



Community Planned Behavior in Renewable Energy Adoption for Decarbonizing Island Communities

Ari Rahman^{1,2}, I Wayan Koko Suryawan^{*1,2,3}

¹Department of Environmental Engineering, Faculty of Infrastructure Planning, Universitas Pertamina, Jalan Sinabung II, Terusan Simprug, Jakarta 12220, Indonesia

²Center for Environmental Solution (CVISION), Universitas Pertamina, Jalan Sinabung II, Terusan Simprug, Jakarta, 12220, Indonesia

³Center for Interdisciplinary Research on Ecology and Sustainability, College of Environmental Studies and Oceanography, National Dong Hwa University, Hualien 97401, Taiwan

*Corresponding author: i.suryawan@universitaspertamina.ac.id

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Abstract. This study investigates the pivotal role of community behavior in adopting renewable energy as a pathway toward achieving carbon neutrality in island communities. Employing the Theory of Planned Behavior (TPB), the research examines how critical dimensions adaptive attitude, subjective norms, perceived behavioral control, and intention influence individual and collective actions for sustainable energy transitions. The findings reveal that adaptive attitude (H1) significantly impacts subjective norms ($p = 0.015$), suggesting that positive perceptions of renewable energy benefits, such as reduced greenhouse gas emissions and potential economic opportunities, foster widespread community support. This indicates that when individuals view renewable energy favorably, they contribute to shaping societal norms that prioritize sustainable energy adoption. Subjective norms (H2) exert a strong influence on perceived behavioral control ($p < 0.001$), underscoring the importance of social networks and cultural dynamics in mobilizing community participation. Furthermore, adaptive attitude (H3) directly affects intention ($p = 0.064$), indicating that personal beliefs and awareness about the advantages of renewable energy drive individuals' readiness to engage in sustainable practices. The results also show that subjective norms (H4) play a critical role in shaping intention ($p < 0.001$), emphasizing the power of social influence, including peer encouragement and collective advocacy, in motivating communities to take action. This demonstrates that societal endorsement of renewable energy creates a positive feedback loop that strengthens individuals' intentions to act. While perceived behavioral control (H5) did not have a direct effect on intention, it remains an essential factor in addressing barriers. Finally, the study finds that intention (H6) serves as a direct driver of tangible support for renewable energy projects ($p < 0.001$), bridging motivation and concrete actions such as the installation of solar panels, adoption of wind

1. Introduction

Addressing climate change and transitioning toward carbon neutrality are among the most pressing global challenges of our time¹. Carbon neutrality, defined as achieving a balance between emitted and sequestered carbon, requires significant shifts in energy systems, environmental policies, and societal behaviors²⁻⁴. While international agreements such as the Paris Agreement set ambitious climate targets, achieving these goals relies heavily on the interplay between global policies and local community actions⁵. Island communities, often at the forefront of climate impacts⁶, serve as critical testbeds for implementing renewable energy solutions and decarbonization strategies. Island communities are uniquely positioned in the global conversation on climate resilience⁷. Their geographical isolation and limited access change underscore the urgent need for sustainable energy systems^{8,9}. Rising sea levels, extreme weather events, and limited infrastructure exacerbate the risks faced by these communities^{10,11}, making the transition to renewable energy not only desirable but essential. Renewable energy technologies such as solar and wind power offer viable solutions to reduce greenhouse gas emissions and enhance community resilience^{12,13}. However, successful adoption requires more than technological innovation¹⁴, it hinges on the active participation and support of local communities.

In the context of Indonesia, the Bali Net Zero Emissions (NZE) 2045 initiative exemplifies the integration of renewable energy into national decarbonization efforts. Bali has committed to achieving 100% renewable energy, with island communities like Nusa Penida identified as strategic locations for pilot projects¹⁵. These communities serve as living laboratories where national policies intersect with local actions. Transitioning to renewable energy in such settings involves addressing technical, financial, and social challenges while ensuring community buy-in and long-term sustainability^{16,17}. The Theory of Planned Behavior (TPB) offers a robust framework for understanding how community behaviors influence renewable energy adoption¹⁸⁻²¹. By examining constructs such as adaptive attitude, subjective norms, perceived behavioral control, intention, and support for renewable energy projects, this research seeks to identify pathways to align local actions with global climate goals. Adaptive attitudes are foundational in shaping community readiness for renewable energy adoption²². Positive attitudes toward solar and wind energy are driven by visible examples of their effectiveness, such as the installation of solar power systems and wind energy projects²³⁻²⁵. When communities perceive these technologies as reliable, cost-effective, and capable of reducing emissions, they are more likely to engage in renewable energy initiatives. These attitudes set the stage for broader societal acceptance, which is critical for scaling renewable energy adoption.

Subjective norms reflect the social pressures and cultural expectations that influence individual behaviors²⁶⁻²⁸. In tightly knit island communities, the role of family, friends, and

local leaders is particularly significant²⁹. When influential community members advocate for renewable energy projects, their actions reinforce a shared sense of responsibility and collective action. Social norms that prioritize environmental stewardship and sustainable practices amplify community engagement³⁰, making it easier to align individual actions with collective goals. Perceived behavioral control represents the confidence individuals have in their ability to contribute to renewable energy adoption^{31,32}. This construct captures the practical barriers and enablers that shape participation. In island communities, where financial constraints and limited infrastructure are common, addressing these barriers is crucial^{33,34}. Public-private partnerships can enhance perceived control by providing the tools and support needed for community members to engage effectively in renewable energy projects³⁵.

The construct of intention bridges attitudes, norms, and perceived control with actionable outcomes. Intention represents the willingness and readiness of individuals to invest in renewable energy systems, advocate for clean energy policies, and participate in project implementation^{36–38}. High levels of intention indicate a strong alignment between individual motivations and community goals^{39,40}. In island settings, this alignment is critical for mobilizing resources and driving collective action^{41,42}. For instance, community interest in installing solar panels and supporting wind energy development reflects a readiness to transition to renewable energy^{43–45}, which can be harnessed to achieve carbon neutrality. Support and general awareness for renewable energy projects represents the tangible outcomes of intention, translating motivation into participation⁴⁶. Active participation in renewable energy initiatives, such as solar panel installations and wind energy projects, demonstrates the community's commitment to sustainability^{47,48}. These actions not only reduce emissions but also enhance ecological resilience and economic opportunities. By integrating renewable energy into local energy systems, island communities can reduce their reliance on fossil fuels, lower energy costs, and create new jobs in the green economy⁴⁹. These benefits further reinforce community support, creating a positive feedback loop that accelerates the transition to carbon neutrality.

While renewable energy offers substantial potential, its widespread adoption faces persistent challenges. High initial costs, limited access to financing, and socio-economic disparities constitute significant impediments. Furthermore, the digital divide and varying levels of technical literacy among community members can further impede equitable participation. Addressing these challenges necessitates a comprehensive approach that combines technological innovation with inclusive policy frameworks and targeted investments. This research aims to contribute to the growing body of knowledge on renewable energy adoption and community resilience by examining how behavioral dimensions influence support for decarbonization pathways in island communities. The conceptual framework is grounded in the Theory of Planned Behavior (TPB), which explains how adaptive attitude, subjective norm, and perceived behavioral control shape intention and subsequently influence support for renewable energy projects^{21,50,51}. Building upon the proposed conceptual framework, six hypotheses are posited. H1 postulates that adaptive attitude positively influences subjective norm, suggesting that favorable perceptions of renewable energy can reinforce collective social expectations and enhance community acceptance. H2 posits that subjective norm positively influences perceived behavioral control, implying that robust social encouragement and collective endorsement can augment individuals' confidence in engaging with renewable energy initiatives. H3 hypothesizes that adaptive attitude positively influences intention,

indicating that advantageous perceptions regarding renewable energy benefits can incentivize individuals to endorse renewable energy transitions. H4 suggests that subjective norm positively influences intention, underscoring the significance of social influence, communal values, and peer pressure in shaping behavioral motivation towards renewable energy adoption. H5 proposes that perceived behavioral control positively influences intention, predicated on the assumption that individuals possessing higher confidence and greater resource access are more inclined to undertake renewable energy actions. Finally, H6 posits that intention positively influences support for renewable energy projects, signifying that robust behavioral motivation can manifest as tangible participation in renewable energy initiatives and decarbonization efforts.

In contrast to prior TPB studies primarily focused on household solar adoption^{18,52} or urban renewable energy acceptance^{21,50,53}, this research incorporates several novel dimensions. The study examines island community decarbonization, with a particular emphasis on the distinct socio-environmental vulnerabilities and energy transition challenges inherent to small island communities. Moreover, the research specifically investigates renewable energy transitions within small-island contexts, wherein geographical isolation, infrastructural limitations, and climate vulnerability delineate unique patterns of renewable energy adoption compared to mainland urban settings. Furthermore, this study underscores the pivotal role of blue carbon ecosystems, such as mangroves and seagrass, in augmenting ecological resilience and facilitating carbon sequestration. These ecosystems not only provide substantial environmental benefits but also serve as critical natural assets in climate change mitigation. The implications of this research extend beyond the confines of island communities, offering valuable insights for other regions endeavoring to navigate the complexities of energy transitions. By demonstrating the critical role of community behavior in achieving carbon neutrality, the study provides a robust model for aligning localized actions with broader national and global climate objectives. As global endeavors intensify to meet the targets stipulated by the Paris Agreement, the judicious integration of renewable energy, community resilience, and environmental preservation will prove indispensable for cultivating a sustainable and carbon-neutral future.

The research framework integrates the Theory of Planned Behavior (TPB) to analyze how community intentions and behaviors can support pathways to carbon neutrality (Figure 1), focusing on renewable energy initiatives like solar and wind energy in alignment with Bali's NZE 2045 objectives. This framework emphasizes the dynamic interplay of adaptive attitudes, subjective norms, and perceived behavioral control in shaping intentions, which then directly influence support for renewable energy projects. By incorporating social, behavioral, and ecological dimensions, the framework provides a comprehensive approach to understanding how community resilience drives decarbonization strategies. Adaptive attitudes (H1) reflect the belief that renewable energy solutions, such as solar and wind energy, are highly effective for reducing greenhouse gas emissions and combating climate change. In the context of Nusa Penida, adaptive attitudes are shaped by successful examples of renewable energy projects, such as the installation of solar panel systems in Suana and pilot wind energy initiatives. These projects serve as visible demonstrations of the practical benefits of renewable energy, including reduced dependency on fossil fuels, improved energy security, and environmental preservation^{54–56}.

Subjective norms (H2) capture the influence of social networks and cultural values on individual decisions to engage in renewable energy initiatives. A strong cultural

emphasis on collective well-being and mutual responsibility amplifies the importance of subjective norms^{57,58}. Local leaders, community figures, and tourism operators play a pivotal role in advocating for blue carbon projects and renewable energy systems^{59,60}. Their active involvement reinforces a shared sense of responsibility, fostering an environment where individuals feel supported and motivated to adopt sustainable practices^{61–63}. This social cohesion is critical for encouraging broader participation in decarbonization efforts and aligns with community-centered climate action goals^{64,65}. Perceived behavioral control (H3) represents the confidence individuals have in their ability to contribute to renewable energy initiatives. In Nusa Penida, perceived control is significantly influenced by the availability of technical resources, such as training workshops on solar and wind energy installations, and the community's trust in renewable energy systems.

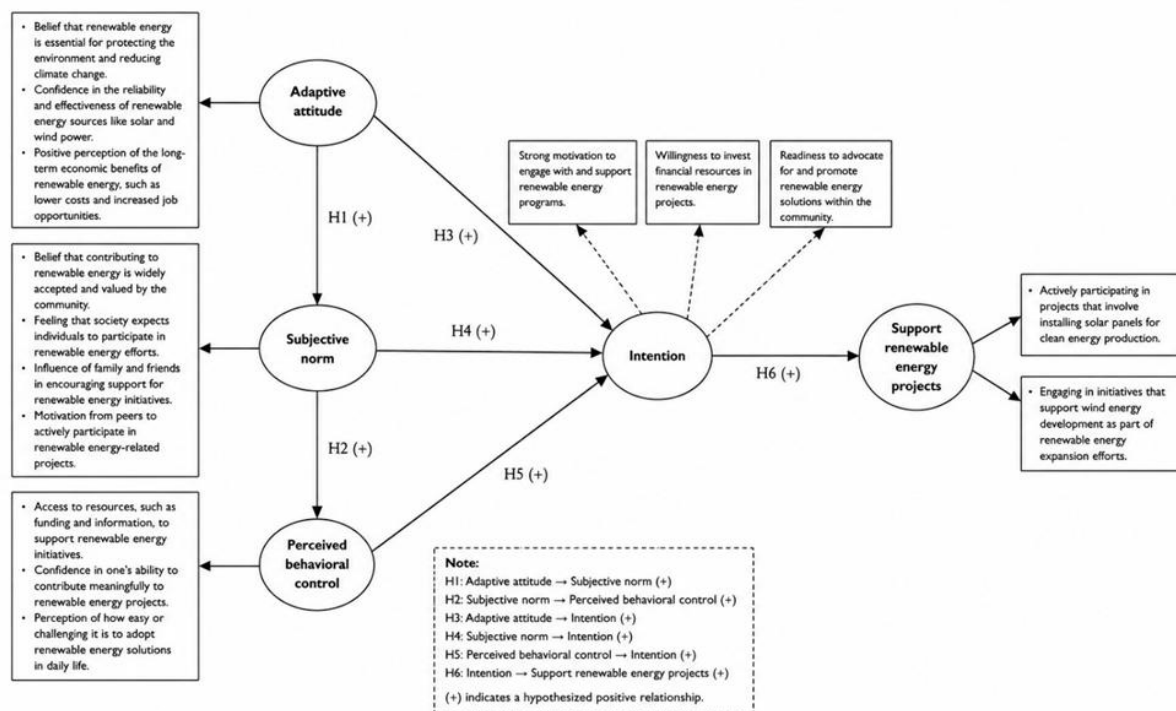


Fig. 1. Conceptual framework and hypotheses of community behavior toward renewable energy adoption.

Figure 1. Conceptual framework of behavior influencing renewable energy adoption in decarbonizing island communities.

Intention (H4) serves as the central construct within the TPB framework, linking adaptive attitudes, subjective norms, and perceived behavioral control to tangible actions supporting renewable energy projects. Intentions manifest as community members' readiness to invest in renewable energy systems⁶⁶, advocate for clean energy policies, and actively participate in project implementation. For example, individuals expressing strong interest in adopting solar panel systems for household use and supporting wind power installations demonstrate their commitment to transitioning to renewable energy. Aligning these intentions with Bali's NZE 2045 goals ensures that community-driven actions effectively contribute to broader decarbonization strategies. The direct relationship between intention and support for renewable energy projects (H6) underscores the importance of translating willingness into concrete actions. Support is

demonstrated through active participation in renewable energy projects^{11,67–69}, such as conserving blue carbon ecosystems, installing renewable energy infrastructure, and advocating for sustainable tourism practices. These actions not only reduce carbon emissions but also strengthen the community's ecological resilience and socio-economic stability. By connecting individual intentions with collective outcomes, this framework provides a strategic pathway for scaling local actions to achieve national and global climate targets.

2. Methodology

2.1. Study Location and Time

The study was conducted on Nusa Penida, an island located within the Klungkung Regency of Bali, Indonesia. Nusa Penida has been identified as a critical site for exploring the transition to renewable energy and sustainable development as part of the Bali Net Zero Emissions (NZE) 2045 initiative. This location is particularly significant due to its unique geographic and socio-economic conditions, including its reliance on marine resources, growing tourism industry, and vulnerability to climate change impacts such as rising sea levels and extreme weather events. The island's existing dependency on diesel-powered electricity and its alignment with national and global decarbonization goals further underline its importance as a focal point for this research. The study utilized a sample size of 400 respondents, which was calculated with a 5% margin of error and a 95% confidence level to ensure statistical robustness and representativeness of the findings. The sampling process involved selecting individuals across different demographic groups to capture a comprehensive view of community perspectives and behaviors toward renewable energy adoption and marine resource decarbonization. This stratified approach ensured adequate representation based on key factors such as income levels, gender, age, and marital status. Nusa Penida's population, as of 2023, was estimated at approximately 64,580 individuals, with a population density of 217.8 people per square kilometer. The sample size was proportionally distributed to account for this demographic diversity. Respondents were chosen from various villages and communities on the island to reflect the heterogeneity in socio-economic conditions, levels of dependency on marine resources, and exposure to renewable energy initiatives.

Table 1 highlights the socio-demographic characteristics of the respondents, emphasizing their association with dependency on marine resource decarbonization. A significant majority of the respondents with a monthly income of less than IDR 2,500,000 demonstrated a higher likelihood of being dependent on marine resource decarbonization, as indicated by the Pearson Chi-Square value of 13.145 ($p = 0.001$). Gender distribution showed a relatively even split, with male and female respondents contributing almost equally to the sample. However, no significant relationship was observed between gender and dependency on marine resources ($p = 0.137$). Age-wise, younger respondents, particularly those aged 18-25 years, showed a notable dependency on marine resource decarbonization, supported by a Pearson Chi-Square value of 9.736 ($p = 0.045$). Marital status did not exhibit a statistically significant association with dependency on marine resources, with both single and married respondents contributing equally to the "yes" and "no" categories.

Perceived behavioral control, a critical component of the TPB framework, was measured by assessing respondents' confidence in their ability to contribute effectively to renewable energy initiatives. This construct also included questions on access to essential

resources, such as funding and information, and perceptions of the ease or difficulty of adopting renewable energy solutions in daily life. These measures shed light on the practical barriers and enablers influencing renewable energy adoption at the community level. The intention to support renewable energy was captured through items designed to measure respondents' motivation and readiness to act. These included their willingness to engage with renewable energy programs, invest financial resources in renewable energy projects, and advocate for and promote renewable energy solutions within their communities. These items linked attitudes, norms, and perceived behavioral control to actionable outcomes, providing insights into the behavioral pathways leading to renewable energy adoption.

Table 1. Socio-demographic characteristics of respondents influencing renewable energy adoption for decarbonizing island communities.

Variables		Dependency on marine resource decarbonization				Pearson Chi-Square	df	p-value (2-sided)
		No		Yes				
Higher monthly income	Less than IDR 2,500,000. -	73	18.25%	151	37.75%	13.145	2	0.001
	IDR 2,500,000. - IDR 5,000,000	18	4.50%	63	15.75%			
	More than IDR 5,000,000	13	3.25%	82	20.50%			
Gender	Male	46	11.50%	156	39.00%	2.210	1	0.137
	Female	58	14.50%	140	35.00%			
Age	18-25 years	14	3.50%	69	17.25%	9.736	4	0.045
	26-30 years	27	6.75%	48	12.00%			
	31-35 years	20	5.00%	64	16.00%			
	36-40 years	15	3.75%	54	13.50%			
	Over 40 years	28	7.00%	61	15.25%			
Marital status	Single	50	12.50%	148	37.00%	0.114	1	0.736
	Married	54	13.50%	148	37.00%			

The final construct, support for renewable energy projects, focused on measuring actual or intended participation in renewable energy initiatives. Respondents were asked about their involvement in activities such as installing solar panels for clean energy production and participating in wind energy development efforts. These measures highlighted the translation of intention into tangible actions, offering practical insights into the implementation of renewable energy projects. The questionnaire was administered using a mixed-method approach that included both face-to-face interviews and online surveys. Trained enumerators conducted face-to-face interviews in areas with limited internet connectivity, ensuring the inclusion of respondents who might otherwise be excluded due to digital access limitations. The online survey targeted digitally active participants, broadening the reach and diversity of the respondent pool. This dual approach enhanced data collection efficiency and inclusivity, accommodating varying

levels of digital literacy and access to technology. Data collected through the questionnaire were systematically coded and analyzed using advanced statistical techniques. These analyses examined the relationships between the TPB constructs and their influence on renewable energy adoption. The structured design of the questionnaire ensured consistent measurement of each construct, facilitating robust statistical analysis. The findings provided valuable insights into the factors driving renewable energy adoption in Nusa Penida, contributing to a deeper understanding of community-level behaviors and offering actionable recommendations for enhancing renewable energy policies and practices in the region. This comprehensive approach underscores the importance of integrating behavioral, social, and practical considerations into renewable energy strategies to achieve sustainable outcomes.

2.2. Data Analysis

The data analysis for this study encompassed a comprehensive series of statistical procedures undertaken to examine the relationships among the constructs derived from the TPB and their influence on renewable energy adoption within island communities. The analytical process was designed to validate the conceptual framework, evaluate the reliability and validity of the measurement model, and assess the structural relationships among adaptive attitude, subjective norm, perceived behavioral control, intention, and support for renewable energy projects in Nusa Penida. The analysis was conducted systematically to ensure methodological rigor, transparency, and robustness of the findings.

Initially, descriptive statistical analysis was performed to summarize the characteristics and distribution of the collected data. Measures including mean, standard deviation, skewness, and excess kurtosis were calculated for each indicator variable. Mean values offered an overview of respondents' agreement levels for each statement, while standard deviation values indicated the variability of responses among participants. Skewness and kurtosis values were examined to assess the normality of the data distribution and identify potential deviations from multivariate normality assumptions. Acceptable skewness values typically fell within the range of -2 to $+2$, thereby suggesting that the data distribution was sufficiently normal for SEM estimation. This preliminary analysis also facilitated the detection of potential outliers, inconsistencies, and abnormal response patterns prior to the conduct of advanced multivariate analysis. Reliability analysis was subsequently conducted to evaluate the internal consistency of the latent constructs within the TPB framework. Cronbach's alpha values were calculated for adaptive attitude, subjective norm, perceived behavioral control, intention, and support for renewable energy projects. Cronbach's alpha quantifies the extent to which indicators within a construct consistently measure the same underlying concept. In this study, Cronbach's alpha values greater than 0.60 were considered acceptable for exploratory behavioral research⁷⁰, while values above 0.70 indicated strong internal consistency and reliability. Elevated Cronbach's alpha values provided evidence that the survey indicators were stable and reliable in capturing the intended behavioral constructs related to renewable energy adoption.

To complement Cronbach's alpha, composite reliability indices, specifically ρ_a and ρ_c , were also computed to offer a more robust assessment of construct reliability⁷¹. Composite reliability is considered particularly suitable for SEM because it accounts for different indicator loadings rather than assuming equal indicator reliability. Values

exceeding 0.70 for rho_a and rho_c denoted satisfactory reliability, thereby demonstrating that the latent constructs exhibited strong internal consistency. The use of both Cronbach's alpha and composite reliability enhanced methodological transparency and reduced the risk of relying solely on one reliability criterion. This dual reliability assessment bolstered confidence in the measurement quality of the constructs employed in the study.

The validity of the measurement model was assessed through both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA)⁷². EFA was initially performed to explore the underlying factor structure of the survey indicators and ascertain whether the observed variables appropriately grouped into their theoretically expected constructs. The suitability of the data for factor analysis was first evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. KMO values exceeding 0.50 indicated sampling adequacy, while a significant Bartlett's Test ($p < 0.05$) confirmed sufficient correlations among variables for factor analysis^{73–76}. During EFA, factor loadings greater than 0.50 were deemed acceptable, signifying that the indicators strongly represented their associated latent constructs. Indicators with low factor loadings or substantial cross-loadings were carefully evaluated to maintain construct validity and improve model clarity.

Following EFA, Confirmatory Factor Analysis (CFA) was performed to validate the factor structure identified during the exploratory stage and confirm the theoretical relationships among indicators and latent variables. CFA assessed whether the observed variables consistently represented the predefined TPB constructs. Standardized factor loadings were scrutinized to determine indicator reliability, with values exceeding 0.50 indicating acceptable convergent representation. The CFA procedure bolstered the theoretical validity of the conceptual framework and ensured that the measurement model adequately reflected the behavioral dimensions influencing renewable energy adoption within island communities.

Several Structural Equation Modeling (SEM) model evaluation criteria were applied to assess the overall goodness-of-fit of the measurement and structural models. These evaluation criteria included the chi-square statistic, Standardized Root Mean Square Residual (SRMR), d_ULS, d_G, and Normed Fit Index (NFI). The chi-square statistic assessed the discrepancy between the observed and model-implied covariance matrices; a non-significant p-value greater than 0.05 indicated acceptable model fit. However, due to the sensitivity of chi-square to sample size, additional fit indices were incorporated to provide a more comprehensive model evaluation. SRMR values below 0.08 indicated satisfactory model fit and evidenced minimal residual differences between observed and estimated correlations. The d_ULS and d_G indices evaluated discrepancies between empirical and model-implied covariance matrices, with smaller values indicating better model approximation. Concurrently, NFI values approaching or exceeding 0.90 reflected strong model fit and satisfactory explanatory capability of the SEM framework. The inclusion of multiple fit indices enhanced the robustness and credibility of the SEM evaluation process.

Convergent validity and discriminant validity were subsequently assessed using the Average Variance Extracted (AVE) and the Heterotrait-Monotrait (HTMT) ratio. AVE values exceeding 0.50 indicated satisfactory convergent validity, signifying that each latent construct explained more than 50% of the variance of its indicators^{50,77–82}. Elevated AVE values demonstrated that the indicators were strongly associated with their

respective constructs and adequately represented the underlying theoretical dimensions. In contrast, discriminant validity assessed whether the constructs were sufficiently distinct from one another. This was evaluated using the HTMT ratio, whereby HTMT values below 0.85 indicated adequate discriminant validity and confirmed that the constructs did not exhibit excessive conceptual overlap. The interpretation of AVE and HTMT values was explicated in detail to enhance methodological transparency and ensure rigorous validation of the TPB measurement model.

To evaluate the hypothesized relationships among the constructs, SEM was employed⁸³. SEM was chosen because it permits the simultaneous estimation of multiple direct and indirect relationships among latent variables while accounting for measurement error. This analytical approach enabled comprehensive examination of how adaptive attitude, subjective norm, and perceived behavioral control influenced intention and subsequently affected support for renewable energy projects. SEM also provided a robust framework for testing the behavioral pathways underlying renewable energy adoption within island communities. The structural model evaluation involved estimating path coefficients, standard errors, t-statistics, and p-values for each hypothesized relationship. Standardized path coefficients represented the strength and direction of relationships among constructs, while t-statistics and p-values determined statistical significance. In this study, p-values below 0.10 were deemed statistically significant, given the exploratory and behavioral nature of renewable energy transition research in emerging island contexts. The interpretation of the path coefficients was conducted cautiously to avoid overstating marginally significant relationships and to maintain analytical rigor.

In addition to direct effects, indirect effects and mediation relationships were also investigated to elucidate the behavioral mechanisms underlying renewable energy adoption. Specifically, the study investigated whether intention mediated the relationships between adaptive attitude, subjective norm, perceived behavioral control, and support for renewable energy projects. Bootstrapping procedures with repeated resampling iterations were applied to estimate indirect effects, standard errors, and confidence intervals. Bootstrapping is particularly advantageous in SEM as it does not rely heavily on strict normality assumptions and provides more stable parameter estimation for mediation analysis. The application of bootstrapping bolstered the robustness of inferential interpretation and enhanced confidence in the structural relationships identified within the TPB framework. The integration of descriptive statistics, reliability analysis, EFA, CFA, AVE assessment, HTMT evaluation, composite reliability testing, SEM model fit criteria, and bootstrapping procedures collectively enhanced the methodological rigor, validity, and transparency of the study. These analytical procedures ensured that the conceptual framework was statistically robust and theoretically grounded for explaining renewable energy adoption and decarbonization behavior within island communities.

2.3. Ethical Considerations

Ethical considerations were carefully integrated into the research methodology to ensure that the study complied with ethical standards for social and behavioral research involving human participants. Prior to data collection, formal permission and research approval were obtained from the village authorities and local administrative leaders in Nusa Penida to facilitate community engagement and field survey activities. Coordination

with village heads (kepala desa) was conducted to ensure that the research process respected local governance structures, community norms, and social contexts within the study area. Participation in the study was entirely voluntary, and respondents were informed that they had the right to decline participation or withdraw from the survey at any stage without any negative consequences. Before completing the questionnaire, all respondents were provided with a clear informed consent explanation describing the objectives of the study, the purpose of data collection, the estimated duration of participation, and the intended academic use of the findings. Respondents were also informed that the study focused exclusively on behavioral perceptions and renewable energy adoption, and no sensitive personal information would be collected. To maintain ethical integrity and respondent protection, all survey responses were anonymized during the data collection and analysis process. No personally identifiable information, such as names, addresses, or identification numbers, was recorded in the dataset. Data confidentiality was strictly maintained throughout the study, and all collected information was used solely for academic and research purposes. Access to the dataset was limited to the research team to ensure secure handling and storage of the information.

3. Results and Discussion

Table 2 provides a comprehensive descriptive analysis and factor loadings for the variables underpinning the study's conceptual framework based on the Theory of Planned Behavior (TPB). This analysis evaluates key constructs such as adaptive attitude, subjective norm, perceived behavioral control, intention, and support for renewable energy projects. The descriptive statistics include mean, standard deviation, skewness, and excess kurtosis, offering insights into the central tendencies and distributions of the data. Factor loadings and Cronbach's alpha values assess the reliability and validity of each construct. For adaptive attitude, the mean values reflect moderate to high agreement among respondents regarding the importance of renewable energy for environmental protection and its economic benefits. High factor loadings (e.g., 0.868 for environmental protection) and Cronbach's alpha (0.797) underscore the construct's reliability, suggesting a consistent perception of renewable energy's role in achieving climate goals. Subjective norm emerges as a critical dimension, with high mean scores indicating strong social influence, particularly from family, friends, and community norms, in supporting renewable energy initiatives. Factor loadings range from 0.681 to 0.81, with a Cronbach's alpha of 0.747, highlighting the construct's validity and internal consistency.

Table 2. Descriptive statistics, factor loadings, and Cronbach's alpha for renewable energy adoption behavior in decarbonizing island communities

Variables	Mean	Standard deviation	Excess kurtosis	Skewness	Factor loadings	Cronbach's alpha
Adaptive attitude						0.797
Belief that renewable energy is essential for protecting the environment and reducing climate change.	3.042	0.943	-0.779	0.059	0.868	
Confidence in the	2.929	1.041	-0.688	0	0.91	

Variables	Mean	Standard deviation	Excess kurtosis	Skewness	Factor loadings	Cronbach's alpha
reliability and effectiveness of renewable energy sources like solar and wind power.						
Positive perception of the long-term economic benefits of renewable energy, such as lower costs and increased job opportunities.	3.389	0.834	-0.11	-0.533		
Subjective norm						0.747
Influence of family and friends in encouraging support for renewable energy initiatives.	4.189	0.776	-0.859	-0.456	0.681	
Feeling that society expects individuals to participate in renewable energy efforts.	4.313	0.637	-0.692	-0.385	0.785	
Belief that contributing to renewable energy is widely accepted and valued by the community.	4.409	0.531	-1.152	-0.034	0.81	
Motivation from peers to actively participate in renewable energy-related projects.	4.611	0.587	0.51	-1.233	0.737	
Perceived Behavioral Control						0.628
Confidence in one's ability to contribute meaningfully to renewable energy projects.	2.738	0.96	-0.233	0.092	0.84	
Access to resources, such as funding and information, to support renewable energy initiatives.	2.829	0.8	-0.186	0.318	0.812	
Perception of how easy or challenging it is to adopt renewable energy solutions in daily life.	3.802	0.788	1.255	-0.837	0.61	

Variables	Mean	Standard deviation	Excess kurtosis	Skewness	Factor loadings	Cronbach's alpha
Intention						0.86
Strong motivation to engage with and support renewable energy programs.	4.34	0.764	0.859	-1.083	0.892	
Willingness to invest financial resources in renewable energy projects.	4.487	0.722	1.424	-1.359	0.91	
Readiness to advocate for and promote renewable energy solutions within the community.	4.344	0.659	-0.717	-0.51	0.85	
Support Renewable Energy Projects						0.706
Actively participating in projects that involve installing solar panels for clean energy production.	3.751	0.76	0.473	-0.765	0.879	
Engaging in initiatives that support wind energy development as part of renewable energy expansion efforts.	3.749	0.728	3.61	-1.548	0.879	

Table 3 presents the Heterotrait-Monotrait (HTMT) ratio matrix along with reliability and validity metrics for the constructs analyzed in this study. The HTMT matrix provides an assessment of discriminant validity, evaluating whether constructs are sufficiently distinct from each other. All HTMT values are well below the conservative threshold of 0.85, indicating that discriminant validity is upheld, and the constructs are not overlapping significantly. The reliability and validity metrics further validate the robustness of the constructs. Composite reliability (rho_a and rho_c) measures internal consistency, with all values exceeding the accepted threshold of 0.7. For instance, adaptive attitude shows a rho_a of 0.81 and a rho_c of 0.882, indicating high internal consistency. Similarly, intention demonstrates the highest reliability with rho_a and rho_c values of 0.862 and 0.915, respectively, reflecting strong alignment among the measured items. The Average Variance Extracted (AVE) values assess convergent validity, ensuring that the constructs capture a significant portion of variance from their respective indicators. All AVE values exceed the minimum threshold of 0.5, with particularly high values for intention (0.782) and support for renewable energy projects (0.773). These results confirm that the constructs effectively capture the underlying dimensions they are designed to measure.

Table 3. HTMT matrix for reliability and validity of the model on renewable energy adoption behavior in decarbonizing island communities.

Variables	HTMT Matrix				Reliability and validity model		Average variance extracted (AVE)
	Adaptive attitude	Intention	Perceived behavioral control	Subjective norm	rho_a	rho_c	
Adaptive attitude					0.81	0.882	0.715
Intention	0.158				0.862	0.915	0.782
Perceived behavioral control	0.432	0.328			0.659	0.802	0.579
Subjective norm	0.226	0.483	0.659		0.753	0.841	0.57
Support renewable energy projects	0.169	0.469	0.201	0.238	0.706	0.872	0.773

Figure 2 illustrates the results of the Structural Equation Modeling (SEM) analysis, highlighting the relationships between the constructs within the framework based on the Theory of Planned Behavior (TPB). This model was designed to examine the factors influencing community intentions and actions to support renewable energy projects, focusing on adaptive attitude, subjective norm, perceived behavioral control, intention, and actual support for renewable energy initiatives. The construct adaptive attitude (0.797) captures the belief in the importance of renewable energy for environmental protection and climate change mitigation. It emphasizes the role of renewable energy's reliability and economic benefits in shaping positive perceptions. Adaptive attitude significantly impacts subjective norm (0.747) and intention (0.869), highlighting the pathway through which personal beliefs influence broader societal and behavioral patterns. Subjective norm (0.747) represents the social influences from family, peers, and community expectations that encourage participation in renewable energy initiatives. This construct strongly predicts intention (0.869), demonstrating how societal pressures and collective values drive individual actions toward renewable energy adoption. Perceived behavioral control (0.628) reflects an individual's confidence in their ability to engage in renewable energy projects, considering access to resources, technical knowledge, and perceived ease of adoption. This construct directly contributes to intention (0.869), indicating the critical role of empowerment and resource availability in fostering proactive engagement. Intention (0.869) acts as the central mediator in the model, linking attitudes, norms, and perceived control to tangible actions. It is measured through respondents' motivation to engage with renewable energy programs, invest financially, and advocate for renewable energy solutions. Intention demonstrates a direct and strong impact on support for renewable energy projects (0.706), which encompasses actions such as installing solar panels and participating in wind energy initiatives.

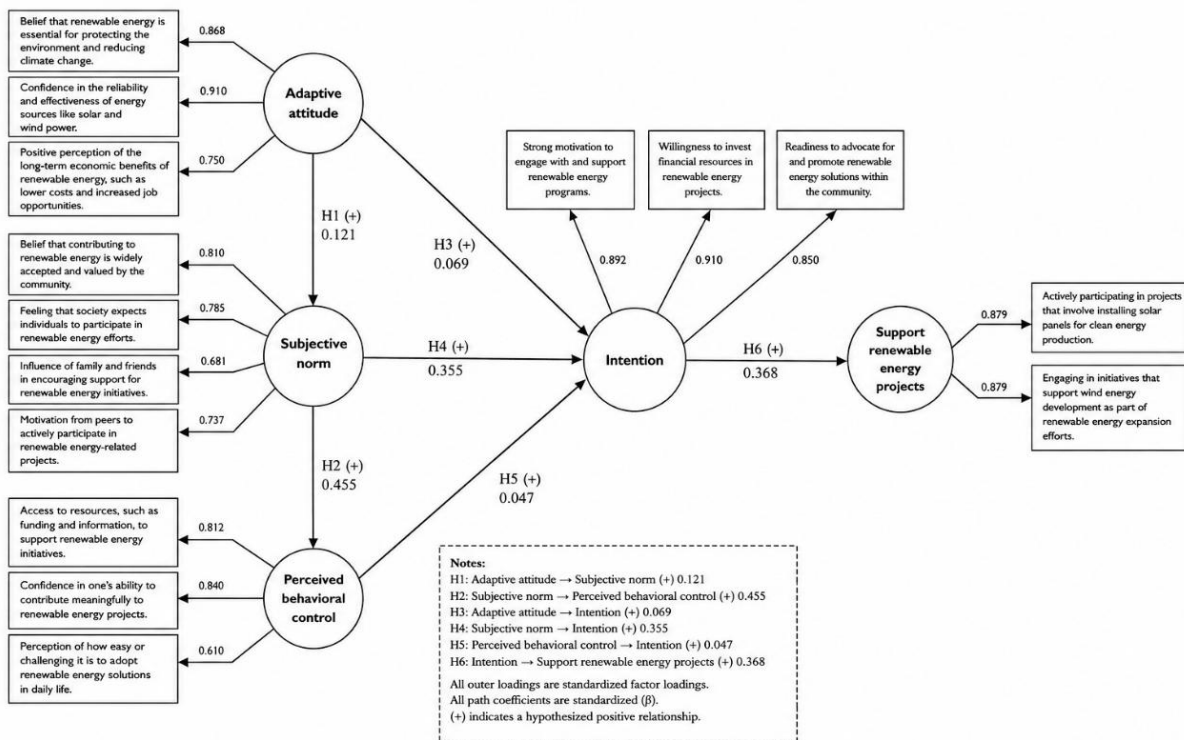


Fig. 1. Structural model with standardized path coefficients and outer loadings.

Figure 2. Structural Equation Modeling (SEM) results for behavior in renewable energy adoption for decarbonizing island communities

Table 4 presents the hypothesis testing results, detailing the direct and indirect effects of the constructs within the framework of the Theory of Planned Behavior (TPB) applied to renewable energy adoption. The analysis evaluates the relationships among adaptive attitude, subjective norm, perceived behavioral control, intention, and support for renewable energy projects. It includes key metrics such as the original sample, sample mean, standard deviation, t-statistics, and p-values to assess the significance of these relationships. The results demonstrate that adaptive attitude significantly influences subjective norm (H1) with a p-value of 0.015, indicating that individuals' positive perceptions of renewable energy impact societal expectations and norms. Subjective norm strongly predicts perceived behavioral control (H2), as reflected in the high t-statistic of 10.474 and p-value < 0.001, highlighting the role of social influence in shaping confidence and access to resources for renewable energy initiatives. The direct relationship between adaptive attitude and intention (H3) is also supported with a marginal significance ($p = 0.064$), suggesting that belief in renewable energy positively affects individuals' motivation to act. Similarly, subjective norm significantly influences intention (H4), with a t-statistic of 7.926 and p-value < 0.001, emphasizing the impact of societal expectations on forming intentions toward renewable energy engagement. However, the relationship between perceived behavioral control and intention (H5) was found to be insignificant ($p = 0.321$), suggesting that confidence in one's ability to act does not directly translate into intention in this context. On the other hand, intention significantly drives support for renewable energy projects (H6), with a t-statistic of 10.022 and p-value < 0.001, underscoring the critical role of intention in motivating concrete actions toward renewable energy adoption. The table also examines indirect effects, such as the influence of adaptive attitude on perceived behavioral control ($p = 0.029$) and its

indirect effect on support for renewable energy projects ($p = 0.062$). The findings indicate that subjective norm indirectly supports renewable energy projects ($p < 0.001$), further emphasizing the interplay of social influences in achieving carbon neutrality goals.

The findings of this study provide critical insights into the dynamics of achieving carbon neutrality within island communities, particularly through the integration of renewable energy technologies and community-driven initiatives. By exploring the relationships among adaptive attitudes, subjective norms, perceived behavioral control, intention, and support for renewable energy projects (H1-H6), this research highlights actionable pathways for transitioning toward a sustainable future. The significant relationship between adaptive attitude and subjective norm underscores the critical role of individual beliefs in shaping societal expectations around renewable energy adoption. Adaptive attitude reflects the community's perception of renewable energy as a necessary solution to climate change and environmental degradation^{84,85}. In the context of island communities, such as those seeking carbon neutrality, these beliefs are reinforced by the visible impacts of climate change^{86,87}, such as rising sea levels and extreme weather events. When individuals recognize the effectiveness and economic benefits of renewable energy solutions, including solar and wind power, their attitudes influence the broader community's acceptance and support for these technologies. For example, the implementation of solar panels in Suana demonstrates the tangible benefits of renewable energy, fostering a sense of optimism and commitment within the community.

Table 4. Hypothesis testing results for behavior in renewable energy adoption to support decarbonizing island communities

Variables effect	Original sample	Sample mean	Standard deviation	t-statistics	p-values
Direct effect					
Adaptive attitude → Subjective norm (H1)	0.121	0.119	0.05	2.445	0.015
Subjective norm → Perceived behavioral control (H2)	0.455	0.454	0.043	10.474	< 0.001
Adaptive attitude → Intention (H3)	0.115	0.112	0.062	1.854	0.064
Subjective norm → Intention (H4)	0.376	0.376	0.047	7.926	< 0.001
Perceived behavioral control → Intention (H5)	0.047	0.045	0.047	0.993	0.321
Intention → Support renewable energy projects (H6)	0.368	0.367	0.037	10.022	< 0.001
Indirect effect					
Adaptive attitude → Perceived behavioral control	0.055	0.055	0.025	2.182	0.029
Adaptive attitude → Support renewable energy projects	0.042	0.041	0.023	1.865	0.062
Perceived behavioral control → Support renewable energy projects	0.017	0.017	0.018	0.945	0.345
Subjective norm → Support renewable energy projects	0.138	0.138	0.021	6.574	< 0.001

The significant relationship between subjective norm and perceived behavioral

control (H2) underscores the critical influence of socio-cultural networks in facilitating renewable energy adoption within island communities. Island communities frequently exhibit strong social cohesion, collective identity, and shared environmental values^{88–90}, which magnify the impact of family members, peers, customary leaders, tourism actors, and village authorities in encouraging participation in renewable energy initiatives. Within the context of carbon neutrality, these socio-cultural influences are instrumental in mitigating perceived barriers to renewable energy adoption⁹¹, including financial constraints, technological uncertainty, and infrastructure limitations. The active involvement of community leaders in advocating renewable energy projects strengthens trust, social legitimacy, and collective confidence⁹², thereby fostering a sense of social support among individuals participating in renewable energy transitions. This finding suggests that strategies aimed at reinforcing subjective norms, such as community-led renewable energy initiatives, peer advocacy, participatory village programs, and local leadership engagement, are posited to enhance perceived behavioral control and stimulate broader community participation in renewable energy projects. This finding aligns with the TPB, which posits that attitudes significantly influence behavioral intentions. These projects not only demonstrate the feasibility of renewable energy but also highlight its socio-economic benefits, such as job creation and energy security^{93–95}.

The relationship between adaptive attitude and intention (H3), while marginally significant ($p = 0.064$), remains theoretically relevant within the TPB framework and necessitates cautious interpretation. This limited statistical strength precludes overstatement of its direct impact. Rather than indicating a strong direct behavioral effect, the findings suggest that positive perceptions toward renewable energy may contribute indirectly to behavioral motivation through broader social and contextual mechanisms. In island communities such as Nusa Penida, adaptive attitudes toward renewable energy are often shaped by practical considerations, including energy affordability, tourism sustainability, employment opportunities, climate vulnerability, and long-term energy security. Although respondents generally recognized the environmental and socio-economic benefits of renewable energy technologies, these favorable attitudes alone may not consistently translate into robust behavioral intentions without additional institutional support, social reinforcement, or resource accessibility. This finding remains consistent with TPB assumptions that attitudes contribute to intention formation, although the strength of this relationship may vary depending on socio-economic and contextual conditions within small-island settings.

The significant relationship between subjective norm and intention (H4) further underscores that renewable energy acceptance pathways in island communities are profoundly shaped by collective social expectations and community-based behavioral mechanisms. In island communities, societal pressure and collective environmental values often exert a more pronounced influence on behavioral decisions than purely individualistic considerations^{96–98}. The combined influence of family members, peers, and socially respected figures, along with the perceived social acceptability of renewable energy initiatives, prompts individuals to align their actions with broader community sustainability goals. This finding suggests that renewable energy transitions in island communities represent socially embedded processes rather than merely technological adoption pathways. Community engagement programs, public endorsements by influential leaders, participatory renewable energy campaigns, and renewable energy promotion during local cultural and social events are posited to foster positive social diffusion effects, thereby reinforcing collective intention toward renewable energy

participation. Such socio-cultural reinforcement mechanisms are capable of accelerating public support for carbon neutrality initiatives within small-island contexts. For instance, promoting the benefits of renewable energy during community events can create a ripple effect⁴⁹, encouraging widespread support for carbon neutrality initiatives. The lack of a significant relationship between perceived behavioral control and intention indicates that confidence in one's ability to contribute to renewable energy projects may not directly translate into motivation to act. This finding suggests that while perceived behavioral control is important, it may need to be supplemented with external support mechanisms to drive intention. For island communities, addressing structural barriers, such as high upfront costs to technical resources⁹⁹, is essential for enhancing perceived behavioral control. Public-private partnerships, grant funding, and training programs can play a critical role in reducing these barriers and empowering individuals to participate in renewable energy initiatives^{100,101}. Additionally, integrating renewable energy education into school curriculums can build technical capacity and confidence over time^{102,103}.

The non-significant relationship between perceived behavioral control and intention (H5) provides important contextual insights into renewable energy adoption in island communities. While perceived behavioral control is theoretically posited within the TPB framework to positively influence behavioral intention, the present study's findings indicate that perceived capability alone may be insufficient to motivate renewable energy participation. In Nusa Penida, structural constraints such as limited financing access, technological limitations, infrastructure barriers, unequal resource availability, and limited technical assistance may weaken the translation of perceived capability into actual behavioral intention. This suggests that even when community members believe they can contribute to renewable energy initiatives, their intention may remain constrained if external enabling conditions are inadequate. This finding aligns with prior TPB-based renewable energy adoption studies, which similarly demonstrate that perceived behavioral control may not consistently serve as a robust predictor of intention when significant practical barriers persist^{104–106}. In several renewable energy acceptance studies, attitudes and subjective norms often exhibit stronger effects on intention than perceived behavioral control, particularly in contexts where renewable energy investment requires substantial financial resources, technical knowledge, and institutional support^{21,66,107,108}. In island and remote community contexts, this phenomenon is particularly salient, as energy transitions depend not only on individual confidence but also on infrastructure readiness, affordability, policy incentives, and access to reliable technology providers. Therefore, the non-significant H5 result corroborates the theoretical interpretation that perceived behavioral control may necessitate institutional and structural support to effectively translate into intention.

The strong and significant relationship between intention and support for renewable energy projects (H6) underscores the importance of converting behavioral motivation into tangible renewable energy actions. Within the pursuit of carbon neutrality, intention serves as a crucial nexus connecting attitudes, social norms, and actual behavioral outcomes. Island communities involved in the Bali NZE initiative have exhibited an increasing propensity to participate in renewable energy projects through activities such as solar panel installation, renewable energy advocacy, and support for wind energy development. This finding highlights the imperative of establishing clear implementation pathways that enable individuals and communities to transform renewable energy intentions into concrete actions. Adaptive attitudes, subjective norms, and intentions collectively constitute critical drivers of renewable energy support, thereby elucidating

the interconnected behavioral mechanisms underlying decarbonization transitions in island communities.

The findings also provide important policy implications for decarbonization strategies in island communities. Policymakers are advised to prioritize community-centered renewable energy programs that strengthen social participation, collective ownership, and local leadership engagement. Renewable energy acceptance pathways in small islands are amenable to enhancement via community-based renewable energy cooperatives, participatory village planning forums, peer advocacy mechanisms, and locally tailored communication strategies emphasizing socio-economic co-benefits such as energy security, tourism resilience, and employment opportunities. Furthermore, the integration of renewable energy initiatives with ecological resilience strategies, including blue carbon ecosystem conservation through mangroves and seagrass^{109–111}, may strengthen carbon sequestration capacity and ecosystem-based climate adaptation. These interconnected socio-ecological pathways underscore that successful decarbonization in island communities requires integrated approaches that simultaneously address behavioral, technological, environmental, institutional, and social resilience dimensions. The pronounced and significant role of subjective norms in shaping both perceived behavioral control (H2) and intention (H4) yields substantial practical implications for renewable energy policy and implementation. Social influence can be operationalized into practical renewable energy programs via community-based cooperatives, wherein residents collectively participate in the planning, financing, operation, and benefit-sharing of local renewable energy systems. Peer advocacy programs can further be utilized to incentivize early adopters, local champions, and respected community members to disseminate their experiences with solar and wind energy. This approach is posited to mitigate uncertainty and enhance trust among residents.

Local leadership engagement is similarly imperative. Village heads, customary leaders, tourism operators, youth organizations, and community-based groups can function as trusted intermediaries between governmental initiatives and local residents. Renewable energy education campaigns ought to be meticulously designed to incorporate locally relevant messaging, articulating the multifaceted benefits of clean energy for household welfare, tourism resilience, energy security, employment generation, and climate adaptation. Village-level participatory planning can further ensure that renewable energy programs reflect local needs, financial capacity, and community priorities. In addition, community demonstration projects for solar and wind energy adoption can furnish tangible evidence of technical feasibility and socio-economic benefits, thereby reinforcing social acceptance and collective intention to participate. These findings indicate that renewable energy adoption in island communities should not be conceptualized solely as an individual behavioral decision; rather, it constitutes a socially embedded and institutionally dependent process. A comparative analysis with previous TPB-based renewable energy studies reinforces the theoretical positioning of this study, demonstrating that the influence of attitude, subjective norm, and perceived behavioral control can vary across urban, household, regional, and island contexts. Specifically, in Nusa Penida, subjective norms emerge as particularly salient, given that social cohesion, local leadership, and community trust are instrumental in shaping renewable energy acceptance pathways. Consequently, decarbonization strategies for island communities ought to integrate behavioral interventions with robust practical support mechanisms, encompassing accessible financing, technical training,

infrastructure enhancements, community cooperatives, and participatory governance models.

4. Conclusions

This study elucidates that community resilience dimensions, specifically adaptive attitude, subjective norms, perceived behavioral control, intention, and support for renewable energy projects, are instrumental in advancing renewable energy adoption within the context of Nusa Penida Island and analogous small-island renewable energy transition settings. The findings reveal a significant influence of adaptive attitudes on subjective norms and their contribution to intention formation, underscoring the imperative of cultivating positive perceptions concerning renewable energy solutions, such as solar and wind power. Within small-island communities, positive perceptions of renewable energy are intrinsically linked to expectations regarding environmental preservation, tourism sustainability, energy security, and local socio-economic resilience. Subjective norms emerged as a prominent behavioral determinant, exerting influence on both perceived behavioral control and intention. This underscores the salience of social influence, emanating from family members, peers, local leaders, tourism stakeholders, and community institutions, in fostering participation in renewable energy initiatives. This suggests that renewable energy transitions in island communities are profoundly shaped by collective social expectations, community trust, and local socio-cultural dynamics. Although perceived behavioral control did not directly exert a significant influence on intention, this construct remains crucial for comprehending how structural impediments may restrict renewable energy participation. Constraints such as limited access to financing, infrastructural deficiencies, inequitable resource distribution, and technological limitations may attenuate individuals' capacity to translate perceived capability into actual behavioral intention. Intention was observed to strongly influence support for renewable energy projects, thereby illustrating the imperative of translating behavioral motivation into tangible renewable energy actions, including engagement in solar panel installation programs, wind energy initiatives, and community-based renewable energy activities. These findings delineate the interconnected pathways through which behavioral, social, and structural dimensions contribute to renewable energy adoption and decarbonization efforts within island communities. Within the context of Nusa Penida and the Bali Net Zero Emissions (NZE) 2045 initiative, this study underscores the criticality of integrating behavioral approaches, community participation, and renewable energy development into island-based carbon neutrality strategies.

The findings also yield practical implications for policymakers and renewable energy stakeholders operating within insular contexts. Renewable energy adoption pathways may be fortified through the implementation of community-based renewable energy cooperatives, peer advocacy programs, village-level participatory planning, renewable energy education campaigns, local leadership engagement, and demonstration projects for solar and wind energy systems. Such approaches are posited to enhance social acceptance, reinforce collective intention, and augment community participation in renewable energy transitions. Nonetheless, this study is not without its limitations. Firstly, the research relied on self-reported behavioral data, which inherently

carries the potential for response bias, given that stated intentions do not invariably correlate with actual long-term behavior. Secondly, the cross-sectional survey design restricts the capacity to capture temporal variations in renewable energy attitudes, intentions, and participation. Thirdly, the contextual specificity of Nusa Penida, as a small-island tourism and coastal community, may constrain the broader generalizability of the findings to regions possessing divergent socio-economic, cultural, and environmental characteristics. Consequently, the interpretations derived from this study should remain circumscribed to Nusa Penida and analogous island renewable energy transition settings, rather than being universally generalized across all renewable energy contexts. Future research endeavors should explore longitudinal approaches to more comprehensively elucidate how renewable energy behavior, intention, and participation evolve over time in response to policy interventions, infrastructure development, and technological advancements. Comparative studies conducted across multiple island communities or regional contexts would also enhance the understanding of how socio-cultural and institutional disparities influence renewable energy adoption pathways. Furthermore, future investigations ought to integrate policy intervention variables, encompassing subsidy programs, renewable energy incentives, financing accessibility, and governance mechanisms, to more rigorously examine their influence on behavioral intention and renewable energy participation. Further investigation is also warranted regarding the role of technological literacy, renewable energy education, and digital access in shaping renewable energy acceptance and participation. Exploration of innovative funding mechanisms, community financing models, and cooperative-based renewable energy systems may yield crucial insights into surmounting financial impediments within island communities. By addressing these identified limitations and expanding upon these future research directions, subsequent scholarly endeavors can contribute to the development of more inclusive, context-sensitive, and equitable renewable energy transition strategies for island communities striving for long-term carbon neutrality and climate resilience goals.

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Conflict of Interest

The authors declare no conflict of interest.

Authors Contribution

I.W.K.: Conceptualization, methodology, formal analysis, writing—original draft, **A.R.:** supervision, resources, project administration.

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References

1. Yang S, Yang D, Shi W, Deng C, Chen C, Feng S. Global evaluation of carbon neutrality and peak carbon dioxide emissions: current challenges and future outlook. *Environmental Science and Pollution Research*. 2022;30(34):81725–81744. doi: 10.1007/s11356-022-19764-0.
2. Chen L, Msigwa M, Yang M, Osman AI, Fawzy S, Rooney DW, et al. Strategies to achieve a carbon neutral society: a review. *Environmental Chemistry Letters*. 2022;20:2277–2310. doi: 10.1007/s10311-022-01435-8.
3. Zou C, Xue H, Xiong B, Zhang G, Pan S, Jia C, et al. Connotation, innovation and vision of “carbon neutrality”. *Natural Gas Industry B*. 2021;8(5):523–537. doi: 10.1016/j.ngib.2021.08.009.
4. Wang Y, Guo C-h, Chen X-j, Jia L-q, Guo X-n, Chen R-s, et al. Carbon peak and carbon neutrality in China: Goals, implementation path and prospects. *China Geology*. 2021;4(4):720–746. doi: 10.31035/cg2021083.
5. Akpuokwe CU, Adeniyi AO, Bakare SS, Eneh NE. Legislative responses to climate change: a global review of policies and their effectiveness. *International Journal of Applied Research in Social Sciences*. 2024;6(3):225–239. doi: 10.51594/ijarss.v6i3.852.
6. Farràs P, Machado JTM, Flynn B, Williamson J. Policy supports for the deployment of solar fuels: islands as test-beds for a rapid green transition. *Progress in Energy*. 2023;5. doi: 10.1088/2516-1083/accef8.
7. Moncada S, Nguyen L. Improving Sustainability, Climate Resilience and Pandemic Preparedness in Small Islands: A Systematic Literature Review. *Sustainability (MDPI)*. 2024;16 (2). doi: 10.3390/su16020550.
8. Pandey R, Kumar P, Archie KM, Gupta AK, Joshi PK, Valente D, et al. Climate change adaptation in the western-Himalayas: Household level perspectives on impacts and barriers. *Ecological Indicators*. 2018;84:27–37. doi: 10.1016/j.ecolind.2017.08.021.
9. Misra R, Tewari N. Gendering the Impact of Climate Change on Agriculture in Asia. In: Rai PK, Rai S, editors, *Climate, Environment and Agricultural Development*. Springer Nature Singapore; 2024. p. 237–248. doi: 10.1007/978-981-97-8363-2_15.
10. Azevedo de Almeida B, Mostafavi A. Resilience of Infrastructure Systems to Sea-

- Level Rise in Coastal Areas: Impacts, Adaptation Measures, and Implementation Challenges. *Sustainability (MDPI)*. 2016;8 (11). doi: 10.3390/su8111115.
11. Hernández-Delgado EA. Coastal Restoration Challenges and Strategies for Small Island Developing States in the Face of Sea Level Rise and Climate Change. *Coasts (MDPI)*. 2024;4 (2):235–286. doi: 10.3390/coasts4020014.
 12. Gan KE, Taikan O, Gan TY, Weis T, Yamazaki D, Schüttrumpf H. Enhancing Renewable Energy Systems, Contributing to Sustainable Development Goals of United Nation and Building Resilience Against Climate Change Impacts. *Energy Technology*. 2023;11(11). doi: 10.1002/ente.202300275.
 13. Suman. Role of renewable energy technologies in climate change adaptation and mitigation: A brief review from Nepal. *Renewable and Sustainable Energy Reviews*. 2021;151. doi: 10.1016/j.rser.2021.111524.
 14. Stornelli A, Ozcan S, Simms C. Advanced manufacturing technology adoption and innovation: A systematic literature review on barriers, enablers, and innovation types. *Research Policy*. 2021;50(6) 104229. doi: 10.1016/j.respol.2021.104229.
 15. IESR. *Menuju Nusa Penida 100% Energi Terbarukan 2030* [Internet]. Institute for Essential Services Reform (IESR); 2024. Available from: <https://iesr.or.id/menuju-nusa-penida-100-energi-terbarukan-2030/>.
 16. Stanitsas M, Kirytopoulos K. Navigating the Nexus: Stakeholder Engagement in Hybrid Renewable Energy Power Purchase Agreements (PPAs) for Sustainable Development. *Sustainability (mdpi)*. 2024;16(17). doi: 10.3390/su16177381.
 17. Leonhardt R, Noble B, Poelzer G, Fitzpatrick P, Belcher K, Holdmann G. Advancing local energy transitions: A global review of government instruments supporting community energy. *Energy & Social Science*. 2022;83 (2022). doi: 10.1016/j.erss.2021.102350.
 18. Waris I, Hameed I, Ali R. Predicting household sign up for solar energy: an empirical study based on the extended theory of planned behavior. *International Journal of Energy Sector Management*. 2023;17(3):455–473. doi: 10.1108/IJESM-06-2021-0010.
 19. Conradie PD, De Ruyck O, Saldien J, Ponnet K. Who wants to join a renewable energy community in Flanders? Applying an extended model of Theory of Planned Behaviour to understand intent to participate. *Energy Policy*. 2021;151. doi: 10.1016/j.enpol.2020.112121.
 20. Zhang N, Hwang B-G, Lu Y, Ngo J. A Behavior theory integrated ANN analytical approach for understanding households adoption decisions of residential photovoltaic (RPV) system. *Technology in Society*. 2022;70. doi: 10.1016/j.techsoc.2022.102062.

21. Wong G-Z, Wong KH, Lau T-C, Lee J-H, Kok Y-H. Study of intention to use renewable energy technology in Malaysia using TAM and TPB. *Renewable Energy*. 2024;221(9). doi: 10.1016/j.renene.2023.119787.
22. El-Mekaoui A, Cetina-Quiñones AJ, Casillas-Reyes A, San-Pedro L, Tapia J, Canto-Esquivel J-C, et al. Empowering indigenous groups: Unveiling a new approach to adaptive-participative sustainable energy in solar pumping projects via a Mayan community in Central America. *Energy Research & Social Science*. 2024;114. doi: 10.1016/j.erss.2024.103589.
23. Scheller F, Doser I, Schulte E, Johanning S, McKenna R, Bruckner T. Stakeholder dynamics in residential solar energy adoption: findings from focus group discussions in Germany. *Energy Research & Social Science*. 2021;76(5). doi: 10.1016/j.erss.2021.102065.
24. Schmidt H, Leschinger V, Müller FJY, de Vries G, Renes RJ, Schmehl R, et al. How do residents perceive energy-producing kites? Comparing the community acceptance of an airborne wind energy system and a wind farm in Germany. *Energy Research & Social Science*. 2024;110. doi: 10.1016/j.erss.2024.103447.
25. Hunaiti, Huneiti ZA. Prospects and Obstacles Associated with Community Solar and Wind Farms in Jordan's Suburban Areas. *Solar*. 2024;4(2):307–328. doi: 10.3390/solar4020014.
26. Liang H, Wu Z, Du S. Study on the impact of environmental awareness, health consciousness, and individual basic conditions on the consumption intention of green furniture. *Sustainable Futures*. 2024;8. doi: 10.1016/j.sftr.2024.100245.
27. Xu Y, Ye Y, Liu Y. Understanding Virtual Gifting in Live Streaming by the Theory of Planned Behavior. *Human Behavior and Emerging Technologies*. 2022;2022(1). doi: 10.1155/2022/8148077.
28. Wu Y, Hu X, Wei J, Marinova D. The effects of attitudes toward knowledge sharing, perceived social norms and job autonomy on employees' knowledge-sharing intentions. *Journal of Knowledge Management*. 2022;27(2):1889–1903. doi: 10.1108/JKM-06-2022-0468.
29. Gawel AM, Wald DM, Rogers HS. Community perceptions of invasive species and environmental management in a US island territory. *Conservation Biology*. 2024;38(6). doi: 10.1111/cobi.14394.
30. Constantino SM, Sparkman G, Kraft-Todd GT, Bicchieri C, Centola D, Shell-Duncan B, et al. Scaling Up Change: A Critical Review and Practical Guide to Harnessing Social Norms for Climate Action. *Psychological Science in the Public Interest*. 2022;23(2):50–97. doi: 10.1177/15291006221105279.
31. Jabbour Al Maalouf N, Sayegh E, Inati D, Sarkis N. Consumer Motivations for Solar Energy Adoption in Economically Challenged Regions. *Sustainability (MDPI)*.

2024;16 (20). doi: 10.3390/su16208777.

32. Agozie DQ, Afful-Dadzie A, Gyamfi BA, Bekun FV. Does psychological empowerment improve renewable energy technology acceptance and recommendation? Evidence from 17 rural communities. *Renewable Energy*. 2023;219(Part 1). doi: 10.1016/j.renene.2023.119449.
33. W. Leal Filho, M. Krishnapillai, H. Sidsaph, G.J. Nagy, J.M. Luetz, J. Dyer, et al. Climate Change Adaptation on Small Island States: An Assessment of Limits and Constraints. *Journal of Marine Science and Engineering*. 2021;9(6). doi: 10.3390/jmse9060602.
34. Nuru JT, JL Rhoades, Gruber JS. The socio-technical barriers and strategies for overcoming the barriers to deploying solar mini-grids in rural islands: Evidence from Ghana. *Technnology in Society*. 2021;65(3). doi: 10.1016/j.techsoc.2021.101586.
35. Hussain S, Xuotong W, Maqbool R, Hussain M, Shahnawaz M. The influence of government support, organizational innovativeness and community participation in renewable energy project success: A case of Pakistan. *Energy*. 2022;239(Part C). doi: 10.1016/j.energy.2021.122172.
36. Jabeen G, Ahmad M, Zhang Q. Perceived critical factors affecting consumers' intention to purchase renewable generation technologies: Rural-urban heterogeneity. *Energy*. 2021;218. doi: 10.1016/j.energy.2020.119494.
37. Nketiah E, Song H, Obuobi B, Adu-Gyamfi G, Adjei M, Cudjoe D. Citizens' willingness to pay for local anaerobic digestion energy: The influence of altruistic value and knowledge. *Energy*. 2022;260. doi: 10.1016/j.energy.2022.125168.
38. Islam MT, Ali A. Sustainable green energy transition in Saudi Arabia: Characterizing policy framework, interrelations and future research directions. *Next Energy*. 2024;5. doi: 10.1016/j.nxener.2024.100161.
39. Godinho Filho M, dos Santos Leite Gonella J, Latan H, Ganga GMD. Awareness as a catalyst for sustainable behaviors: A theoretical exploration of planned behavior and value-belief-norms in the circular economy. *Journal of Environmental Management*. 2024;368. doi: 10.1016/j.jenvman.2024.122181.
40. Zhang L, Rui G. Incentives for resident and organizer participation in China: a study based on a participation training project in Foshan. *Journal of Asian Architecture and Building Engineering*. 2025;24(6):5686-5707. doi: 10.1080/13467581.2024.2418504.
41. Nurhasanah IS, Van den Broeck P. Towards a Sustainable Metamorphosis of a Small Island Tourism: Dynamizing Capacity Building, Alternating Governance Arrangements, and Emerging Political Bargaining Power. *Sustainability (MDPI)*. 2022;14(12). doi: 10.3390/su14126957.

42. Papazu I. Entrepreneurial resource construction through collective bricolage on Denmark's renewable energy Island: an ethnographic study. *Entrepreneurship & Regional Development*. 2021;33(9-10):837–862. doi: 10.1080/08985626.2021.1964613.
43. MacKay M, Parlee B, Parkins JR. Towards energy security in the Inuvialuit Settlement Region: insights from community members and local residents. *Local Environment*. 2021;26:1128–1144. doi: 10.1080/13549839.2021.1964455.
44. Lamhamedi BEH, de Vries WT. Comparative analysis of rural communities' tradeoffs in large-scale and small-scale renewable energy projects in Kenya. *Discover Sustainability*. 2024;5. doi: 10.1007/s43621-024-00637-0.
45. Buonomano A, Giuzio GF, Maka R, Palombo A, Russo G. Empowering sea ports with renewable energy under the enabling framework of the energy communities. *Energy Conversion and Management*. 2024;314. doi: 10.1016/j.enconman.2024.118693.
46. Otte L, Schmid L, Baerens T, Tomboanjara M, Ahmed F, Heinz B. An energy transition for all: Investigating determinants of citizen support for energy community initiatives on the island of Mayotte. *Energy Research & Social Science*. 2024;116. doi: doi.org/10.1016/j.erss.2024.103690.
47. Antwi SH, Ley D. Renewable energy project implementation in Africa: Ensuring sustainability through community acceptability. *Scientific African*. 2020;11(3). doi: 10.1016/j.sciaf.2020.e00679.
48. Ahmed S, Ali A, D'Angola A. A Review of Renewable Energy Communities: Concepts, Scope, Progress, Challenges, and Recommendations. *Sustainability (MDPI)*. 2024;16(5). doi: 10.3390/su16051749.
49. Awolesi O, Salter CA, Reams M. A Systematic Review on the Path to Inclusive and Sustainable Energy Transitions. *Energies (MDPI)*. 2024;17(14). doi: 10.3390/en17143512.
50. Suryawan IWK, Ulhasanah N, Suhardono S, Sari MM, Rahman A, Sofiyah ES, et al. Understanding why refuse-derived fuel biomass projects fail through the lens of adaptive capacity in rural Bali. *Energy for Sustainable Development*. 2026;92. doi: 10.1016/j.esd.2026.101950.
51. Almrafee M, Akaileh M. Customers' purchase intention of renewable energy in Jordan: the case of solar panel systems using an extended theory of planned behavior (TPB). *International Journal of Energy Sector Management*. 2024;18(3):457–473. doi: 10.1108/IJESM-01-2023-0002.
52. Zulu S, Zulu E, Chabala M. Factors influencing households' intention to adopt solar energy solutions in Zambia: insights from the theory of planned behaviour. *Smart and Sustainable Built Environment*. 2022;11(4):951–971. doi: 10.1108/SASBE-01-

2021-0008.

53. Sadiq M, Leong MY, Chong KM, He L. Unravelling the drivers of renewable energy adoption through an extended TPB framework with moral identity, sustainable knowledge and social influences. *Management of Environmental Quality an International Journal*. 2026:1–20. doi: 10.1108/MEQ-09-2025-0621.
54. Obaideen K, Olabi AG, Al Swailmeen Y, Shehata N, Abdelkareem MA, Alami AH, et al. Solar Energy: Applications, Trends Analysis, Bibliometric Analysis and Research Contribution to Sustainable Development Goals (SDGs). *Sustainability (MDPI)*. 2023;15(2). doi: 10.3390/su15021418.
55. Olabi AG, Shehata N, Maghrabie HM, Heikal LA, Abdelkareem MA, Rahman SM, et al. Progress in Solar Thermal Systems and Their Role in Achieving the Sustainable Development Goals. *Energies (MDPI)*. 2022;15(24). doi: 10.3390/en15249501.
56. Vijayan DS, Koda E, Sivasuriyan A, Winkler J, Devarajan P, Kumar RS, et al. Advancements in Solar Panel Technology in Civil Engineering for Revolutionizing Renewable Energy Solutions—A Review. *Energies (MDPI)*. 2023;16(18). doi: 10.3390/en16186579.
57. Salehzadeh R, Esmailian H, Javani M. Understanding BallotLoafing at work: examining employee loafing during political elections. *Journal of Organizational Effectiveness: People and Performance*. 2025;13(1):1-19. doi: 10.1108/JOEPP-06-2024-0256.
58. Sartono Y, Astuti ES, Wilopo W, Noerman T. Enhancing Sustainability in Solution Projects through Social CRM: An Expansion of the Self-Efficacy Value Adoption Model. *Sustainability (MDPI)*. 2024;16(19). doi: 10.3390/su16198353.
59. Suryawan IWK, Suhardono S, Lee C-H, Boosting beach clean-up participation through community resilience hypothetical scenarios. *Marine Pollution Bulletin*. 2024;207. doi: 10.1016/j.marpolbul.2024.116853
60. R WH, Pratiwi MA, Adeh R. Emerging Community-Based Blue Economy Industry Sectors in Bintan: Examples From Kampong Teripang. In: *BIO Web of Conferences*. 2024;134. doi: 10.1051/bioconf/202413403003.
61. Thompson OP, Breitenstein RS, Barnes BR, Glory R. Promoting Behavioral Change and Public Awareness for Sustainable Clean Air. In: Ogwu MC, Izah SC, editors, *Sustainable Strategies for Air Pollution Mitigation*. Springer Nature Switzerland, Cham; 2024. p. 475–511. doi: 10.1007/698_2024_1171.
62. Kyambade M, Mugambwa J, Nkurunziza G, Namuddu R, Namatovu A. Servant leadership style and socially responsible leadership in university context: moderation of promoting sense of community. *International Journal of Educational Management*. 2024;38(1):660–678. doi: 10.1108/IJEM-12-2023-0629.

63. Ashraf S, Ali SZ, Khan TI, Azam K, Afridi SA. Fostering sustainable tourism in Pakistan: Exploring the influence of environmental leadership on employees' green behavior. *Business Strategy and Development*. 2023;7(1). doi:10.1002/bsd2.328.
64. Kavathekar A, Tangtrakul K, Pearl N, Britton J, Chapman S, et al. A First Step in the Co-Production of a Climate Resilience Research Agenda for the Philadelphia Region. *Community Science*. 2024;3(4). doi:10.1029/2023CSJ000071.
65. Fiander J, Walker C, Rowlands IH, Devine-Wright P, Wilson C, Soutar I, et al. Energy democracy, public participation, and support for local energy system change in Canada. *Energy Research & Social Science*. 2024;113. doi: 10.1016/j.erss.2024.103526.
66. Yee CH, Al-Mulali, U Ling GM. Intention towards renewable energy investments in Malaysia: extending theory of planned behaviour. *Environmental Science and Pollution Research*. 2022;29:1021–1036. doi: 10.1007/s11356-021-15737-x.
67. Kazmierczuk K, Henderson C, Duffy K, Hanif S, Bhattacharya S, Biswas S, et al. A socio-technical assessment of marine renewable energy potential in coastal communities. *Energy Research & Social Science*. 2023;100. doi: 10.1016/j.erss.2023.103098.
68. Havea PH, Su B, Liu C, Kundzewicz ZW, Wang Y, Wang G, et al. Wind and solar energy in Small Island Developing States for mitigating global climate change. *IScience*. 2024;27(10). doi: 10.1016/j.isci.2024.111062.
69. Vishwakarma S, Tyagi R. Challenges and Opportunities for Energy Efficiency and Sustainable Practices in Small Island Nations, In: *2024 1st International Conference on Smart Systems and Artificial Intelligence (SESAT)*; 2024. p. 1–6. doi: 10.1109/SESAT61023.2024.10599436.
70. Raharjanti NW, Wiguna T, Purwadianto A, Soemantri D, Indriatmi W, Poerwandari EK, et al. Translation, validity and reliability of decision style scale in forensic psychiatric setting in Indonesia. *Heliyon*. 2022;8(7). doi: 10.1016/j.heliyon.2022.e09810
71. Pehlivan D, Aras S, Glaze DG, Ak M, Suter B, Motil KJ, Development and validation of parent-reported gastrointestinal health scale in MECP2 duplication syndrome. *Orphanet Journal of Rare Diseases*. 2024;19(1). doi: 10.1186/s13023-024-03022-2.
72. Sureshchandar GS. Quality 4.0 – a measurement model using the confirmatory factor analysis (CFA) approach. *International Journal of Quality & Reliability Management*. 2023;40(1).280–303. doi: 10.1108/IJQRM-06-2021-0172.
73. Suryawan IWK, Rahman A, Suhardono S, Nguyen VV, Lee C-H. Green-blue workforce readiness for mangrove conservation: Community competency clusters and participatory drivers in Indonesia. *Forest Policy and Economics*. 2025;178. doi:

10.1016/j.forpol.2025.103593.

74. Suhardono S, Lee C-H, Suryawan IWK. Influence of adaptive management indicators on willingness to adapt to single-use plastic ban. *Environmental Economics and Policy Studies*. 2025;27(3). doi: 10.1007/s10018-025-00439-2.
75. Suryawan IWK, Sari MM, Rahman A, Suhardono S, Phan TTT, Lee C-H. Factors influencing attitudes and willingness to pay for data protection and sustainability in e-waste management of laptop/personal computer. *Cleaner Waste Sytems*. 2025;10. doi: 10.1016/j.clwas.2024.100202.
76. Sofiyah ES, Suryawan IWK, Rahman A, Ulhasanah N, Sari MM. Socio-demographic and governance drivers of sanitation participation: Preliminary Evidence from Gorontalo City, Indonesia. *International Journal of Marine Engineering Innovation and Research*. 2025;10(4):1244–1257. doi: 10.12962/j25481479.v10i4.
77. dos Santos PM, Cirillo MÂ. Construction of the average variance extracted index for construct validation in structural equation models with adaptive regressions. *Communication in Statistics-Simulation and Computation*. 2021;52(12):1639–1650. doi: 10.1080/03610918.2021.1888122.
78. Ulhasanah N, Suhardono S, Lee C-H, Faza AS, Zahir A, Suryawan IWK. Modelling participation in waste bank initiatives at public transport hubs to advance circular economy development. *Discover Sustainability*. 2025;6. doi: 10.1007/s43621-025-00940-4.
79. Suryawan IWK, Sianipar IMJ, Lee C-H, Rahman A, Sofiyah ES. Community attitudes, adaptive capacity, and competitive performance in sustainable tourism development in a small town. *Asia-Pacific Journal of Regional Science*. 2025;9(4):1053–1079. doi: 10.1007/s41685-025-00399-1.
80. Sianipar IMJ, C-H Lee, H-J Wang, D-C Kim, IWK Suryawan. Adaptive strategies and community engagement for sustainable conservation and tourism in Komodo National Park, Indonesia. *International Journal of Geoheritage and Parks*. 2025;13(3):335–349. doi: 10.1016/j.ijgeop.2024.09.004.
81. Yang B-C, Lee C-H, Suryawan IWK. *Financial Support in E-waste Management within a Circular Economy with Structural Equation Modeling Analysis from Taiwan*. Circular Economy and Sustainability. 2025;5:949–973. doi: 10.1007/s43615-024-00459-2.
82. Suhardono S, Phan TTT, Lee C-H, Suryawan IWK. Design strategies and willingness to pay for circular economy service policies in sustainable tourism. *Environmental Challenges*. 2025;18. doi: 10.1016/j.envc.2025.101081.
83. Tan KL, Sia JK-M, Tang DKH. To verify or not to verify: using partial least squares to predict effect of online news on panic buying during pandemic. *Asia Pacific Journal of Marketing and Logistics*. 2021. doi: 10.1108/APJML-02-2021-0125.

84. Guo R, Li Y, Shang L, Feng C, Wang X. Local farmer's perception and adaptive behavior toward climate change. *Journal of Cleaner Production*. 2020;287(1). doi: 10.1016/j.jclepro.2020.125332.
85. Lin C-Y, Chau KY, Moslehpour M, Linh HT, Duong KD, Ngo TQ. Factors influencing the sustainable energy technologies adaptation in ASEAN countries. *Sustainable Energy Technologies and Assessments*. 2022;53(Part C). doi: 10.1016/j.seta.2022.102668.
86. Upham DP, Sovacool PB, Ghosh DB. Just transitions for industrial decarbonisation: A framework for innovation, participation, and justice. *Renewable and Sustainable Energy Reviews*. 2022;167. doi: 10.1016/j.rser.2022.112699.
87. Font X, Hindley A. Understanding tourists' reactance to the threat of a loss of freedom to travel due to climate change: a new alternative approach to encouraging nuanced behavioural change. *Journal of Sustainable Tourism*. 2017;25:26–42. doi: 10.1080/09669582.2016.1165235.
88. Boostani P, Pellegrini-Masini G, Klein J. The Role of Community Energy Schemes in Reducing Energy Poverty and Promoting Social Inclusion: A Systematic Literature Review. *Energies (MDPI)*. 2024;17(13). doi: 10.3390/en17133232.
89. Allen E, Lyons H, Stephens JC. Women's leadership in renewable transformation, energy justice and energy democracy: Redistributing power. *Energy Research & Social Science*. 2019;57. doi: 10.1016/j.erss.2019.101233.
90. Monteil C, Simmons P, Hicks A. Post-disaster recovery and sociocultural change: Rethinking social capital development for the new social fabric. *International Journal of Disaster Risk Reduction*. 2020;42. doi: 10.1016/j.ijdrr.2019.101356.
91. Du H, Han Q, de Vries B. The effects of social influence on low-cost and high-cost household energy-efficient product adoption: a case study in Wuhan. *Smart and Sustainable Built Environment*. 2025;14(6):1908-1926. doi: 10.1108/SASBE-11-2023-0338.
92. Abdulkareem AK. Examining the role of community engagement and capacity building in the acceptance of renewable energy projects: The mediating role of trust. *Public Administration and Regional Studies*. 2024;17(1).
93. Imam AA, Abusorrah A, Marzband M. Potentials and opportunities of solar PV and wind energy sources in Saudi Arabia: Land suitability, techno-socio-economic feasibility, and future variability. *Results in Engineering*. 2024;21. doi: 10.1016/j.rineng.2024.101785.
94. Ram M, Osorio-Aravena JC, Aghahosseini A, Bogdanov D, Breyer C. Job creation during a climate compliant global energy transition across the power, heat, transport, and desalination sectors by 2050. *Energy*. 2022;238(Part A). doi: 10.1016/j.energy.2021.121690.

95. Rocha-Meneses L, Luna-delRisco M, González CA, Moncada SV, Moreno A, Sierra-Del Rio J, et al. An Overview of the Socio-Economic, Technological, and Environmental Opportunities and Challenges for Renewable Energy Generation from Residual Biomass: A Case Study of Biogas Production in Colombia. *Energies*. 2023;16(16). doi: 10.3390/en16165901.
96. Burholt V, Scharf T, Walsh K. Imagery and imaginary of islander identity: Older people and migration in Irish small-island communities. *Journal of Rural Studies*. 2013;31:1–12. doi: 10.1016/j.jrurstud.2013.01.007.
97. Partelow S, Nelson K. Social networks, collective action and the evolution of governance for sustainable tourism on the Gili Islands, Indonesia. *Marine Policy*. 2018;112:1–12. doi: 10.1016/j.marpol.2018.08.004.
98. Monita Nand M, Clissold R, McNamara KE, Yee M. Guiding our responses to climate change by what people value: Insights from Fiji. *Geoforum*. 2024;155. doi: 10.1016/j.geoforum.2024.104080.
99. Lucas H, Fifita S, Talab I, Marschel C, Cabeza LF. Critical challenges and capacity building needs for renewable energy deployment in Pacific Small Island Developing States (Pacific SIDS). *Renewable Energy*. 2017;107:42–52. doi: 10.1016/j.renene.2017.01.029.
100. Chaurey A, PR Krithika, Palit D, Rakesh S, Sovacool BK. New partnerships and business models for facilitating energy access. *Energy Policy*. 2012;47(Supplement 1):48–55. doi: 10.1016/j.enpol.2012.03.031.
101. Hannon M, Cairns I, Brauholtz-Speight T, Hardy J, McLachlan C, Mander S, et al. Carrots, sticks and sermons: Policies to unlock community energy finance in the United Kingdom. *Energy Research & Social Science*. 2023;100. doi: 10.1016/j.erss.2023.103086.
102. Derasid NAC, Tahir LM, Musta'amal AH, Abu Bakar Z, Mohtaram N, Rosmin N, et al. Knowledge, awareness and understanding of the practice and support policies on renewable energy: Exploring the perspectives of in-service teachers and polytechnics lecturers. *Energy Reports*. 2021;7(3):3410–3427. doi: 10.1016/j.egyr.2021.05.031.
103. Eshiemogie SO, Ighalo JO, Banji TI. Knowledge, perception and awareness of renewable energy by engineering students in Nigeria: A need for the undergraduate engineering program adjustment. *Cleaner Engineering and Technoogy*. 2022;6(11). doi: 10.1016/j.clet.2021.100388.
104. Adib M, Cruz SM, Wu H. Breaking Barriers to Green Stormwater Infrastructure: Understanding Resident Stewardship Intentions in Three Major U.S. Cities. *Environment and Behavior*. 2026;58(4):512–544. doi: 10.1177/00139165261422058.
105. Mo PKH, Mak WWS. Help-seeking for mental health problems among Chinese: the

- application and extension of the theory of planned behavior. *Social Psychiatry and Psychiatric Epidemiology*. 2009;44(8):675–684. doi: 10.1007/s00127-008-0484-0.
106. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*. 2006;32(4):665–683. doi: 10.1111/j.1559-1816.2002.tb00236.x.
 107. Gamel J, Bauer A, Decker T, Menrad K. Financing wind energy projects: An extended theory of planned behavior approach to explain private households' wind energy investment intentions in Germany. *Renewable Energy*. 2022;182:592–601. doi: 10.1016/j.renene.2021.09.108.
 108. Huijts NMA, Molin EJE, Steg L. Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable and Sustainable Energy Reviews*. 2012;16(1):525–531. doi: 10.1016/j.rser.2011.08.018.
 109. Choudhary B, Dhar V, Pawase AS. Blue carbon and the role of mangroves in carbon sequestration: Its mechanisms, estimation, human impacts and conservation strategies for economic incentives. *Journal of SEa Research*. 2024;199. doi: 10.1016/j.seares.2024.102504.
 110. Macreadie PI, Costa MDP, Atwood TB, Friess DA, Kelleway JJ, Kennedy H, et al. Blue carbon as a natural climate solution. *Nature Reviews Earth and Environment*. 2021;2:826–839. doi: 10.1038/s43017-021-00224-1.
 111. Friess DA, Gatt YM, Fung TK, Alemu JB, Bhatia N, Case R, et al. Blue carbon science, management and policy across a tropical urban landscape. *Landscape and Urban Planning*. 2023;230. doi: 10.1016/j.landurbplan.2022.104610.



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