods were used in 15 studies (23%), while only 3 studies (4%) adopted a purely qualitative approach, indicating a relatively low emphasis on exploratory, narrative or in-depth case study designs. The dominance of quantitative methods highlights the prevailing focus on statistical analysis and measurable factors in the context of the adoption of solar photovoltaics. However, the relatively limited use of qualitative and mixed methods suggests a need for more diverse methodological approaches in future research to capture deeper, more nuanced insights into the complex social and environmental dimensions of adoption behavior.

3.5. Research findings

3.5.1 Role of social factors

Several studies have shown that the influence of peers on deciding whether to adopt at the firm level is greater in rural areas, where community pride and social networks have a stronger influence [10, 28]. In such settings, interaction at the interpersonal level and trust-based social systems are the main enablers of technology acceptance. The adoption of solar photovoltaic technologies among early adopters clustered in closely knit communities offers social validation, which may then reduce uncertainty and boost group confidence in solar photovoltaics.

In addition, information accessibility, social norms, and active participation of local leaders play a significant role in the successful uptake of solar energy. Research by Lau et al. [29] and Shi et al. [17] shows that local champions supporting and participating in renewable energy projects articulate and strengthen trust within the community and increase participation. These are credible change agents for the social construction of new norms of green social responsibility. Their inclusion allows technology to gain legitimacy and integrate into the daily routines and cultural activities of the community.

Community engagement has also proven critical in tackling the structural and financial barriers that can prevent adoption. Ford et al. [30] and Joshi et al. [31] highlight the role of collaborative partnerships and community-led initiatives in increasing access to solar energy, reducing costs, and improving technology dissemination. Such collaboration also engenders a sense of pride

and shared responsibility, both necessary for sustainability. Engagement in solar strategy and deployment leads to a greater sense of belonging and ownership, strengthening trust and long-term sustainability.

In addition, these collaborative efforts help mitigate the risks and uncertainties that often accompany emerging technologies. As noted by Moncada et al. [32], informal risk mitigation channels reassure potential adopters. Peer use provides a model of success that instills a sense of safety and reliability in the technology, particularly in areas where formal technical support may not be robust. This first hints at the importance of social structures that support bottom-up clean energy transitions.

Lastly, this review highlights the importance of drawing on social learning and communication tactics to promote greater adoption of solar photovoltaic technology. Research carried out by Liu et al. [33], and Roy & Mohapatra [34], indicates that while passive channels were driving perceptions of solar energy reliability and usefulness, active communication channels, including community meetings, social media, and opinion leaders, also played an important role in shaping perceptions of solar energy reliability and usefulness. These channels of communication are essential conduits of information that pour knowledge into otherwise uncertain situations and drive behavioral intentions. Ultimately, the critical importance of community participation and the role of social dynamics as a key accelerator for the successful adoption of solar photovoltaic technologies is paramount, especially in low-income and energy-insecure areas.

3.5.2 Role of environmental concerns

Several studies have also strongly emphasized the importance of environmental concerns in influencing the adoption of solar photovoltaic (PV) systems. Adnan [18] highlighted that environmental concern significantly mediates the relationship between awareness, attitude, and adoption, demonstrating its critical role in shaping consumer behavior. A study in China by X. Li et al. [35] showed that environmental awareness, particularly in rural areas, strongly impacts the willingness of consumers to pay for solar PV systems, suggesting that promoting environmental awareness could boost adoption rates. Furthermore, X. Li et al. [35] also emphasized that environmental awareness and motivation are crucial factors influencing consumer willingness to pay for solar PV systems, particularly in rural areas where community participation and social influences amplify the impact of environmental concerns.

Additional research in China reinforces the importance of environmental concerns in driving solar adoption. For example, W. Wang et al. [11] found that social capital in rural China affects perceptions of solar photovoltaic use, costs, and environmental awareness, social networks, and opinion leaders playing a critical role in disseminating information. Furthermore, a study by J. Zhang & Huang [36] further also identified strong connections between environmental concerns, new energy use, and policy, emphasizing the need for enhanced environmental awareness and policy support to increase adoption. Similarly, Huang & Cheng [19] also revealed that an ecological lifestyle and environmental awareness were key factors influencing attitudes toward residential PV systems in China, suggesting that promoting environmental values could positively impact solar adoption. These findings collectively show that environmental awareness, when reinforced by social and policy factors, is vital to encourage the adoption of solar photovoltaics.

These trends are also evident in other contexts. A study in Mexico by Arroyo & Carrete [7] had also revealed that environmental consciousness is the main driver behind the purchase of solar energy systems, particularly among consumers with higher socioeconomic levels. A study in Malaysia by Cheam et al. [37] also underscores the crucial role of environmentalism and knowledge in shaping the embracement of solar PV systems, as those with enhanced ecological

awareness exhibit a higher likelihood of investing in photovoltaic solutions.

Extending this argument to other contexts, Ioannou et al. [38] demonstrate that environmental considerations significantly influence the willingness of Greek farmers to adopt solar PV, particularly when they perceive clear environmental benefits, such as reducing reliance on fossil fuels. Similarly, Liu et al. [39] substantiate that in the subsidy-free paradigm, carbon-conscious ideologies continue to catalyze solar PV uptake, reinforcing the premise that, even in the absence of pecuniary inducements, ecological imperatives, primarily emissions abatement, remain a predominant motivational vector for adoption. Furthermore, Kyere et al. [3] found that in Ghana, environmental concerns play a significant role in household decisions to adopt solar PV in addition to cost savings, peer effects, and energy independence. Similarly, Parsad et al. [40] show that in Kerala, both environmental concerns and financial incentives drive solar adoption.

In Norway, Cherry & Sæle [5] also found that while environmental factors influence adoption, cost and satisfaction with existing energy systems remain significant considerations. Likewise, Mundaca & Samahita [6] pointed out that in Sweden, environmental concerns, along with subsidies and peer effects, play a crucial role in encouraging solar PV adoption. In Australia, Best et al. [41] showed that environmental preferences, coupled with wealth and income, significantly increase the likelihood of rooftop solar adoption. Furthermore, Gastaldo et al. [42] emphasized that environmental consciousness, combined with financial motivations and social influences, drives solar investors in households, which often possess ecocentric values. Similarly, Parkins et al. [43] highlighted that in Canada, environmental values, along with public engagement and visibility of solar technology, strongly influence the intention to adopt rooftop solar, underlining the importance of promoting environmental awareness to further boost adoption.

In agreement with these empirical insights, Abuzaid et al. [44] found that environmental and financial factors are the main drivers of the adoption of residential photovoltaics in the UAE. Similarly, Hasheem et al. [45] noted that ecological lifestyles and environmental awareness influence attitudes toward solar PV adoption. In Poland, Mularczyk et al. [46] emphasized that environmental motivations significantly shape the intention to adopt prosumer photovoltaic technology. In rural China, J. Li et al. [1]] found that environmental motivations, along with social influences, drive solar adoption, though local conflicts can hinder progress. Bouaguel & Alsulimani [47] highlighted environmental awareness as a key factor in Saudi consumers' solar adoption decisions, along with cost and ease of use. Liang et al. [48] also found that environmental concerns, coupled with social influence, enhance the propensity for photovoltaic panel procurement, while Jeyapaul [49] identified environmental awareness as a key motivator in Tamil Nadu, India, along with income and return on investment. Grbosz-Krawczyk et al. [50] further identified that functional and environmental values are critical to influence the decisions of Polish consumers to install photovoltaic panels, highlighting that promoting environmental impact, along with practical benefits, is key to encouraging the adoption of green energy. In general, several studies reveal that environmental concerns are important, but often work in conjunction with financial and other practical considerations to shape the adoption decisions of solar PV.

However, contrasting views have been presented by researchers who argue that environmental concerns have a less significant impact on the adoption of solar photovoltaics. Scheller et al. [51], Irfan et al. [52], and Corbett et al. [53] all emphasized that while environmental benefits can create positive attitudes toward low-carbon technologies, they do not decisively drive adoption. Instead, financial incentives and personal gains are more influential in the decision-making process. Irfan et al. [52] similarly concluded that environmental awareness did not exert a discernible impact on consumer preference for renewable energy expenditures, attributing this to the lack of government-led awareness campaigns on ecological issues. Corbett et al. [53] also found that although pro-environmental attitudes increase the likelihood of considering rooftop solar, practical

considerations such as economic feasibility and place attachment play a much stronger role in the final decision.

Other studies further reinforce this trend. For example, Zdonek et al. [54] noted that although ecological benefits positively influence acceptance of photovoltaic technology in Poland, economic factors such as ease of use and promotional activities play a greater role, particularly among younger consumers. Wang et al. [55] found that while environmental concerns were acknowledged in the deliberative process that governs the assimilation of rooftop photovoltaic infrastructure among farmers in rural China, they had a relatively minor impact compared to other factors. Personal power, influence of authority, and understanding of PV technology were the primary drivers of adoption. This suggests that practical and social factors play a larger role in farmers' decisions, with environmental motivations having less influence on their choice to adopt solar energy.

Similarly, Aghlimoghadam et al. [56] found that in Iran economic, political, and social factors took precedence over environmental awareness, with high costs and limited knowledge being major barriers. Furthermore, Kesari et al. [57] also observed that environmental awareness was insufficient to drive adoption, as many consumers perceived their individual contributions to environmental solutions as ineffective, with social influence and practical knowledge being more impactful.

Angowski et al. [9] further illustrated this by showing that in rural Poland, environmental concerns could even negatively affect adoption intentions due to apprehensions about the long-term environmental impacts of solar technology. Finally, Brown et al. [58], Aggarwal et al. [59], Shakeel & Rahman [60], Engelken et al. [61], Dharsing [62], Schaffer & Brun [63], and Sigrin et al. [64] all similarly found that economic factors such as cost savings, financial incentives, and regulatory frameworks were much more important in influencing adoption decisions, underscoring the limited role environmental concerns play in the overall process.

These mixed findings present a complex picture regarding the impact of environmental concern on the adoption of solar photovoltaics. Although some studies indicate that environmental concerns have a significant effect, others suggest that their impact is less significant or even negligible. This divergence underscores the complexity of the relationship between environmental awareness and the decision to adopt solar PV technology. This implies that ecological apprehension does not invariably serve as the predominant impetus for adoption trajectories, with other factors such as economic incentives, policy frameworks, or technological considerations often playing a more prominent role in certain contexts. These varied results highlight the need for a deeper investigation of how different variables interact to influence solar PV adoption, revealing that environmental concern alone may not fully explain the adoption behavior across different regions or populations.

4. Discussion

This metaanalytic assessment indicates that the relationship between environmental cognizance and solar photovoltaic uptake is characterized by variability. Some studies point to the motivation for environmental awareness as the main driver for the decision to adopt solar PV, while other studies found that financial benefits, such as cost savings and the receipt of government incentives, usually supersede the role of environmental awareness.

4.1. Social issues as a key driver of solar PV adoption

Social factors play a crucial role in the adoption of solar PV technologies, especially in rural and low-income areas. Peer influence, community pride, and trust-based social networks help reduce uncertainty and encourage adoption [10, 28]. Participation of local leaders fosters trust and promotes environmental norms [17, 29], while community involvement helps overcome adoption barriers by enabling partnerships that expand access, lower costs, and promote shared ownership [30, 31]. Informal support and peer modeling mitigate perceived risks [32], and social communication channels further shape perceptions and behavioral intentions [33, 34]. These findings highlight the importance of social dynamics in accelerating the adoption of solar PV. This is also supported by Lo [65], who demonstrated that even in an authoritarian context, China's solar poverty program advanced fairness and local participation through consultation and transparent benefit sharing.

4.2. Environmental concerns as a key driver of solar PV adoption

Environmental concerns have been found to lead to greater adoption of solar photovoltaic systems in multiple studies. According to Adnan [18], environmental concern plays a crucial mediating role between awareness and attitude, as well as between attitude and adoption behavior, highlighting its importance in the adoption process. Likewise, Arroyo & Carrete [7] and Liu et al. [39] demonstrate that environmental consciousness is a strong predictor of solar adoption, in a post-subsidy setting. In support of this, Cheam et al. [37] empirically substantiated that heightened ecological cognizance correlates positively with photovoltaic system procurement, thus underscoring the pivotal influence of environmentalism in adoption behavior. In the same vein, previous studies by Lo et al. [66] similarly noted that environmentally minded individuals in Hong Kong were less constrained by financial concerns, suggesting the strength of ecological motivations within certain groups.

4.3. Interplay between social, environmental, financial, and policy drivers in solar PV adoption

Social influence further reinforces environmental concern, and the interaction between these two factors creates a variable decision-making environment. Including studies like X. Li et al. [35] and W. Wang et al. [11] show that the role of environmental awareness in increasing the likelihood of adopting solar PV systems is significantly amplified by social networks and participatory communities. J. Li et al. [16] and Gastaldo et al. [42] highlight that social pressure with environmental incentive is the key driver, especially in rural areas, while Bouaguel & Alsulimani [47], Liang et al. [48] and Gastaldo et al. [42] emphasize how environmental awareness and social influence permeate the information on adoption decisions between countries.

In addition, environmental concerns are often weighed against financial perspectives. Studies suggest balancing immediate financial gain with environmental concern. Kyere et al. [3], Parsad et al. [40], and Gastaldo et al. [42] indicate that environmental concerns are significant, but usually interleave with cost savings, peer effects, and financial incentives to influence adoption decisions. Examples of these findings that are applied in practice include Cherry & Sæle [5] and Mundaca & Samahita [19], where scholars support the consideration of practical concerns as nearly as important as environmental factors. Likewise, Jeyapaul [29], Grbosz-Krawczyk et al. [30], and Abuzaid et al. [23] illustrate that concerns about the environment and economic benefits, such as return on investment, are motivations that often go hand in hand.

Moreover, environmental norms are often embedded in wider policy and lifestyle frameworks. Highlights on the importance of lifestyles with respect to ecology and supportive policies were discussed in Huang & Cheng [11] and J. Zhang & Huang [10], which identify the positive impact of promoting sustainable lifestyles and supportive policies toward the adoption of solar PV. Lo and Castán Broto [67] similarly emphasize how top-down policies and local responses interact to shape solar adoption outcomes, particularly in rural China. Consistent with these findings, environmental values, public participation and visibility of solar technology, according to Parkins et al. [22], are determinants of consumer behavior, pointing towards the higher-level socio-political dimension of environmental concern.

In general, while social and environmental concerns appear to be an important driver of solar PV adoption, this particular motivation interacts with financial considerations and the policy framework. These studies show that social factors and environmental awareness are the important determinant of adoption decisions, but that their effects are often compounded or balanced by other considerations, including cost and government support.

4.4. Financial, practical, and social considerations often outweigh environmental motivation

While environmental sustainability is often highlighted as a primary reason for promoting the adoption of solar PV, real-world consumer behavior does not always align with this ideal. In various contexts, individuals and communities often prioritize other factors when considering whether to adopt solar PV systems.

Scheller et al. [31], Irfan et al. [32], and Corbett et al. [33] demonstrated that while environmental factors may create a positive attitude for solar PV systems, they are not decisive in the adoption process. Consumer behavior is driven much more by financial incentives, cost savings, and economic feasibility than by a singular worldview of saving the planet. These findings underscore the notion that although environmental awareness may foster a favorable perception of solar PV, it does not necessarily translate into action unless accompanied by strong financial incentives.

In addition to financial aspects, social and practical considerations have also been shown to influence adoption behavior more strongly than environmental motivations. Zdonek et al. [34] indicated that younger consumers were more influenced by economic factors and promotion activities compared to environmental benefits. Wang et al. [35] further found that environmental concerns were not a significant factor influencing adoption among farmers in rural China. Instead, adoption was strongly influenced by personal power, technological knowledge, and economic issues in the area. Similarly, in Hong Kong, Lo et al. [66] found that while a minority of the respondents, including environmentally conscious individuals and institutional actors, reported less sensitivity to financial constraints, Lo et al. emphasized that technical and economic barriers were still the most frequently cited obstacles to the adoption of photovoltaics.

Furthermore, some studies have indicated that environmental considerations may even hinder adoption in certain cases. For example, Angowski et al. [38] noted that in rural Poland, concerns about the long-term environmental impact of solar panels, such as how to dispose of them, had deterred adoption.

A broader body of literature further supports the predominance of financial and institutional enablers. Other studies such as Brown et al. [39], Aggarwal et al. [40], Shakeel & Rahman [41], Engelken et al. [42], Dharsing [43], Schaffer & Brun [44], and Sigrin et al. [45] affirmed the predominance of financial considerations, positive regulatory frameworks, and economic incentives in promoting solar PV uptake.

Together, these findings suggest that even though environmental motivation can help raise

awareness of PV, it rarely enters the decision-making process on an equal footing with much more immediate financial, social, and practical concerns.

5. Conclusion

This study examined the literature on solar PV adoption, revealing varied results that underscore its complex nature. The findings indicate that social and environmental factors play a significant, though context-dependent, role in shaping adoption behavior.

Social elements, including peer influence, trust-based community networks, leadership involvement, and collective participation, frequently serve as significant facilitators of solar PV adoption, especially in rural areas. These social dynamics mitigate perceived dangers, promote shared responsibility, increase legitimacy, and cultivate the trust essential for sustained technological adoption. In contrast, the significance of environmental concerns is more complex. Although environmental awareness may serve as a significant motivation for adoption, particularly in environmentally conscious societies or areas with robust legislative support, its impact is not always conclusive. Environmental motivations often take a backseat to more pressing financial, economic, and social factors. In some cases, environmental fears may not turn into behavioral intentions or may be counterbalanced by skepticism, perceived ineffectiveness, or insufficient institutional support.

The findings suggest that the connection between environmental concern and adoption intention is complex and often influenced by other factors. Future studies should investigate the interaction of social structures, environmental values or benefits, and economic rationality, focusing on mediating and moderating variables. Furthermore, broadening research to include commercial, industrial, and public sector adoption will provide a more comprehensive perspective on solar PV integration.

Methodologically, the integration of qualitative or mixed method techniques might improve understanding of the personal, cultural, and institutional factors that influence adoption behavior. Ultimately, formulating more precise and context-sensitive policies will be crucial to promoting the fair and extensive use of solar photovoltaic technologies in the quest for global sustainability goals.

Declaration of interest: The authors declare no conflicts of interest.

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