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Solar PV adoption at household level: Insights based on a systematic literature review

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ABSTRACT

The conventional model of energy production and consumption has come under severe scrutiny. Concerns related to climate change, increased energy needs and issues surrounding conventional sources of energy generation have highlighted a need to adopt sustainable means of energy generation. Renewable energy sources are believed to have the potential to meet rising energy needs in a sustainable and environmentally friendly manner. Solar energy is particularly interesting in this respect as it has the potential to be used at commercial as well as household level; however, to this end, its contribution to global energy supply has remained limited. A number of studies have explored factors influencing the adoption of solar photovoltaics (PV) at the household level and proposed measures to foster its development. This paper aims to systematically review and analyse the state of solar PV adoption by exploring "W*hat are the key factors influencing the adoption of solar PV at household level?*". From 146 studies published in peer-reviewed scientific journals, the study identifies 127 unique factors influencing adoption behaviour, and groups these into eight categories, namely economic, environmental, social, personal, demographic, technical, regulatory and market-related factors. Based on the findings, this paper proposes guidelines for practitioners, identifies knowledge gaps and suggests directions for future research to strengthen the scholarship in this domain.

1. Introduction

Energy plays an important role in the development of modern economies. The advances that we see today would not have been possible without ample supplies of energy. Historically, hydrocarbons have provided the bulk of energy supplies; however, this conventional model of energy production and consumption has come under serious scrutiny. Rising energy needs, concerns regarding greenhouse gas emissions and climate change, the depletion of conventional energy sources, the unequal distribution of natural resources and concerns regarding energy security have made it impossible to follow similar production and consumption patterns [1–4]. Countries across the globe are seeking to adopt ways to meet rising energy needs in a sustainable and environmentally friendly manner using indigenous resources.

Renewable energy sources are believed to have the potential to meet rising energy needs in this way. However, despite their huge potential, their actual contribution to primary energy supplies has remained limited [5–7]. Technological advances, supportive policy frameworks and increased environmental awareness have stimulated the growth of renewables in recent times, and evidence suggests that renewables have now surpassed hydrocarbons in new power generation facilities [6]. Solar energy is particularly interesting as it has the potential to be used for large-scale commercial facilities as well as at the household level. Solar energy is currently used globally: over 126 countries have introduced some sort of policies or regulatory support to encourage its development [8]. To this end, solar energy generation has experienced remarkable growth, surpassing 1000 TeraWatt hours (TWh) in 2021 compared to a mere 31 TWh in 2010, representing a staggering growth of more than 30 times within a decade. The International Energy Agency estimates that solar energy production will exceed 7000 TWh by 2030 [9]. However, it is

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widely believed that the current contribution is far lower than its potential, and efforts should be made to enhance its adoption.

Scholars across the globe have conducted studies to understand the factors influencing the adoption of solar photovoltaics (PV) and have proposed measures to foster its development. However, a careful review of the literature reveals that the existing research on the topic is somewhat scattered and disintegrated. While various factors have been studied in different contexts, the evidence remains fragmented and lacks coherent understanding. There is, therefore, a need to review, integrate and synthesise the existing literature to offer a comprehensive understanding of the factors influencing the adoption of solar PV at the household level. There is an evident scarcity of comprehensive literature reviews in this domain: existing reviews have either emphasised on technical aspects, limited their scope to certain geographical regions, presented a holistic view by including a number of different renewable energy technologies or offered a rather brief overview of the subject [10–14]. This systematic literature review aims to bridge this gap by: (a) critically analysing the state of solar PV adoption at the household level and consolidating current research on the topic, and (b) identifying knowledge gaps and proposing directions for future research. Given these overarching objectives, the main research question of the study is "W*hat are the key factors influencing the adoption of solar PV at the household level?*" The study seeks to answer this question through a systematic literature review.

The remainder of the paper is structured as follows: Section 2 gives details of the methods employed to conduct the review. Section 3 presents the main results and findings. Section 4 offers a discussion of the results, while Section 5 identifies the limitations of the study and proposes avenues for future research. The final section presents the conclusion of the paper.

2. Methodology

The first step in answering the research question is to collate the relevant literature on the topic. This systematic literature review was conducted following the guidelines for preferred reporting items for systematic reviews and meta-analyses (PRISMA). PRISMA ensure that the review is conducted systematically while enhancing the legitimacy of the process, improving clarity and limiting bias that may otherwise affect the results [15,16].

This first step involved developing a review protocol, a list of questions and a strategy to conduct the search. Focusing on the objective of the study – "examining factors influencing the adoption of solar PV at the household level" – a comprehensive set of keywords was compiled to ensure that all possible studies on the subject were included in the review. It was observed that various authors had used synonyms: for instance, for the term "adoption", authors have frequently used keywords such as "purchase", "uptake", "willingness", "deployment", "installation", "investment", and so on. While these terms may somewhat differ in their dictionary meanings, they have been used to express the same phenomenon. In order to ensure that the maximum number of relevant studies is included, we have used a combination of synonymous terms to avoid missing a piece of literature that could be relevant to the context of this study. The list of keywords used for the study is presented in Table 1.

Once the list of keywords was finalised, the systematic review proceeded with establishing inclusion and exclusion criteria (Table 2). Inclusion criteria direct researchers on the articles to be included, while exclusion criteria limit the scope by filtering out those studies that are irrelevant to the review [17,18]. The first criterion concerned publication channels. This review is based on papers published in scientific journals only. We have excluded all other records, such as those appearing in conference proceedings, books, book chapters, working papers, editorials, letters to editors, grey literature or any other publications. The scope was limited to journal papers for two reasons: to keep the number of studies at a manageable level and because articles published in journals have undergone a peer-review process and their findings are widely acknowledged as validated knowledge that is likely to influence the field [17,19]. The second inclusion criterion required articles to be based on empirical research and concerned with solar PV at the household level. Lastly, we only included studies published in the English language; however, we set no limits on timespan or geography. This allowed us to collate all related material, irrespective of the time or context of publication, ensuring a global and comprehensive review.

The Scopus and Web of Science (WoS) databases were selected for carrying out the search. These databases offer access to a large number of scientific articles and are frequently used by researchers for systematic reviews [18,20–22]. The title, abstract and keywords option was selected to explore the databases. The initial search yielded 1498 records from both databases. Screening for English reduced the number of records to 1471, and the second filter – articles published in journals – further decreased the number of items included to 1178 articles. After that duplication check was performed, which reduced the total number of records to 648. These were then reviewed by screening their titles, abstracts and keywords to determine whether they fit the inclusion criteria. In those instances where it was not possible to establish whether

Table 1
List of keywords used for the search query.

Keywords
factor* OR motivator* OR enabler* OR predictor* OR antecedent* OR driver* OR barrier* OR impediment* OR determinant* OR enabler* AND affect* OR influenc* OR examin* AND intention* OR "Intention* to use" OR use OR adopt* OR "Intention* to Adopt" OR adopt OR willingness OR "willingness to adopt*" OR accept* OR application* OR purchase OR "Uptake" OR "up take" OR install* AND "Renewable Energy Technolog*" OR "Solar energy" OR "Solar PV" OR "Solar Photovoltaic*" OR "Photovoltaics" OR "Solar rooftop*" OR "Rooftop*" OR "solar roof top" OR "roof top" OR "BISP" OR "building integrated solar Photovoltic*" OR prosumer* AND "household*" OR home* OR "Hous*" OR dwelling* OR "private dwelling*" OR "Building*"

Table 2
Inclusion and exclusion criteria Inclusion and Exclusion criteria.

Included	Excluded
- Publication in scientific journals - Publications focusing on the adoption of solar PV at the household level - Publications in English	- Records published in other forums such as conference proceedings, books, book chapters, editorials, letters to editors, working papers, reports, grey literature, or publications appearing at any other forums - Publications focusing on other types of solar energy technologies, other RETs; or studies discussing adoption at other than household level - Articles in a language other than English

an article met the criteria, the full text was consulted to ensure that the review omitted no studies that should have been included or, alternatively, mistakenly included publications that did not match the criteria. At this stage, we strictly ensured that the articles included discussed the adoption of solar PV at the household level and excluded a number of studies that addressed the adoption of other renewable energy technologies (RETs) such as wind power, bioenergy or any other technology. We also excluded those studies concerned with solar thermal or focused on the commercial sector, as the objective of this study is to review evidence on the adoption of solar PV at the household level. This step left us with 136 articles that were selected for full-text reading.

To further ensure that the review included all relevant studies, a backward and forward snowballing approach was employed to compensate for any studies on the topic not previously included in the review [17,23,24]. This step identified ten additional articles that matched our criteria and were, therefore, added to the list of studies. The final list included 146 studies examining the state of solar PV adoption at the household level (Fig. 1).

Data were extracted following a specifically designed data extraction form that included information concerning the title of the paper, author details, publication year, name of the journal, methodology, information on theory or main constructs, the context of the study, factors studied and key findings. The extracted information assisted in developing an overall understanding of the field, making sense of the data and reported results, and developing an understanding of the relationships between factors. Data analysis was divided into two levels: descriptive and thematic. The descriptive analysis concerned, for instance, the year in which articles were published, the journals in which they were published, the countries chosen as context, the methods adopted by the study and related issues. In contrast, the thematic analysis presents a detailed account of factors influencing the adoption behaviour. The identified factors are grouped into eight categories – economic, environmental, personal, social, demographic, technical, market-related and regulatory factors. This eight-factor typology is derived endogenously following a systematic approach. In the first stage, all factors influencing the adoption were collected in an excel document. In the second stage, factors with similar characteristics were grouped together. For instance, factors dealing with price, costs, income, returns and related factors were clustered together and labelled as 'Economic' factors. Likewise, factors dealing with social issues such as societal pressure, peer effects, social network and so on were grouped together and categorised as 'Social' factors. It is important to highlight that in some studies authors

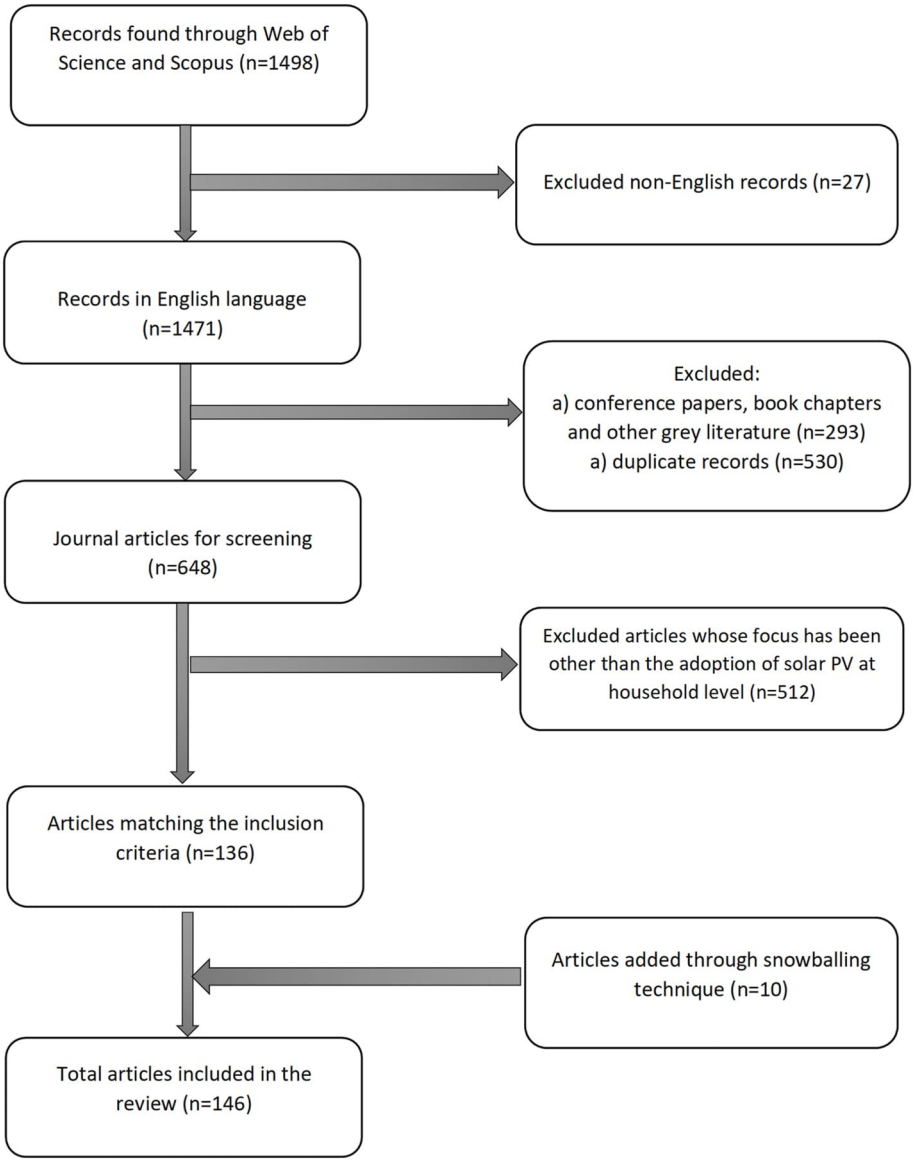

Fig. 1. Search criteria for relevant literature.

have studied similar phenomena but have labelled factors slightly differently. For instance, to gauge the effect of the price, some studies have used terms such as the cost of the system and purchase price. The terms, in actuality, are different but refer to the same thing in some studies. In instances where the terms were used synonymously, they were removed to avoid duplication. However, where authors have included installation costs, financing cost, perceived costs etc., these were included as these meant different things, and their inclusion deepens the analysis. The process was repeated until all variables were clustered together under different headings. Once all variables were categorised under overarching cluster labels, the second round of clustering was initiated to sub-group variables under each category. For instance, in the 'Economic' category, factors were sub-grouped based on the topic. Factors related to cost (upfront cost, installation cost, maintenance cost etc.) were sub-grouped under 'cost' while factors dealing with income (level of income, household income, income from pension etc.) were sub-grouped under income. The process was carried out for all categories to group the diverse variable into meaningful representative sub-headings (Fig. 4).

However, it is important to note that the factors included in the taxonomy are not always mutually exclusive, and there are overlaps and interactions across different categories. The factors influencing the adoption behaviour are complex and multifarious in nature and thus could be argued to place under different categories. For instance, the support offered by the government in the form of subsidies or other financial incentives, in essence, are a policy initiative. However, it influences the overall economics of the PV system. Thus, an argument could be made to link these to economic factors. Likewise, factors such as education, age and related considerations could be placed under personal or demographic characteristics. The manual clustering approach and subjective placement raise the issue of fairness and consistency. To address this challenge, each time we came across a factor that could be placed in multiple categories, we discussed that among the team and registered it where it suited the most. The approach has helped us to maintain coherence and remain consistent in the extraction process. Lastly, this review has used the United Nations country index list to group countries into developing and developed worlds [25], enabling us, among other things, to ascertain whether certain factors play a more dominant role in one context than the other, adding breadth to the analysis.

3. Results

3.1. Descriptive analysis

3.1.1. Classification based on publication type

A diversity of publication sources is important in producing conclusive results; it also increases the validity and wider acceptability of a study. The 146 articles reviewed were published in 56 different journals. Energy Policy contributed 35 articles, the highest number of publications, while 12 articles appeared in Sustainability and 11 in Renewable Energy. Other prominent journals included Renewable and Sustainable Energy Reviews and Energy Research & Social Science, with nine papers each. On the other hand, the International Journal of Energy Sector Management, Environment Research Letter and Journal of Cleaner Production published five articles each. Technological Forecasting and Social Change contributed four articles, whereas three articles were published in Energy Economics. Two journals contributed with two papers, while the input of the remaining 44 journals was restricted to one article each (seeTable 3).

3.1.2. Classification by year

The review included publications from 2006 to the fall of 2021, the period in which the search query was executed. It is important to note that we set no restriction on time, as we were interested in including records from the earliest possible date. The oldest paper in the review was published in 2006, and the pattern suggests that the number of publications has increased steadily over the years. This growing number reflects an increasing global interest in solar PV; research is expected to

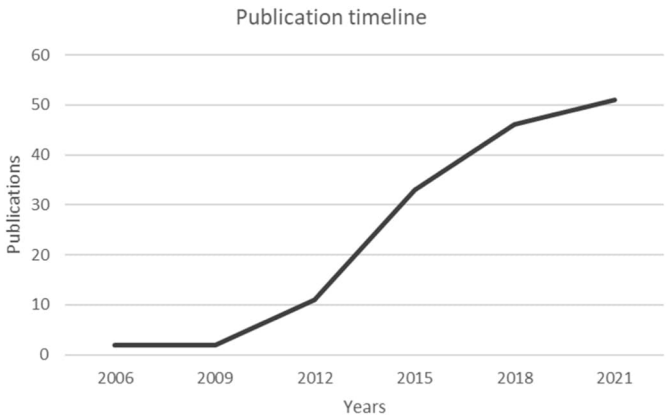

Fig. 2. Publications on yearly basis.

Table 4
List of countries.

Name of country	No. of publications	Name of country	No. of publications
United States	31	Australia	10
China	8	India	7
Germany	6	Malaysia	6
Japan	5	United Kingdom	4
Pakistan	4	Netherlands	4
Switzerland	3	South Korea	3
Sweden	3	Canada	3
Bangladesh	3	Finland	2
Saudi Arabia	2	Singapore	2
Belgium	2	Sri Lanka	2
Norway	2	Vietnam	2
Uganda	2	Tanzania	2
Ethiopia	2	Hong Kong	2
Greece	2	Chile	2
Iran	2	Mexico	2
Nigeria	2	Others	15

Table 3
Publications according to journal.

Name of Journal	No. of publications	Name of Journal	No. of Publications
Energy Policy	35	Sustainability	12
Renewable Energy	11	Energy Research & Social Science	9
Renewable and Sustainable Energy Reviews	9	Environment Research Letter	6
International Journal of Energy Sector Management	5	Journal of Cleaner Production	5
Technological Forecasting and Social Change	4	Energy Economics	3
Australian Journal of Agricultural and Resource Economics	2	Journal of Environmental Economics and Management	2
Others	44		

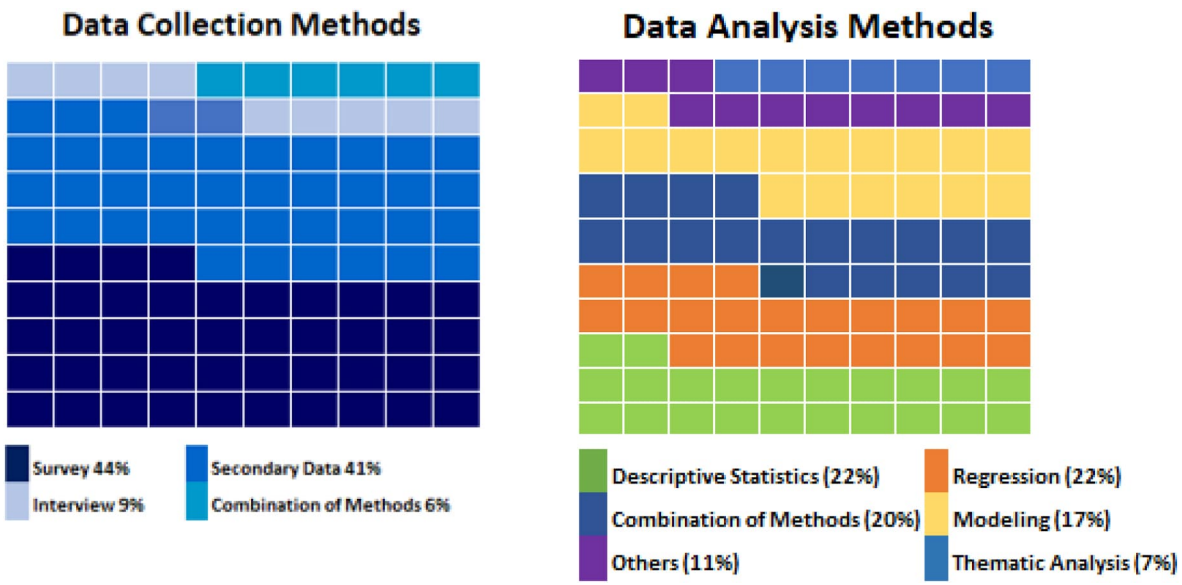

Fig. 3. Data collection and analysis approaches.

Table 5
Name of theory/model.

Name of theory or model	Freq. of use	Name of theory or model	Freq. of use
Roger's innovation diffusion model	12	Theory of planned behaviour	11
Unified theory of acceptance and use of technology 2	3	Theory of reasoned action	2
Bass diffusion theory	2	Technology acceptance model	2
Goal framing theory	1	The energy cultures framework	1
Trudgill's framework for analysis	1	Theory of technology transition	1
Sociotechnical network	1	Group decision making theory	1
Attitude-toward-the-ad model	1	Theory of normative conduct	1
Pro-environmental policy framework	1	Social cognitive theory	1
Bottom of the pyramid approach	1	The model of trilogy attitudes	1
The trying-to-consumer model	1	The multi attribute attitude model	1
Behavioural Reasoning theory	1		

make a significant contribution in this area for the foreseeable future (Fig. 2).

3.1.3. Classification by country

Studies included in the review were conducted in 48 different countries: the USA led with 31 publications, followed by Australia and China with ten and eight papers respectively. Seven studies were conducted in India, while six studies were conducted in each of Malaysia and Germany. Japan contributed with five studies, whereas four were conducted in each of the Netherlands, United Kingdom, and Pakistan. Five countries have three publications each, while sixteen countries contributed two studies. The rest of the 15 countries offered one paper each. Only four studies used data from multiple countries. It is interesting to highlight that the seven countries leading in terms of the number of publications are also ahead in terms of actual solar PV deployment [26] (Table 4). Based on the UN list, 81 articles focused on developed countries, 64 articles emerged from developing countries, while one study gathered evidence from both developing and developed countries.

3.1.4. Classification by research method

An overwhelming majority of the studies, approximately 85%, used quantitative methods, while only 8% of studies were qualitative in nature and approximately 7% adopted a mixed-method approach. Of the quantitative studies, the survey was the most widely adopted instrument for data collection, with 52% incorporating these, while the remaining 48% of studies relied on secondary data, utilising sources such as census data, governmental reports and surveys, private energy companies' data and so on. Qualitative studies most commonly used interviews for primary data collection, while a quarter of the studies also included secondary sources. Mixed-method studies relied on surveys, interviews and secondary data.

Descriptive statistics and regression are found to be the most used data analysis approaches in quantitative studies, while a sizeable number of studies adopted modelling approaches. In qualitative studies, content and thematic analysis were frequently used (Fig. 3).

3.1.5. Classification based on the use of theory or constructs

Approximately 21% of studies used theory to examine the state of solar PV adoption. The innovation diffusion theory was used in 12 studies, making it the most widely used theory, while the theory of planned behaviour (TPB) (used in 11 papers), unified theory of acceptance and use of technology 2 (used in three papers) and theory of reasoned action (TRA), technology acceptance model and the bass diffusion theory (used in two papers each) were also common. The use of various other theoretical lenses was limited to one paper only (Table 5). Of the papers that employed theories, 22% adopted a combination of theories, while 35% extended the original theory, adding determinants to the original theory to study the phenomenon. In contrast,

Fig. 4. Frequency of occurrence.

approximately three-quarters of the papers relied on factors extracted from the literature or employed modelling techniques.

3.2. Determinants for the adoption of solar PV

The analysis showed a range of factors studied to examine their effect on the adoption of solar PV. In total, the study identified 127 unique factors grouped into eight categories – economic, environmental, personal, social, demographic, technical, market-related and regulatory factors (Fig. 5).

3.2.1. Economic factors

Economic factors were found to play a key role in householders' decision to adopt solar PV. More than 72% of the studies included in the review examined economic-related factors in assessing consumers' willingness to adopt solar PV. This high level of consideration shows the importance of such factors in decision-making in both developing and developed countries. One justification of why these economic considerations become important in decision-making actually has to do with the high cost of the technology. The installation of solar PV requires a significant outlay, and the cost is often higher than alternative solutions available in the market. Though, the overall cost of solar has declined considerably over the years [27]. However, it is yet to reach to a point where it is less of a concern for consumers.

The impact of economic considerations has been examined in various ways. For instance, Mah et al. [28] and Shakeel and Rahman [29] tested the effect of high installation costs, referring to the amount needed to setup the PV system. The overwhelming majority of the studies reported that the high cost of the technology has a negative effect on adoption [30–33]. Authors including Lu et al. [34] and Weerasinghe et al. [35] examined the effect of the payback period; an economic indicator used to measure the length of time needed to recover the amount invested. A strong negative relationship was reported between the lengthy payback period and consumers' intention to adopt solar PV. The high costs combined with a long payback period make PV a less attractive avenue for investment [36,37]. Jayaraman et al. [38] investigated the impact of the economic return or monetary benefits that investment in solar PV may yield in the form of savings on energy bills or exchanging surplus energy for a price. These studies highlight the supporting role of economic return on adoption and confirm that higher economic returns enhance the likelihood of adoption [39]. However, the net value or overall economic benefit potentially brought by solar energy is closely linked to prevailing energy prices, with evidence suggesting that high energy prices positively affect the adoption of solar PV. High prices tend to increase the financial burden on a household, encouraging householders to opt for alternatives that can reduce their dependence on grid electricity by generating their own electricity and making energy produced by the panels economically viable [40–43]. Ugulu [44] argues that, despite the obvious economic benefits, consumers' reluctance to buy solar PV is largely due to the unavailability of credit or financing mechanisms. Sackey et al. [45] also reported a lack of credit availability as a significant barrier to the adoption of solar PV.

A number of studies have evaluated the effect of an individual's income on solar PV adoption and have reported interesting findings. Research conducted by Sirgin et al. [46] and Kowalska-Pyzalska [47] found that higher income positively influences adoption, as greater financial liquidity enables householders to buy solar PV. However, Bashiri and Alizadeh [48] argue that those on lower incomes are more likely to adopt solar PV: people with higher incomes care less about how much they are spending on energy; this higher spending on energy is not

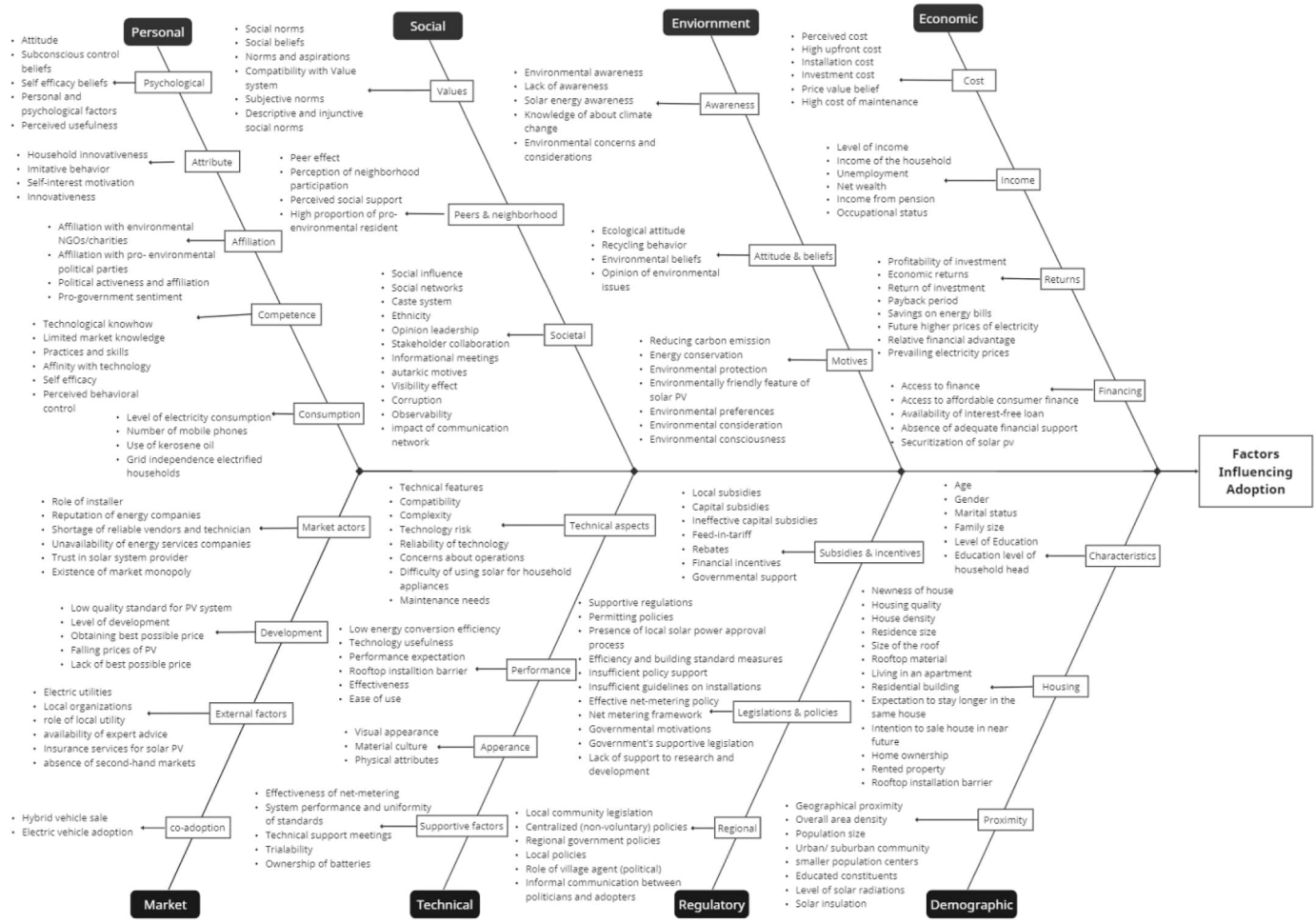

Fig. 5. Classification of factors influencing adoption.

generally a cause of concern for them. As a result, these people are less likely to adopt solar PV, whereas those on limited incomes always strive to find alternative ways to reduce their energy bills to balance their monthly budget. On similar lines, Rahut et al. [49] and Best et al. [50] examined the effect of overall household wealth on adoption and reported a higher adoption rate among wealthier families. Briguglio and Formosa [51] further assessed the relationship between unemployment and adoption, suggesting that unemployed households were highly unlikely to opt for solar PV. These findings strengthen the argument that greater financial liquidity positively influences consumer intention to adopt solar PV. Ma et al. [52] studied economic effects from a different perspective, examining how the installation of solar PV affects housing prices and found that property value appreciates as a result, making it expensive compared to houses without PV installed. This additional value is found to encourage consumers to opt for PV systems.

3.2.2. *Social factors*

Social factors are also found to play an important role in whether consumers opt for solar PV. Approximately 35% of the studies included in the review examined social factors and their impacts on consumers' willingness to adopt solar PV. Peer-effect has frequently been found as an important social indicator influencing individuals' choice to use solar PV. It refers to the influence on an individual from colleagues or peers [53–55]. Graziano et al. [56] examined peer effect by scrutinising whether friends' or colleagues' use of solar PV enhances an individual's willingness to adopt solar PV and found a positive effect. An individual's perception that their decision to adopt solar PV will be supported by those important to them strengthens the likelihood of adoption [57].

Curtius et al. [58] further suggest that social pressure to comply with neighbours' behaviours positively influences adoption. A number of other studies have examined the effects of social factors from different perspectives. For instance, Kapoor and Dwivedi [59] explored whether having solar PV installed in the neighbourhood or on nearby buildings influenced a consumer's choice and found that individuals living in areas and neighbourhoods with more solar PV installations were more likely to invest in solar PV themselves. This visibility effect is often attributed to two factors: firstly, the visibility of technology in the surrounding area raises awareness; secondly, such visibility develops trust and reduces the concerns that make individuals reluctant to choose solar PV by boosting their confidence in the technology as well as providing them with an opportunity to further enquire about PV [54,59–61].

Aggarwal et al. [62] and Engelken et al. [63] explored the role of social norms and beliefs on individuals' likelihood of adoption. Social norms are the rules and standards of society as understood by its members; while beliefs are an individual's personal views about issues prevailing in their surroundings. The findings suggest that an individual's affinity and overall positive attitude towards their environment positively influence adoption.

Lin and Kaewkhunok [64] examined the effect of the ethnic caste system on intention to adopt solar PV and found that households from higher castes are more likely to adopt solar PV than those from lower castes. In societies where the caste system is still prevalent, it often influences people's lives, professional choices, income, living standards, and social status. People from higher castes are likely to have higher income, social status and better economic opportunities and are, therefore, more likely to adopt the technology. On similar lines, studies

have also investigated the level of adoption among ethnic minority groups and produced varying results. McEachern and Hanson [65], for instance, conducted research in Sri Lanka, revealing that households in villages dominated by ethnic minorities are more likely to adopt solar PV as they face difficulties in gaining grid connection due to their lack of influence in the political system. Minorities often follow a policy of self-reliance, and thus, a higher adoption rate can be observed. In contrast, a study in the United States found that Black and Hispanic ethnic groups are less likely to install solar PV. This difference in findings is likely to be due to the socio-economic and technical landscape of these countries. In developed countries, basic electricity needs are often met through the grid, so low-income households living in such communities are less likely to invest large sums of money in the installation of solar PV [66].

3.2.3. Environmental factors

The environmental features of RETs make them a highly desirable source of energy generation. Approximately 33% of the studies in the review included environmental considerations in assessing consumers' willingness to adopt solar PV. Environmental concerns referred to whether consumers were worried about the environment and were willing to adopt measures to address this [63]. The findings suggest that people who are concerned about the environment are more likely to use solar energy [67–69]. However, a number of studies have also found no relationship between consumers' environmental concerns and their willingness to adopt solar PV [40]. For instance, Opiyo [70] conducted a study in the context of a developing country, where people often adopt alternative solutions when electricity from the grid is not available. In these situations, factors such as the availability of cheap and undisrupted electricity often influence decision-making, while environmental considerations may be less important [29].

Prioritising the environment over other considerations also had to do with the general level of understanding and awareness of environmental issues among the population: people unaware of the dangers of climate change were less likely to give weight to environmental considerations. Several studies confirmed that higher levels of environmental awareness and knowledge lead to an increased likelihood of solar PV adoption [48,71]. Kowalska-Pyzalska [47] examined consumers' pro-environmental beliefs and suggested that individuals who are likely to keep a check on emissions, want to protect the environment and are inclined towards energy efficiency measures are more likely to adopt solar PV. De Groote et al. [72] further explored the association with the environment, measured by individuals' affiliation with environmental charities, and found this to positively influence the likelihood of use: such participation signifies awareness of and interest in the issues surrounding the environment and enhances the likelihood of adopting renewables-based solutions.

3.2.4. Personal factors

Personal factors also play an important role in the decision-making process. The review indicates that approximately 37% of the studies included personal factors when examining the likelihood of adopting solar PV. Research conducted by Kowalska-Pyzaksla [47], Kwan [73], and Yuan et al. [74] examined levels of education and the tendency to adopt solar PV and found that, as the level of education increases, the adoption rate also grows. This may be due to the fact that education, among other benefits, provides individuals with a view to understand the world rationally. These findings are supported by studies that found that pre-existing knowledge, familiarity with technology, and environmental consciousness positively influence decisions to choose solar PV [48,75,76]. Solangi et al. [77] and Afroz et al. [33] explored how limited knowledge of technology may impact an individual's decision to adopt such technology. The findings supported the assertion that limited knowledge negatively affects the likelihood of buying and concluded that adoption among households with insufficient information is rare.

Baharoon et al. [78] studied how various personal and psychological factors affected the adoption of solar PV in urban and rural areas and reported that individual personal experiences and observations positively influence the likelihood of adoption. In addition to education and knowledge, the level of innovativeness in households could also be an important factor in the adoption of emerging technology. A study by Bashiri and Alizadeh [48] affirmed a positive association between innovativeness and intention to use solar PV. It is generally believed that those willing to learn, innovate and try new things are more likely to understand the technology and not be swayed by the adoption's risks. De Groote et al. [72] and Irfan et al. [79] further examined the likelihood of adoption among householders who are self-employed and confirmed that this increases the likelihood of installing solar PV. Self-employment, in practice, requires a certain level of risk, often in somewhat uncertain market conditions. These traits are consistent with people adopting novel technologies [80].

A number of studies have also tested the effect of an individual's attitude towards technology on the likelihood of adoption. Attitude refers to the negative or positive feelings an individual may have towards the use of technology [29]. In the case of solar PV, it could be influenced by expected outcomes, which may take the form of economic, social and environmental or related considerations. Studies have reported a positive relationship between attitude and the use of solar PV [47]. Similarly, an individual's feelings of moral obligation to combat the challenges of energy and climate, referred to as personal pro-environmental norms, also positively influence their desire to use solar PV [57]. Likewise, studies have also reported perceived behavioural control – an individual's perception of their ability to perform a specific behaviour [81] – as an important personal determinant. Shakeel and Rahman [29] assessed its significance and revealed its positive influence on intention. Aggarwal et al. [62] further probed the effect of self-efficacy on adoption. Self-efficacy refers to a person's perceived degree of confidence in installing solar PV, including design, installation and overall engineering competence. The study suggests that if an individual is confident of being able to manage the technical issues, their intention to adopt solar PV increases. Furthermore, if the use of the technology is consistent with individuals' past experiences, this also increases the likelihood of adoption [31,37,59,82].

Ma et al. [52] examined the influence of individuals' personal plans on the likelihood of adoption. The findings suggest that individuals who are likely to move out or sell the property in the near future are less inclined to install solar PV. Similarly, one study in the US scrutinised the relationship between political affiliation and adoption. A person's political affiliation demonstrates their mindset and the kind of policies and developments they want to see in society. The study suggests that households affiliated with pro-environmental parties are more likely to adopt solar PV. Komatsu et al. [83] went further to discover other factors that could be linked to the use of solar PV. The study examined how household levels of kerosene consumption and the number of mobile phones impact the likelihood of shifting to solar energy. In many developing countries, kerosene is used for lighting, and the use of solar may be a sustainable alternative. Similarly, households with a greater number of mobile phones are also more inclined to use solar, as limited or no electricity from the grid means they need alternative means to charge mobile devices.

3.2.5. Demographic factors

Demographic indicators are also found to be important in influencing individuals' intention to adopt solar PV. Approximately 31% of the studies included in the review examined these aspects. Zander et al. [75] assessed the impact of age and found a negative relationship with adoption: younger people are more likely to use solar PV, and the likelihood of adoption reduces with increased age. Briguglio and Formosa [51] suggest that people in this age group may have limited funds available for installation; however, the possibility to gain benefits for a longer period encourages uptake. Yuan et al. [74] claim that younger people are more likely to be aware of the benefits that the use of solar PV

may bring, thus are more inclined to adopt it. Conversely, Lin and Kaewkhunok [64] report that the age of the household head is positively associated with adoption. Jayaweera et al. support this finding by suggesting that, in some cases, the likelihood of adoption may increase in the later stages of life as affordability is significantly increased due to income gained from retirement and pension [84].

Schaffer and Brun [85] argue that home ownership is an important determinant in the adoption of solar PV. Briguglio and Formosa [51] affirmed that individuals who own a house are more likely to opt for solar systems. Schaffer and Brun [85] further analysed the impact of renting property on the adoption of solar PV and found that those renting were less likely to opt for solar PV. The renters typically do not have the authority or incentive to pay for the installation of solar PV systems. The issue is referred to as the split incentive problem, where renters or landlords do not benefit from their actions. Research conducted by Best et al. [50] examined the likelihood of adoption between the residents of apartments and houses are found that people living in apartments are less likely to use solar PV than those living in houses. De Groote et al. [72] examined the relationship between the age of the house and the uptake of solar PV. The evidence suggests that households living in newly constructed homes are more likely to opt for solar PV, as older homes may not be suitable for installation due to the state of the electrical wiring, the condition of the property, and the expenses incurred in maintenance and renovation.

The number of people living in a house, or family size, is also influential in deciding whether to opt for solar PV. Bashiri and Alizadeh [48] suggest that an increase in family members causes electricity consumption to rise, thus increasing the likelihood to install solar PV. Studies have also investigated the impact of overall population density – the total number of people living per square kilometre – on adoption. Kosugi et al. [86] conducted a study in Japan and discovered that less densely populated areas were more likely to adopt solar installation. Kwan analysed adoption in suburban areas and found a lower concentration of solar PV despite large open spaces [73]. The possible reasons for this low adoption may be associated with the number of trees in those areas shadowing potential installations. Several studies have examined the likelihood of adoption by looking at settlement structure [39]. The installation of solar PV requires reasonable space; the size of a house, therefore, becomes an important factor when considering installation. The positive relationship confirms that larger houses are more likely to use solar power. Another relevant aspect, the size of the roof, is also discussed in predicting the use of solar energy: studies by Best et al. [33] and Briguglio and Formosa [51] support findings that the space of the roof positively influences adoption as it makes installation on the property possible.

3.2.6. Technical factors

Solar PV is a relatively new technology, and a lack of awareness about its functionality, technical aspects and value may act as a barrier to its adoption at the household level. Approximately 32% of the studies included in the review considered technical issues and assessed their influence on the adoption of solar PV. Kapoor and Dwivedi [59] examined the effect of the complexity associated with solar PV and found it to be a hindrance to its widespread adoption. Alam et al. [82] further explored individuals' perceptions of how easy or difficult it would be for them to use solar PV and suggested that adoption is higher among individuals who are confident in using the technology. Similarly, reliability is an important determinant in the purchase of technology. Despite recent technological advances and overall improvements in solar PV systems, households may still have concerns over reliability. Alrashoud and Tokimatsu [31] considered this aspect and found a positive association with use, confirming that high reliability is likely to increase adoption. On similar lines, Arroyo and Carrete [68] evaluated how perceived technology risk influences adoption. The findings suggest that technical risk associated with solar PV decelerates its adoption. In instances where a householder perceives investment in solar PV to be high-risk, the likelihood of adoption diminishes. To address these concerns, Alam et al. [82] investigated whether providing consumers with the opportunity to experience the technology might offset some of their concerns regarding its functionality. The positive association between trialability and adoption supports the assertion that experience may offset some of the fears and facilitate the use of solar PV. Zhu et al. [87] argue that an opportunity to discuss solar PV with the companies' experts and seek technical advice positively influences consumer trust in the technology and fosters adoption [60]. Rai et al. [88] and Mah et al. [28] discussed the role of installers and energy companies in this regard. They found that an energy company's positive reputation significantly improves the likelihood of adoption.

In addition to technical functionality and consumer trust in the technology, the actual generation potential is a significant determinant in consumers' willingness to use solar PV. This potential is directly linked to the amount of solar radiation the PV receives [73]: a higher level of radiation can lead to improved energy production. Schaffer and Brun [85] affirmed that locations with higher average radiation levels experience higher installations. Qureshi et al. [67] claim that a high level of generation enables households to switch more appliances to using solar PV, consequently increasing the likelihood of adoption. Panos and Margelous [89] suggest that a household's ability to efficiently use energy generated from solar PV also plays a role in adoption. Komatsu et al. [83] conducted a study in Bangladesh and found that households with installed batteries are more likely to use solar PV as it can provide the opportunity to store energy for later use.

3.2.7. Regulatory factors

The governmental interest in expanding the usage of solar PV is crucial in ensuring widespread adoption. Governments make laws and regulations to encourage populations to embrace the technologies that they want to promote. This support is particularly important in the case of RETs, as energy is a strategic commodity, and facilitating the use of indigenous energy sources helps a country to reduce its dependence on external energy sources. Moreover, the high price of the technology and its relatively early stage of development make governmental support an integral element [35,54,87]. Approximately 32% of studies included regulatory aspects when assessing consumers' willingness to adopt solar PV. Research conducted by Jirakiattikul et al. [90] assessed the effectiveness of governments' motivation in promoting solar energy and reported it to be an important factor in influencing widespread adoption. Aggarwal et al. [62] suggest that developing and enforcing supportive policies positively affects the adoption of solar PV. Graziano et al. [91] examined the link with non-voluntary government policies and found these to positively influence adoption. In addition to the national-level policy regime, in some countries, regulations and policies are also developed and implemented at the regional or community level. Fikru [41] studied the role of local policy in encouraging households towards solar installation and revealed its positive contribution to increasing the number of solar installations. Hsu [92] found that the existence of a local solar-power approval process positively influences adoption as it makes the process simpler and easier. Zhang et al. [71] also investigated the relationship between regional policy and adoption and found a positive connection.

In addition to introducing overall policies and providing a stimulating environment, governments across the globe are seeking to introduce regulatory measures to facilitate the usage of renewable energy solutions at the household level. The introduction of feed-in tariff schemes, net metering and similar regulations positively supports the development of solar PV by making it economically viable for the masses [38,93,94]. A number of studies have evaluated the effectiveness of government subsidies and incentives for promoting solar PV use [87, 95–98]. The results conclude that the availability of financial incentives positively affects consumers' willingness to adopt. However, such subsidies need to be well-directed or else they may fail to produce the desired results [99]. These findings highlight the importance of the

government in encouraging the use of renewable energy solutions through the introduction of effective subsidies and financial incentives. Likewise, in locations where regulations have made it possible for consumers to sell excess electricity to the grid, this has been found to have a positive effect on adoption [93], encouraging consumers to opt for solar PV and generate a monetary benefit from the sale of electricity [100].

3.2.8. Market-related factors

Market-related factors are also found to be playing an important role in influencing consumers' adoption of solar PV. Approximately 12% of studies included in the review have examined the effect of such factors. The significant financial commitment and the potential long-term use encourage consumers to purchase solar PV systems from reputable and trustworthy vendors. Tsantopoulos et al. [101] affirm that the unavailability of reliable vendors negatively influences consumers' adoption. Abdullah et al. [102] examined the role of the installers and found that the lack of expert or trustworthy installers also causes reluctance to adopt solar PV systems.

Mohandes et al. [103] explored the effect of overall market progress on the adoption and found that continuous improvement in a solar PV system, in terms of improved efficiencies and reduction in prices, often induces decisional procrastination, enticing consumers to postpone purchase decisions until the technology gets cheaper or improves in performance. Torani et al. [104] affirm that the trend of continuous price reduction entices consumers to wait until the prices reach an absolute minimum. Cargo and Chernyakhovskiy [105] further explored the link between the adoption of solar PV and the sale of hybrid vehicles and found that sales of electric vehicles are positively associated with the adoption of solar PV. The development in one sector of the market often leads to the co-adoption of associated technologies to gain synergies.

Inderberg et al. [98] found that the existence of third-party market actors facilitates the adoption as they offer a broad range of solutions and services, making it easier for consumers to opt for solar PV systems. Wang et al. [106] reported that the availability of insurance services for solar systems also plays a role in encouraging adoption as it provides safety and peace of mind to consumers. Similarly, the possibility of reselling solar PV systems in the second-hand market to recover investments strengthens the likelihood of adoption [107].

Leenheer et al. [76] suggest that the available infrastructure and energy supplies coming from the grid also affect the market of solar PV. The frequent disruptions in grid electricity, often experienced in underdeveloped countries, encourage consumers to seek alternative ways to meet energy needs. Opiyo [70] examined the effect of an unreliable grid system on the uptake of solar power in Kenya and reported that it positively influenced adoption. A similar factor, power outage, was investigated in another study which also found a positive association between power disruptions and adoption [44].

4. Discussion

The adoption of solar PV is a complex process, affected by a number of economic, social, environmental, market-related, personal, demographic, technical and regulatory factors. The reviewed literature firstly reveals that cost-related factors are among the most important in the adoption of solar PV, due at least in part to the high cost of the technology [31]. In developed countries, energy is universally available, and the choice of solar PV is driven by factors such as self-sufficiency, savings on bills, and environmental or related considerations. Since energy needs are met through the electricity supply from the grid, the decision to use solar PV becomes somewhat secondary. For instance, if an individual wants to use solar PV to save on energy bills, the decision may naturally become a cost-benefit proposition. Once it becomes an investment decision, factors such as the rate of return, payback period, savings and opportunity cost become important considerations, making individuals reluctant to invest in solar PV if the price and the value do not create a profitable equation. Thus, potential investment in solar PV has to compete with other possible avenues for spending, making it somewhat challenging. However, in many developing countries, electricity supply from the grid is often limited or, in some cases, non-existent [29,44,107]. In situations where the need is evident and obvious – that is, a household needs an alternative form of electricity generation to meet its basic needs – individuals are simply choosing between the options offering the best source for power generation. In these cases, solar PV competes with uninterruptable power supply systems (UPS), oil or natural-gas-based power generators, batteries and other available solutions. The equation becomes somewhat simpler as there is an evident need to be met. The decision to choose alternatives over solar PV is often influenced by individuals' financial situations. Therefore, it is important to have financing mechanisms in place that can mitigate the high cost of the technology. The price of solar PV has lowered over the years, and if prices continue to decline, the need for financing or support mechanisms may no longer exist. However, until that point, measures to reduce the upfront cost are imperative. Instruments such as leasing facilities, power purchase agreements and credit facilities are found to positively affect adoption by mitigating the impact of the high cost [45].

Secondly, it is also important to raise the level of environmental awareness. There is a need to educate people about the environmental hazards and issues associated with the use of conventional hydrocarbons, in the form of greenhouse gas emissions and climate change, both in developing and developed countries [57,108]. The findings of the review reveal that the knowledge and understanding of environmental issues are generally slightly better in developed countries, as many households adopt solar PV to offset their environmental footprint. However, the evidence is somewhat limited in developing countries. Therefore, there is a need to raise the level of environmental awareness by educating people about climate change and the ripple effects it could have on their country and the world in general [71]. Improved awareness of environmental issues and the benefits that the use of renewable energy solutions such as solar PV can bring would encourage householders to see renewables as more than a mere alternative to existing solutions and to value the environmental benefits the product offers in addition to meeting functionality requirements. Such awareness may also boost individuals' willingness to pay for solutions, such as solar PV, in recognition of their benefit in terms of an improved environment.

Thirdly, market-related factors are also important in influencing the decision to opt for solar PV. Companies involved in the solar business need to develop business models and offerings to develop consumer trust in the technology. The technical nature of solar PV, being in a relatively early phase of development, and the high financial commitment makes households reluctant to invest in a solution that poses technical and financial risks. Companies must adopt practices and develop business models that match customer needs. For instance, offering periodic site visits, guaranteed repairs and maintenance, and readily available support in the event of system failures may offset consumers' fears, encouraging them to use solar PV. Likewise, the possibility of reselling solar PV systems on the second-hand market or to the original vendor may also increase the technology's adoption. A number of households living in impermanent accommodations refrain from investing in solar power, as they fear losing their investment when they move out. The possibility of reselling the system or getting a facility to re-install it at new premises would certainly encourage customers' trust and play a role in increased adoption.

Fourthly, the role of government is important and was found to play a significant role in the development of the solar PV market [54]. Such support is vital both in developing and developed countries, as assistance in the form of subsidies or financial incentives can mitigate the high cost of installing solar PV [73,94]. Moreover, the role of the government as a regulator cannot be overlooked. Introducing supportive policies encouraging the use of solar power, reducing bureaucracy in the system and facilitating integration into the transmission network can

minimise bottlenecks affecting the diffusion. There is ample evidence to support the assertion that in places where governments have introduced policies and implemented measures to encourage solar PV development, this has positively affected adoption. Likewise, indirect facilitation by removing technical difficulties such as facilitating connection with the grid, net metering and the ability to sell excess electricity to the grid can certainly boost the development of the solar market [97], as can governmental drive to reduce dependence on conventional hydrocarbons. Adopting measures to encourage the use of electric vehicles and providing a regulatory and physical infrastructure can also indirectly affect the development of the PV market.

4.1. *Factors influencing adoption: from the perspective of motivation-opportunity- ability model*

This review presents a detailed description of the factors influencing the adoption of solar PV at the household level. The eight-factor typology details the factors influencing adoption behaviour. This section aims to link these factors to an established theoretical model to offer a more profound understanding and reflect on how these factors could be examined further. The motivation–opportunity–ability (MOA) model offers an opportunity to understand and integrate constructs across disciplinary boundaries to gain insights into different levels of analysis. MOA has often been used to study energy consumption behaviour, attitude towards energy and other psychological, social and economic factors affecting individual energy consumption behaviours [109–111]. The following briefly explains MOA constructs and links them to the identified variables. The MOA model defines motivation as consumers' willingness to perform an action [112]. Motivation can be influenced by a number of factors, such as interests, desires, attitudes, belief systems, etc. Opportunity refers to the factors that provide consumers with the possibility to successfully undertake the desired action [111] and is linked to location, dwelling characteristics, financial resources, access to information and similar external conditions that influence the behaviour. Finally, ability refers to the skills and capabilities needed to undertake an action [109]. In the studied context, it is linked to knowledge, experience, proficiency in using the system, self-confidence, external factors facilitating the decision-making process, etc., that can influence individuals' ability to undertake an action. The following figure presents an account of the factors linked to the MOA model (Fig. 6).

It is important to highlight that the identified factors tend to operate in the spectrum, as they could act as enablers or barriers depending upon their bearing in each case. For instance, a higher income may improve the likelihood of adoption if other conditions exist. However, a lack of financial resources tends to negatively influence adoption. In such cases, the impact of subsidies, support schemes and other financing instruments may modify this relationship. Therefore, it is important to incorporate factors based on the prevailing conditions to gain a comprehensive understanding of how relations with one another actually influence the decision-making process.

5. Limitations and future research

This review has revealed a number of interesting insights about the factors influencing the adoption of solar PV at the household level. Based on these findings, the study proposes various avenues that researchers may consider in future to strengthen the scholarship in this field. The proposed directions take two forms: (a) those based on the limitations of this review, with suggestions as to how future research could address the highlighted shortcomings, and (b) suggestions originating from the discussion and insights gained from the in-depth review of the literature.

5.1. *Limitations of the study*

The first limitation of this review concerns the evidence incorporated to study the subject matter. Although the review aims to be

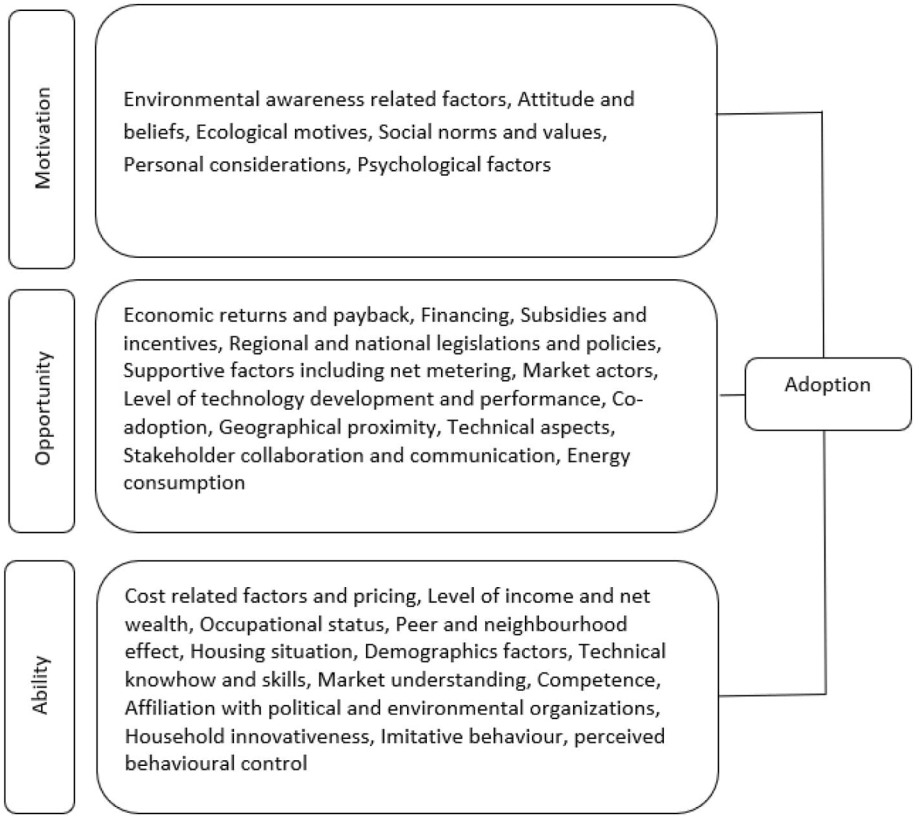

Fig. 6. MOA model.

comprehensive, presenting evidence from 146 studies, it is possible that the search approach, the database and the keywords search strategy may have allowed relevant studies to be omitted from the review [17,24]. The incorporation of the snowballing approach compensates for this by including additional studies, yet the possibility of relevant studies that have not been acknowledged cannot be overlooked. However, it is reasonable to assume that the articles analysed and the evidence presented in this study represent the core research efforts within the domain. Thus, the inclusion of possible omitted studies, if any, is less likely to radically affect the analysis. Secondly, we have only included articles published in scientific journals, based on the assumption that these account for the frontier of research, and have excluded records published in other forums. There might be interesting studies that could reveal emerging research on the topic. However, they are left out because of this methodological choice we had to make to ensure the quality of the review. We propose that future research include this evidence to broaden the scope of the research in this field. Thirdly, we have only included studies that are published in English. There may be studies that contain interesting information on the topic in languages other than English. We suggest that scholars consider conducting similar studies incorporating evidence from different languages.

The next limitation concerns the scope of the study. The systematic review limited its scope to solar PV and excluded other solar solutions. Since technologies are at different stages of development and adoption, any generalisation of these results in the context of other technologies should be made with caution. We propose that future research should be conducted for other solutions to identify the factors influencing the adoption of these specific technologies. Finally, the review used the UN list to group countries into developing and developed countries; however, the countries included in each categorisation differ in many aspects. Therefore, we recommend that future research use alternative categorisations to gain deeper insights into the results.

5.2. Future research directions

Based on the review's findings, the first proposal concerns the choice of methods. The limited application of the existing methodologies renders an opportunity for future studies to adopt alternative methodological approaches to gain insights into the adoption of solar PV. Since a number of the factors influencing the decision-making process are rooted in social, cultural, economic and technical spheres, making the process complex and multifaceted [29,51,66,81,113], it is important that, in addition to sound quantitative studies, more qualitative and mixed-methods studies are conducted in less explored contexts to gain a deeper understanding of the factors influencing adoption. Moreover, evidence from different countries, presented in the form of comparative studies, may also enhance our understanding of the subject matter. Currently, only a few studies have relied on comparative studies; it is therefore suggested that future research should conduct studies to compare and contrast findings from different countries. Similarly, there is also a lack of studies adopting a longitudinal perspective. Future studies may benefit from the use of longitudinal case study approaches to gain an in-depth understanding of changes in behaviours over time and how perceptions of the various factors have changed over the years.

The second proposition concerns broadening the scope and dimensions of future studies. The existing studies, more often than not, overlooked when adoption in a country took place. Some countries started to adopt solar PV earlier than others, and the acceptance of technology, the levels of familiarity and understanding should, therefore, be considerably higher here than in the countries that joined the race later. It would be interesting to see whether there are differences between early- and late-adopter countries. Similarly, future studies may want to pay closer attention to the contextual role of national culture in terms of individualist and collective societies, as these factors may play a vital role in decision-making processes. Moreover, the review also suggests a lack of overall studies exploring market-related factors, especially with respect to the role of companies in influencing household adoption. Solar PV vendor companies involved in the dissemination of information, interaction with the consumers, sales and post-sale services are an important element in the value chain. Companies' ability to devise and deliver value offerings can influence consumers' purchase decisions. Their role becomes particularly important as the technology is still in the earlier phases of diffusion, and the technical details are often novel for a common householder. However, to this end, very little emphasis has been paid to this aspect. The existing studies have primarily limited companies' roles as technology providers, installers, and financing solutions providers. However, the effect of companies' business models and the services offered on the adoption behaviour has largely remained unexplored. It would be interesting to examine the impact of companies' operations and offerings on adoption. Likewise, the role of intermediaries in influencing adoption has been minimally explored. Intermediaries are becoming increasingly important actors in facilitating adoption. The recent development of the solar PV market has led to the emergence of new intermediary actors that can play a vital role in fostering diffusion. Future research should consider the role of new actors functioning as diffusion intermediaries within the context of solar PV.

Moreover, the subject of co-adoption is something that should be explored in future. Co-adoption refers to the adoption of one thing fostering the use of associated technologies to gain synergies. For instance, the use of electric and hybrid cars is currently on the rise [114]. This increased adoption of Electric Vehicles (EVs) is likely to positively impact the demand for solar PV. EVs with bidirectional charging capabilities add flexibility by offering the possibility to effectively use the power generated by the system [115]. This, as a result, improves PV system utilisation and economics. Future research should pay attention to co-adoption issues to examine their influence on adoption behaviour. Moreover, the prolonged effects of the COVID-19 pandemic on the global supply chain and its impact on the production and distribution of solar PV systems, along with the recent geopolitical uncertainty brought on by the war in Europe and its bearings on global energy markets, have significantly altered market dynamics. This offers an interesting opportunity to explore how the increase in recent electricity and heating prices and market disruption caused by the geopolitical landscape influence adoption behaviour and diffusion trajectory.

The third proposition concerns the application of theories. The overwhelming majority of the papers are atheoretical, i.e. theory has not been a fundamental foundation for the research design. Instead, studies have predominantly relied on the existing literature to devise frameworks. Though this approach has helped to unravel the critical factors influencing adoption behaviour, it has also limited the possibility of testing and extending novel theories in different contextual settings. Moreover, the richness and diversified application of the theories is also limited, as most papers rely on a narrow range of theories. There is a clear need to broaden the prevailing cross-disciplinary approaches through the application of a wider variety of theoretical notions to improve the construction of empirical and conceptual studies.

6. Conclusion

Solar energy is becoming an increasingly important source of renewable energy generation. Countries across the globe are seeking ways to increase their contributions to primary energy supplies. However, the widespread adoption and use of solar energy are dependent on its uptake at the household level. The adoption of solar PV is a complex and multifarious phenomenon. The existing literature has explored a number of factors influencing adoption behaviour and has proposed measures to foster its development. This paper systematically reviews the evidence presented in 146 peer-reviewed studies to identify the factors influencing solar PV adoption. The identified factors are grouped into eight factors: economic, environmental, personal, social, demographic, technical, market-related and regulatory. Based on the

findings, this paper offers suggestions for practitioners, identifies knowledge gaps and suggests directions for future research to strengthen scholarship in this domain.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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Appendix A. Supplementary data

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