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Assessing Pro-Environmental Behaviour toward Solar Energy using Norm Activation Model and Social Influence

[1,]Nayab Riaz, [2,]Muhammad Awais
[1,2,]*School of Economics and Management, University of Science and Technology Beijing, China*

ABSTRACT: Globally greenhouse gas emission is a growing concern which emphasise sustainable energy solutions on urgent bases. This study investigates the pro-environmental and social factors that influence individual intention to accept and adopt solar energy at household level in Pakistan. Using the conceptual framework of norm activation model (NAM) this study examines the direct impact of awareness of consequence (AC), personal norms (PN), and social norms (SN) on people intention to adopt and recommend (to others) solar energy. Further this study also checks the mediation impact of personal and social norms among AC and people intention to adopt and recommend solar energy. A quantitative survey is used to collect data from 386 households through an online questionnaire. Further structural equation modelling (SEM) approach is used on smart-PLS software to analyse data. Results of this study revel that all proposed hypothesis are accepted except one. The hypothesis of mediation impact of social norm between AC and peoples intention to recommend solar energy was not supported in this study. The findings of this study contribute in growing literature on pro-environmental behaviour and provide insights for policymakers to promote renewable energies in developing countries like Pakistan.

KEYWORDS: Awareness of consequences, Norm activation model, Pro-environmental behaviour, Social norms, Solar energy.

I. INTRODUCTION

In today's energy generation, greenhouse gases are a global issue, particularly in developing nations like Pakistan (Rahman, Hasanuzzaman, & Abd Rahim, 2017; Wang & Azam, 2024). These challenges highlight the urgent need for environmentally friendly energy alternatives that can satisfy rising energy demands while minimize ecological harm. Among the various renewable energy options available, solar energy stands out as a highly promising alternative due to its clean, abundant, and renewable nature (Awais, Fatima, & Awan, 2022). This is particularly relevant for countries like Pakistan, where the geographical location provides an exceptional advantage in terms of solar radiation. Pakistan has immense potential to harness solar energy to address its energy shortages and reduce environmental degradation (Adnan, Hayat Khan, Haider, & Mahmood, 2012; Muhammadi et al., 2024). It is reported that in Pakistan there are a lot of feasibility with long-term economic and environmental benefits of solar energy, but still its adoption has been noticeably limited (Qureshi, Ullah, & Arentsen, 2017). This thing can be explained to various barriers and many of which rooted from social and individual behavioral factors. These factors include peoples lack of awareness about the environmental benefits of solar energy, resistance to change grounded in social norms, and short personal motivation to adopt pro-environmentally and responsible behaviors (Awais et al., 2022). Additionally, there are limited numbers of studies that work in this domain of pro-environmental behaviour of peoples toward the adaptation of solar energy in specially Pakistan. Recognizing and addressing these behavioral and social factors is necessary to fully utilize potential of solar energy in Pakistan and strengthen the countries commitment to sustainable development goals.

The purpose of this study is to investigate the key elements that affect people's intents to use solar energy in Pakistan, with a focus on pro-environmental behavior. Increasing the use of renewable energy requires understanding behavioral changes. This study uses norm activation model (NAM) a comprehensive theoretical model that helps in understanding the psychological factors that drives such behavior (Schwartz, 1977). NAM define that there are two main factors that derive peoples intention to behave in sustainable way, first one is awareness of consequences (AC), and second is ascription of responsibilities (AR), further these two factors built personal norms (PN) in a person to act accordingly. This study just focuses on AC which is a key factor in NAM (Stern, Dietz, Abel, Guagnano, & Kalof, 1999), to check its key role in shaping peoples intention toward solar energy. Studies define AC as a peoples capacity to understand the effect of their actions and decisions they make about energy could include addressing energy crises and climate change. To further enhance this

understanding this study includes two mediating variables personal norms (PN) from NAM theory (Schwartz, 1977) and social norms (SN) from theory of plain behaviour (TPB) (Ajzen, 1991). Personal norms are defined as a person internal moral obligations that force him/her to behave in pro-environmental way, for example the adaptation of renewable energy (Stern et al., 1999). These norms are often based on a person moral ethics, ecological knowledge, and obligations to coming generations (Schwartz, 1977; Stern et al., 1999). Conversely, social norms encompass the wider expectations of society as well as the actions of peers or community members that impact personal decisions (Ajzen, 1991; Lin & Niu, 2018). In terms of solar energy adoption, these norms may manifest as social circles perception of the social acceptability and attractiveness of renewable energy adoption. The findings from this study are intended to contribute to an emerging body of literature on pro-environmental behavior, specifically in the context of the uptake of renewable energy technologies in developing countries such as Pakistan. This study intends to bridge existing knowledge gaps and provide a deeper understanding of the behavioral aspects behind renewable energy decisions by emphasizing on the psychological and social factors that affect people intentions to adopt solar energy.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Awareness of Consequences and People Intention toward Solar Energy

Awareness of consequences has been identified as playing a key role in motivating pro-environmental behavior in one of the major norm-based approaches to understanding environmental attitudes (Schwartz, 1977) Norm Activation Model (NAM). As more people learn about the environmental, social, or economic impact of their actions, they increasingly feel a sense of moral obligation to behave in an environmentally responsible manner, said NAM. For example, research has shown that knowledge about the detrimental impacts of traditional forms of energy (eg, fossil fuels) will stimulate personal and social norms and influence people to adopt greener sources of energy such as solar (Han, 2015). Awareness of consequences is defined as an emotional and cognitive understanding that an action may have harmful effects on the environment and it promotes people to engage in behaviours to reduce these negative consequences (Stern et al., 1999). For example, studies show that when individuals received information about the impact of climate change/environmental degradation on their lives (e.g., loss of land, flooding, crop loss), they were more likely to state an intention to engage in eco-friendly behaviors like switching to solar energy (Steg, Dreijerink, & Abrahamse, 2005). People who understand that solar will help them in the long run, with decreased greenhouse gas emissions and lower energy bills, are more likely to see solar as a viable and beneficial energy source. Based on the above literature, we propose the following hypothesis:

H1: Awareness of consequences has a positive effect on the intention to use solar energy.
H2: Awareness of consequences has a positive effect on the intention to recommend solar energy.

Awareness of Consequences and Personal Norms

Awareness of consequences plays a pivotal role in shaping pro-environmental behavior by fostering a sense of moral obligation to act responsibly (Stern et al., 1999). Rooted in the Norm Activation Model (NAM) (Schwartz, 1977), awareness of consequences refers to an individual's understanding of how their actions impact the environment, society, and economy. When individuals recognize that adopting environmentally friendly behaviors, such as using solar energy, can mitigate adverse consequences like climate change and resource depletion, they are more likely to internalize these concerns as personal responsibilities. Research highlights that individuals with heightened awareness of environmental challenges are more likely to develop personal norms an internalized moral obligations that motivate them to engage in sustainable actions (Awais et al., 2022; Steg et al., 2005). For example, a study by (Harland, Staats, & Wilke, 2007) found that increased awareness about environmental degradation directly strengthened personal norms, leading to higher engagement in pro-environmental behavior. So based on the above literature, we propose the following hypothesis:

H3: Awareness of consequences has a positive effect on personal norms regarding solar energy adoption.

Awareness of Consequences and Social Norms

Awareness of consequences not only influences individual behavior but also plays a significant role in shaping societal attitudes and norms (Han, 2015; Karimi & Mohammadimehr, 2022). Social norms refer to the collective expectations about acceptable behaviors within a given community or society (Ajzen, 1991). When individuals become aware of the environmental, social, and economic impacts of their actions, they are more likely to share this awareness within their social circles, thereby influencing collective behaviors and reinforcing societal norms. The Theory of Planned Behavior (TPB) (Ajzen, 1991) suggests that awareness of consequences can increase the salience of pro-environmental behaviors, such as adopting solar energy, within a social context.

When individuals are aware of the environmental benefits of solar energy, they may perceive it as a behavior that is both desirable and normative within their community. Research has shown that awareness of environmental issues can trigger social influence, leading individuals to adopt behaviors that align with societal expectations (Gkargkavouzi, Halkos, & Matsiori, 2019; Karimi & Mohammadimehr, 2022). Based on the above literature, we propose the following hypothesis:

H4: Awareness of consequences has a positive effect on social norms regarding solar energy adoption.

Personal Norms and People Intention toward Solar Energy

Personal norms (PN) are defined as a persons internalized sense of moral obligation to behave in pro-environmental manners (Landon, Woosnam, & Boley, 2018). PN play a central role in motivating peoples to engage in sustainable actions as defined by (Stern et al., 1999). According to the NAM theory PN are activated when a person perceive a moral responsibility to deal with environmental issues like climate change or resource depletion (Schwartz, 1977). According to VBN theory PN are shaped by a person internal values and environmental beliefs (Hwang, Kim, & Kim, 2020; Stern et al., 1999). When a person internally develop the belief that solar energy adaptation is necessary for the environment PN drive them to act accordingly (Awais et al., 2022). Studies have shown that strong PN significantly impacts people behavior by making a sense of responsibility to make choices that benefits environment. Such research by (Awais et al., 2022) on renewable energy found that personal norms are powerful motivators for pro-environmental behaviors. Based on the above literature, we propose the following hypothesis:

H5: Personal norms have a positive effect on peoples intention to use solar energy.
H6: Personal norms have a positive effect on peoples intention to recommend solar energy.

Social Norms and People Intention toward Solar Energy

Social norms (SN) is the shared expectations that an peoples think to be appropriate in within society and these SN have a strong effect on pro-environmental behaviour (Awais et al., 2022). The theory of planned behavior (TPB) (Ajzen, 1991) asserts that social norms influence intentions to perform certain behaviors because they generate the feeling of social pressure to conform. For example, when it comes to adopting solar energy, if individuals see that their peers or residents in their community approve of renewable energy solutions, they may seeking to conform to those social norms. Social norms have been established as a strong drive behind pro-environmental behaviors in past research (Awais et al., 2022). Growing body of research surrounding pro-environmental behavior indicate that people perceive and adopt behaviors as consistent with the values of their community (Karimi & Mohammadimehr, 2022). For example, with solar energy specifically, the role of social norms might lead people to consider solar adoption not only to be a pro-environmental choice, but also a behavior that their social group views positively or approves of (i.e., an injunctive norm). Drawing from the preceding literature, we hypothesize the following:

H7: Social norms have a positive effect on the peoples intention to use solar energy.
H8: Social norms have a positive effect on the peoples intention to recommend solar energy.

Personal Norms as Mediator

Personal norms play a crucial role in guiding pro-environmental behavior, acting as internalized moral obligations that motivate individuals to engage in sustainable actions (Schwartz, 1977; Stern et al., 1999). Studies shows that when peoples have strong AC factors this will directly activate their personal norms (PN) which making them feel about a sense of moral responsibility to behave in pro-environmental way (Ghazali, Nguyen, Mutum, & Yap, 2019; Schwartz, 1977). According to NAM theory PN are more likely to be activated when peoples recognize the harmful impacts of their actions on environmental degradation (Schwartz, 1977). Research has shown that PN mediate the relationship between AC and pro-environmental behavior. Such as Harland et al. (2007) found that AC such as climate change often build stronger PN which in turn motivated individuals to act in pro-environmental ways. Similarly in the context of this study when individuals are aware of the negative environmental effects of using conventional electricity their PN may mediate their behavior to switch toward solar energy. Based on the above literature, we propose the following hypothesis.

H9: Personal norms mediate the relationship between awareness of consequences and the usage intention of solar energy.
H10: Personal norms mediate the relationship between awareness of consequences and the recommendation intention of solar energy.

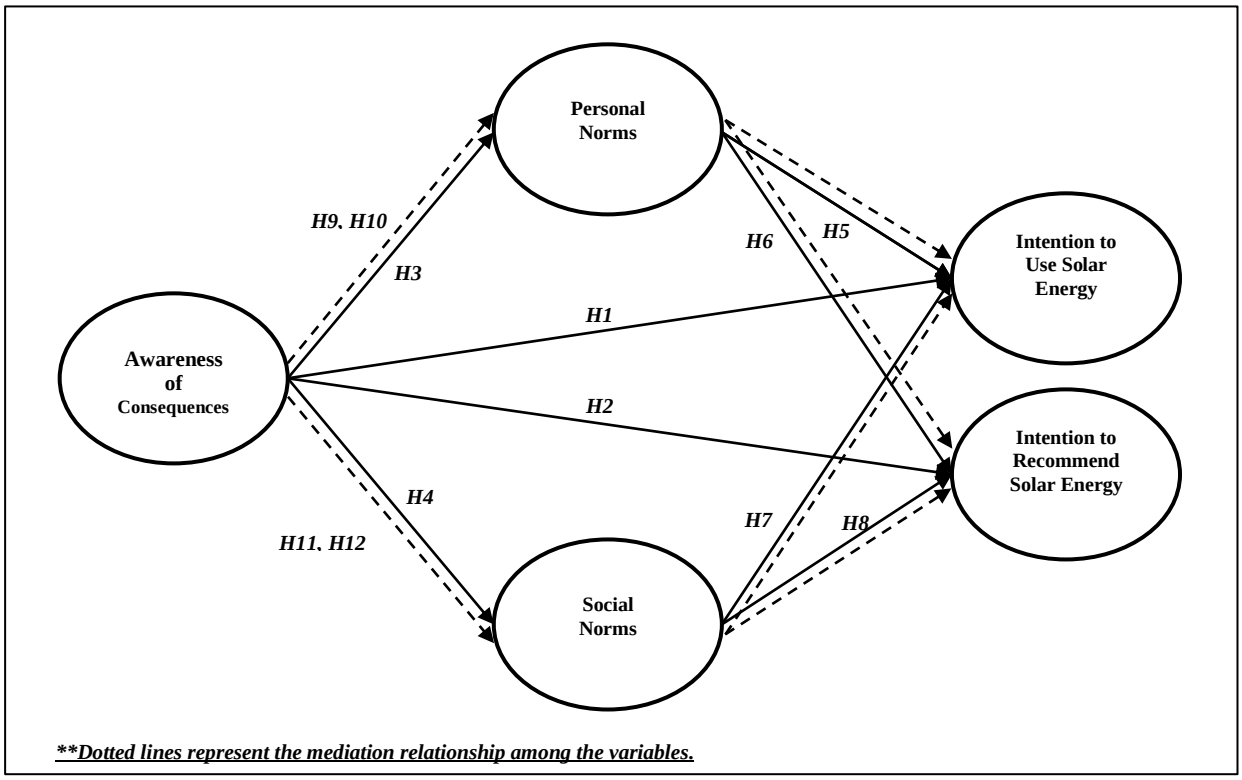
Social Norms as Mediator

Studies witnessed that Social norms (SN) have a significant impact on peoples behaviors to adopt pro-environmental practices (Han, 2015; Karimi & Mohammadimehr, 2022). SN represents the acceptable actions within an individual community, and these actions are about what behaviour the people in that community desire from that person. Studies like (Awais et al., 2022) suggest that when people face the social pressure from their community they behave in pro-environmental manners. Similarly (Han, 2015) in their study on travellers pro-sustainable behaviour found that SN positively mediate the relation between AC and pro- environmental behaviour of tourists. While in context of solar energy the awareness of negative consequences about the usage of conventional electricity can force an individual to use renewable energy, especially when it is perceived as a social pressure from surrounding peoples. (Karimi & Mohammadimehr, 2022) also found similar results in their study on socio-psychological factors of pro-environmental behaviour. (Cialdini, Reno, & Kallgren, 1990) illustrate that when peoples sees that a behavior aligns with his/her social circle, they will adopt it ever if their personal preferences does not align with it. So when individuals are aware about the environmental benefits of solar energy their SN can mediate the relationship between the AC and their intention toward solar energy. Based on the above literature, we propose the following hypothesis:

H11: Social norms mediate the relationship between awareness of consequences and the usage intention of solar energy.

H12: Social norms mediate the relationship between awareness of consequences and the recommendation intention of solar energy.

Figure 1: Research Framework



III. METHODOLOGY

As rooted in quantitative nature this study examine the relation between explained variables. This study is conducted among the general public in Multan city of Pakistan. This study use convenience sampling technique and collect data through online survey from selected households those want to use solar energy in near future, instead of convenience electricity that is provided by Government. An online questionnaire is used to collect data, and valid responses from 386 household users are collected within 6 months. Further to measure variable items current study use seven point Likert-scale ranges from strongly disagree to strongly agree. The questionnaire used in this study to collect data was divided into two portions. The first part contains the demographic information of the peoples that participate in this study. And second part of questionnaire contains

the item related to variables used in this study. Also the list of items and the source papers for these items are given in **Table no 2**.

IV. RESULTS

Demographic profile of respondents : In this study the first part of the questionnaire was focused on respondent demographic information like age, gender, income and education. From data analysis it is found that from 386 respondents there were 71.76% males and 28.24% females. The age of the respondents ranges from 0.78% below 20 years, 6.22% 21–25 years, 36.27% 26–30 years, 29.02% 31–35 years, 15.28% 36–40 years, 8.55% 41–45 years, 3.11% 46–50 years, and 0.78% above 50 years. Further the results for education and income of respondents are presented in **Table no 1**.

Table No 1: Demographic Segmentation

Demographic	**Frequency**	**%**
Gender		
Male	277	71.76
Female	109	28.24
Age		
Less than 20	3	0.78
21-25 Years	24	6.22
26-30 Years	140	36.26
31-35 Years	112	29.02
36-40 Years	59	15.28
41-45 Years	33	8.55
46-50 Years	12	3.11
Above 50 Years	3	0.78
Education		
Matric	2	0.6
Intermediate	22	5.7
Associate Degree	58	15
Bachelor	202	52.4
Masters/M. Phil	89	23.1
Doctorate/Ph.D	12	3.2
Income		
Below PKR25,000 (US$89.84)	2	0.6
PKR 25,000–PKR50,000 (US$89.84–US$179.69)	15	4
PKR50,000–PKR100,000 (US$179.69–US$359.37)	119	30.8
PKR100,000–PKR150,000 (US$359.37–US$539.06)	145	37.5
Above PKR150,000 (US$539.06)	26	6.7

Measurement Model : In this study measurement model is used to check the reliability and validity of this paper. The factor loadings of all items of proposed constructs are above the recommender threshold (Hair, Risher, Sarstedt, & Ringle, 2019). Values of factor loadings reach from to 0.844 for PN2 to 0.945 for ITR3 which shows that all items are reliable the results are clearly depicted in the **Figure no 2**. Further this study applies construct reliability through Cronbach's alpha and composite reliability, to access internal consistency of all measures in study. Results shows the minimum and maximum value of Cronbach's alpha is between 0.883 for SN to 0.953 for PN, so it means the data is reliable because it is within the require threshold 0.7 to 1.

Table No 2: Factor Loadings of items and source

Constructs	**Items**	**Source**	**Loadings**
Awareness of Consequences	AC1	(Awais et al., 2022)	0.889
	AC2		0.860
	AC3		0.894
	AC4		0.875
	AC5		0.894

Personal Norms	PN1	(Ghazali et al., 2019)	0.863
	PN2		0.844
	PN3		0.873
	PN4		0.880
	PN5		0.871
	PN6		0.886
	PN7		0.877
	PN8		0.878
Social Norms	SN1	(Han, 2020)	0.937
	SN2		0.847
	SN3		0.916
Intention to Use	ITU1	(Hwang et al., 2020)	0.902
	ITU2		0.880
	ITU3		0.928
Intention to Recommend	ITR1	(Hwang et al., 2020)	0.940
	ITR2		0.907
	ITR3		0.945

Additionally the results of composite reliability in this study ranges from 0.890 for ITU to 0.955 for PN, which also confirms that data is reliable, because the recommended value should be more than 0.7 (Hair Jr et al., 2021). Moreover average variance extracted AVE is checked in smart-PLS to check the convergent validity of constructs. Results reveal that minimum value of AVE is 0.760 for PN, which meets the required criteria, as AVE should be more then 0.5. The results of Cronbach's alpha, CR, and AVE are presented in **Table no 3**.

Table No 3: Construct Reliability and Validity

Constructs	Cronbach's alpha	CR	AVE
AC	0.929	0.930	0.779
ITR	0.923	0.927	0.867
ITU	0.888	0.890	0.817
PN	0.955	0.955	0.760
SN	0.883	0.894	0.812

Lastly in measurement model, discriminant validity of variables is accessed through HTMT ratio. Results reveal that all values are in accepted range less than 0.9 as recommended (Teo, Srivastava, & Jiang, 2008). The results of HTMT values are presented in **Table no 4**.

Table No 4: HTMT Ratio

	AC	ITR	ITU	PN	SN
AC					
ITR	0.623				
ITU	0.810	0.717			
PN	0.821	0.648	0.818		
SN	0.747	0.599	0.781	0.763	

Structural Model : Structural model in SEM is used to check the impact and relationship between the studies construct, i.e., the intensity and type of relationship that exist among variables, and it helps in decision making about hypothesis acceptance or rejection. In smart PLS we apply bootstrapping technique with 5000 samples to run the structural model (Hair Jr et al., 2021). SEM results show that there is a significant relation among all the proposed hypothesis in this study. Results indicate that awareness of consequences (AC) has a significant and positive impact on recommendation intention of solar energy (ITR) ($\beta = 0.579$, $t = 8.802$, $p < 0.001$), which support H2, intention to use solar energy (ITU) ($\beta = 0.737$, $t = 14.732$, $p < 0.001$), which support H1, personal

norms (PN) (β = 0.774, t = 15.210, p < 0.001), which support H3, and social norms (SN) (β = 0.680, t = 10.996, p < 0.001), which support H4. Direct paths also confirm the relevance of PN and SN. PN significantly impacts ITR (β = 0.326, t = 3.084, p = 0.002) and ITU (β = 0.348, t = 3.758, p < 0.001), which support H6, and H5 respectively. Similarly, SN has a notable positive effect on ITR (β = 0.174, t = 2.084, p = 0.037) and ITU (β = 0.251, t = 3.093, p = 0.002) and it support H8 and H7 respectively. Further results of direct impact are presented in **Table no 5**.

Table No 5: Direct impact between variables

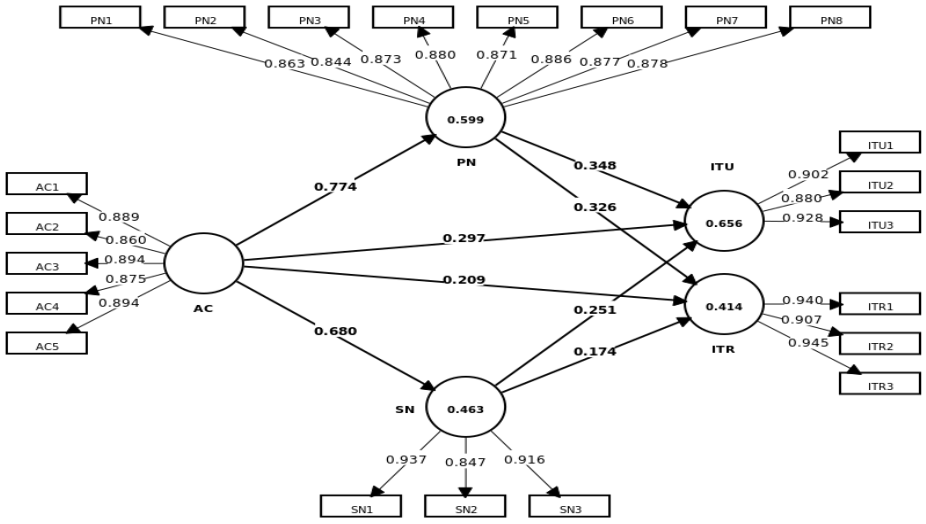
Hypothesis	Relationship	β	SD	t-value	p-values	Decision	VIF
H1	AC→ITU	0.737	0.050	14.732	0.000	Supported	2.743
H2	AC→ITR	0.579	0.066	8.802	0.000	Supported	2.743
H3	AC→PN	0.774	0.051	15.210	0.000	Supported	1.000
H4	AC→SN	0.680	0.062	10.996	0.000	Supported	1.000
H5	PN→ITU	0.348	0.093	3.758	0.000	Supported	2.914
H6	PN→ITR	0.326	0.106	3.084	0.002	Supported	2.914
H7	SN→ITU	0.251	0.081	3.093	0.002	Supported	2.177
H8	SN→ITR	0.174	0.084	2.084	0.037	Supported	2.177

Mediation Effect : This study also proposed mediation effect of constructs such as personal norms (PN) and social norm (SN) between the awareness of consequences (AC) and peoples pro-environmental behaviour (ITU and ITR) toward solar energy. This indirect effect is also found significant among all proposed hypothesis except one. Results shows that AC have positive impact on ITU through PN as mediator (β = 0.269, t = 4.014, p < 0.001), through SN as mediator (β = 0.118, t = 1.959, p = 0.050), this support proposed hypothesis H9 and H11. Further AC also have significant positive impact on ITR through PN as mediator (β = 0.252, t = 3.172, p = 0.002), which support proposed hypothesis H10. But the impact of AC on ITR through SN as mediator found not significant so hypothesis H12 is rejected in this study (β = 0.118, t = 1.959, p = 0.050). The SEM results of mediation paths are presented in **Table no 6**. The results are perfectly aligned with the existing literature in the domain of pro-environmental behaviour, like (Awais et al., 2022; Ghazali et al., 2019; Schwartz, 1977; Stern et al., 1999). Findings of this study provide strong evidence for proposed hypothesis, and reveal an excellent understanding for the drivers of people pro-environmental behaviour toward solar energy.

Table No 6: Indirect Effect

Hypothesis	Relationship	β	SD	t-value	p-values	Decision
H9	AC→PN→ITU	0.269	0.067	4.014	0.000	Supported
H10	AC→PN→ITR	0.252	0.079	3.172	0.002	Supported
H11	AC→SN→ITU	0.171	0.059	2.876	0.004	Supported
H12	AC→SN→ITR	0.118	0.060	1.959	0.050	Not supported

Figure No 2: Measurement Model



V. DISCUSSION

This study used to check people's pro-environmental behavior toward the acceptance and adaptation of solar energy in Pakistan's metropolitan city Multan. As solar energy is perceived as green energy and it has zero greenhouse gas emission because it does not use any fossil fuels. On the other hand the conventional electricity is harmful for our environment because it is fully fuel based and a big reason of greenhouse gas emission. In Pakistan this fuel base conventional electricity is the main source of energy and the household sector is a major user of this energy. So it is necessary to check the pro-environmental behavior of household sector toward the adaptation of solar energy for their daily usage and to minimize the usage of conventional electricity. Also studies have shown the increase trend of the usage of solar energy in Pakistan and the main reason behind this is reported as cost effectiveness, availability of solar panels and sunlight (Irfan, Zhao, Ahmad, & Mukeshimana, 2019). But on other hand still there is limited work in domain of pro-environmental behavior toward the acceptance of solar energy. While the main factor that promote pro-environmental behavior in people is personal norms (PN) which is highlighted by many studies like NAM and VBN theory (Schwartz, 1977; Stern et al., 1999). These personal norms are people's moral obligations that motivate them to take sustainable actions for the betterment of society. Solar energy is perceived as environmental friendly so this study includes PN to check people adaptation of solar energy. Further also other factors are included like awareness of consequences (AC) which is reported as the main activator of PN. AC stands for the people awareness of the negative consequences of their actions on society. Studies have proved that when people are aware about the consequences of their actions they are more morally obliged to behave in sustainable way. So in similar way it is propose that the awareness of the uses of conventional energy and its negative consequences on environment and uses of solar energy and its positive benefit for environment will make peoples more morally obliged to adopt solar energy.

Further this study use social norm (SN) also as predictor of pro-environmental behavior. As it is reported that people sustainable action are also inspired by social circle like society and people around. So SN is included as a factor that can impact people pro-environmental behavior toward solar energy as reported (Awais et al., 2022). Also this study makes a distinguished proposition that SN is also infected by awareness of consequences. It means that when people are aware of negative consequences of their actions they are more socially obliged to act in sustainable way. Moreover this study also proposed that personal and social norms act as mediator between the relation of AC and people pro-environmental behavior toward solar energy. Result of this study shows that all hypothesis are supported. AC, PN, and SN are positively related with people pro-environmental behavior towards solar energy which is in line with studies (Awais et al., 2022; Ghazali et al., 2019). Further this research also supports the mediation role of SN and PN in relation of AC and people's pro-environmental behavior towards solar energy. It means that when people have strong awareness about the negative consequences of their actions they are more personally and socially obliged to act in a way that is beneficial for society and environment.

VI. CONCLUSION

This study used to investigate the people's pro-environmental behavior to use solar energy. As solar energy is environmental friendly so this study propose that people personal norms and awareness about the consequences of their actions for environment can motivate them to adopt solar energy. It is also major proposition of NAM which stated that people's awareness of their consequences and PN are main factor behind Pro-environmental behaviour. Further this study also includes social norm as the behavior of surrounding people also have and strong influence on his/her action, which is also highlighted by (Ajzen, 1991). Moreover this study contributes by checking the impact of AC on SN which is least tested before. The study also proposed that PN and SN act as mediator among the relation of AC and people pro-environmental behavior towards solar energy. The results of the study highlights that all proposed hypothesis are accepted by significance positive impact. So this could be a rational document in domain of acceptance and adaptation of solar energy especially in a developing country like Pakistan, where the environmental pollution is a major problem and the conventional fuel-based energy is a major source of that pollution.

Future Recommendations and Limitations : This study use SEM analysis to inspect people pro-environmental behavior to accept solar energy. The results of this study are very significant for research and practice but these results fall short in some areas. As Pakistan is a diverse populated country having different cultures, languages and states, this study is just focused in one city which limits its generalizability. In future it is recommended to carry out similar studies in other regions of country with the comparative study also possible. Further the nature of the study is cross-sectional as data is collect at a specific time period, so it is recommended to do a longitudinal study in future. This will help to observe the changes in behaviour of selected sample over an extended period. Next this study did not focus on demographic characteristic of sample, so in

future it is also recommended to include demographic segmentation such as level of education, income and social status etc.

Further this study targets general population in city without focusing that they are active user or not of solar energy. So it is recommended that in future, studies should be conducted through purposive sampling technique by targeting the actual user of solar energy to check the pro-environmental behaviour. Also as being a good theoretical model many researchers extends NAM to increase its productive power, in the same social norm is included in this study. So in future it is recommended that studies should also use other factors such as communication and marketing strategies as highlighted by (Awan & Awais, 2023), with NAM mainly in case of solar energy.

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