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# Harnessing the power of renewable energy in Borongan City, Eastern Samar: Sustainable energy program

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ABSTRACT

This study assessed the status, awareness, and potential of renewable energy utilization in Borongan City, Eastern Samar as a basis for developing a Sustainable Energy Program. Specifically, it examined the level of community awareness, acceptance, and perceived effectiveness of renewable energy and identified the opportunities and challenges affecting its adoption. The study employed a quantitative descriptive research design using a structured and modified questionnaire. A total of forty (40) respondents participated in the study, composed of twenty (20) local government officials and energy stakeholders and twenty (20) household consumers in Borongan City. Respondents were profiled according to age, gender, civil status, educational attainment, employment status, position, length of service, and participation in training or seminars related to energy and sustainability. Findings revealed varying levels of awareness and acceptance of renewable energy across key domains such as environmental sustainability, economic benefits, energy reliability, accessibility, and community impact. Other factors examined included affordability, efficiency, safety, service responsiveness, and institutional support. While respondents recognized the potential benefits of renewable energy, several implementation barriers were identified, including limited technical expertise, high initial investment costs, inadequate infrastructure, regulatory constraints, and insufficient public awareness. Based on the findings, the study recommends the adoption and strengthening of renewable energy initiatives, particularly solar and wind energy systems, along with enhanced institutional support, capacity-building programs, and community awareness campaigns to promote energy security, environmental sustainability, and sustainable development in Borongan City, Eastern Samar.

Keywords: Renewable energy, sustainable energy program, solar energy, wind energy, energy security, environmental sustainability.

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## INTRODUCTION

Energy plays a vital role in economic development, social stability, and environmental sustainability because reliable and affordable electricity supports household welfare, business operations, public services, and technological advancement. In contrast, inadequate and

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unstable energy supply constrains productivity, discourages investment, and weakens disaster resilience, particularly in developing and disaster-prone communities. As global energy demand continues to increase, the transition toward renewable energy has emerged as a critical strategy for achieving sustainable development. This global direction is reflected in the United Nations Sustainable Development Goals, particularly SDG 7 on Affordable and Clean Energy and SDG 13 on Climate Action, which emphasize expanding access to renewable energy to reduce greenhouse gas emissions, mitigate climate change, and foster inclusive economic growth. Consistent with these objectives, recent global energy reports indicate that renewable energy sources, including wind, solar, hydro, and biomass, accounted for a record 32 percent of global electricity generation in 2024, demonstrating the accelerating deployment of clean energy technologies and reinforcing the growing recognition that sustainable energy systems are essential for addressing present and future energy challenges.

Despite these technological advancements and increasing global investments, many developing countries continue to experience energy insecurity because of their dependence on fossil fuels and vulnerable power infrastructures. These challenges are particularly evident in regions where aging energy systems, inadequate infrastructure, and frequent natural disasters disrupt electricity supply and limit socioeconomic development. Renewable energy technologies such as solar, wind, hydro, and biomass have therefore been widely recognized as viable solutions capable of enhancing energy security while reducing environmental degradation. Their capacity to generate clean, reliable, and locally available energy positions them as practical alternatives for communities seeking sustainable and resilient energy systems.

The Philippines possesses significant renewable energy resources, particularly in solar, wind, hydro, and geothermal energy, placing the country in a favorable position to advance sustainable energy development. Among the regions with considerable untapped renewable energy potential is Eastern Visayas, where Borongan City is strategically situated within a coastal and riverine environment characterized by abundant sunlight and favorable natural conditions for renewable energy generation. According to the Department of Energy (DOE, 2020), Eastern Visayas has substantial renewable energy capacity that remains largely underutilized despite its potential to contribute to long term energy sustainability. Borongan City, a component city in Eastern Samar, is also geographically vulnerable to climate related hazards such as typhoons and flooding that frequently disrupt conventional power systems and threaten the reliability of traditional energy infrastructure. These environmental realities highlight the urgency of exploring renewable energy alternatives that can strengthen energy security while improving climate resilience. Although the Department of Energy (DOE, 2020) has recognized the region's high renewable energy potential, actual utilization remains constrained by economic, technical, and political barriers that continue to hinder widespread implementation.

The literature consistently supports the transformative role of renewable energy in promoting sustainable development while also identifying the complex barriers that impede its adoption. Sovacool (2017) emphasized that renewable energy systems substantially reduce greenhouse gas emissions while enhancing energy independence, particularly within developing economies seeking sustainable growth. Similarly, Painuly (2001) identified financing limitations, inadequate public awareness, and insufficient policy mechanisms as major obstacles affecting renewable energy deployment in low-income communities. Within the Philippine context, Villafuerte and Almo (2021) observed that many rural communities remain excluded from clean energy initiatives despite demonstrating openness toward sustainable energy alternatives. Collectively, these studies reveal that successful renewable energy adoption requires not only technological capability but also supportive policies, financial accessibility, institutional commitment, and active community participation. While these findings converge in recognizing the benefits and challenges of renewable energy, they

also reveal an important research gap because most existing studies concentrate on highly urbanized or industrialized areas while providing limited attention to smaller cities with distinct geographic, environmental, and socioeconomic characteristics such as Borongan City. Consequently, localized investigations remain necessary to understand the unique opportunities and constraints influencing renewable energy implementation within rural and disaster vulnerable communities.

Addressing this gap, the present study explored the utilization of renewable energy sources in Borongan City, Eastern Samar by examining both their prospects and limitations. As the global climate crisis intensifies, identifying sustainable and environmentally responsible energy alternatives becomes increasingly important for vulnerable regions that experience recurring natural disasters capable of damaging conventional energy systems. Through an examination of local renewable energy opportunities, implementation challenges, and community conditions, the study seeks to contribute to the localized realization of the Sustainable Development Goals while generating evidence-based policy recommendations that promote inclusive, resilient, and sustainable energy transitions within Borongan City and similar localities.

The conduct of this investigation was further strengthened by the researcher's academic qualifications, professional experience, and direct familiarity with the local energy context. As a faculty member of the Eastern Samar State University College of Technology handling major subjects in Electrical Technology, the researcher possesses substantial technical competence in electrical power systems and energy applications. His master's thesis, which focused on a micro hydro field power system, further enhanced his expertise in renewable energy generation and sustainable energy technologies. Beyond his academic preparation, his personal experience as a resident of Borongan City exposed him to frequent power interruptions that affected households, educational institutions, and economic activities. These lived experiences reinforced his commitment to investigating renewable energy alternatives capable of improving energy reliability, disaster resilience, and environmental sustainability. The integration of his academic preparation, professional practice, and firsthand understanding of the local energy situation established both the competence and contextual relevance necessary for undertaking the present study.

The study was anchored on a comprehensive multi theoretical and policy-based framework that integrates scientific principles of energy, behavioral theories, technology adoption models, sustainable development perspectives, legal mandates, and international standards to provide a holistic understanding of renewable energy adoption within the local context of Borongan City. This integrated framework recognizes that renewable energy implementation extends beyond technical feasibility and encompasses behavioral, institutional, environmental, and policy dimensions that collectively shape the success of sustainable energy programs.

The scientific foundation of the study draws from Einstein's Theory of Energy, particularly the principle that energy cannot be created or destroyed but can only be transformed. This principle provides the scientific basis for understanding how renewable resources such as solar radiation, wind, and flowing water are converted into usable electrical energy without depleting finite natural resources. The theory reinforces the sustainability of renewable energy systems by emphasizing efficient energy transformation rather than resource consumption. Complementing this scientific perspective is Ohm's Law, which explains the relationship among voltage, current, and resistance within electrical systems. This law provides the technical basis for evaluating the efficiency, reliability, safety, and operational performance of renewable energy installations, particularly solar photovoltaic systems and wind energy

technologies. It also supports the assessment of infrastructure readiness by identifying potential technical limitations involving system losses, grid constraints, and load capacity within the energy infrastructure of Borongan City.

Recognizing that renewable energy adoption is equally influenced by human behavior and institutional decision making, the study incorporates Taylor and Balmer's Awareness Theory together with the Endless Situation Awareness Theory. Awareness Theory emphasizes that public understanding, education, information dissemination, and stakeholder perception significantly influence the acceptance of innovations. Within Borongan City, this perspective explains how government initiatives, community engagement, and educational programs shape public awareness regarding the benefits and risks associated with renewable energy technologies. Complementing this perspective, the Endless Situation Awareness Theory underscores the continuous process of monitoring, evaluating, and responding to changing environmental, technological, and socioeconomic conditions. This theoretical perspective is especially relevant in disaster prone areas such as Eastern Samar because energy planning requires ongoing adaptation to climate related hazards, infrastructure vulnerabilities, and evolving community needs rather than relying solely on static policy interventions.

The primary theoretical anchor of the study is Rogers' Diffusion of Innovations Theory (2003), which provides a systematic explanation of how renewable energy technologies are introduced, communicated, evaluated, adopted, and sustained within communities. Rogers identified five sequential stages consisting of knowledge, persuasion, decision, implementation, and confirmation. These stages closely reflect the experiences of households, institutions, and local government units in Borongan City as they become informed about renewable energy technologies, evaluate their practicality and benefits, decide whether to adopt them, implement renewable energy systems, and determine whether continued utilization is appropriate. This framework is reinforced by Davis's (1989) Technology Acceptance Model, which explains that adoption decisions are largely influenced by perceived usefulness and perceived ease of use. In communities where financial limitations and technical literacy remain concerns, these perceptions significantly influence acceptance or resistance toward renewable energy technologies. The model therefore provides an explanation for behavioral and social barriers such as reluctance to transition from conventional energy sources and concerns regarding operational complexity, maintenance requirements, and long-term system performance.

The study is further grounded in Sustainable Development Theory, which aligns closely with the principles embodied in the United Nations Sustainable Development Goals, particularly SDG 7 on Affordable and Clean Energy and SDG 13 on Climate Action. This theoretical perspective emphasizes achieving a balance among environmental protection, economic development, and social equity while promoting sustainable resource utilization. It reinforces the view that renewable energy adoption contributes not only to improved energy security but also to climate change mitigation, enhanced disaster resilience, environmental sustainability, and inclusive socioeconomic development, outcomes that are especially important for geographically isolated and climate vulnerable communities such as Borongan City.

The theoretical framework is further strengthened by national legislation and international policy commitments that provide institutional support for renewable energy development. At the national level, Republic Act No. 9513, otherwise known as the Renewable Energy Act of 2008, establishes incentives and institutional mechanisms supporting renewable energy investments and implementation. Republic Act No. 9729, or the Climate Change Act, integrates climate change considerations into national and local development planning, while Republic Act No. 11285, the Energy Efficiency and Conservation Act, promotes efficient energy utilization alongside renewable energy adoption. Internationally, the study aligns with

the Paris Agreement (2015), which commits participating nations to reducing greenhouse gas emissions, and with the United Nations Sustainable Development Goals that collectively provide the global framework for sustainable energy transition. These legal and policy instruments establish the urgency, legitimacy, and policy relevance of renewable energy initiatives within Borongan City.

To ensure technical credibility and consistency with internationally recognized engineering practices, the study also incorporates standards established by leading global institutions. Guidance from the International Renewable Energy Agency supports the evaluation of renewable energy policies and best practices, while ISO 50001:2018 provides internationally accepted principles for effective energy management systems. Likewise, IEC 61400 establishes standards governing wind turbine systems, and IEC 61730 specifies safety and performance requirements for photovoltaic modules. These international standards provide objective benchmarks for assessing the technical, institutional, and operational readiness of Borongan City to implement renewable energy technologies effectively and sustainably.

Guided by these interconnected theories, laws, and standards, the conceptual framework focuses on the prospects and limitations associated with the utilization of renewable energy sources as the foundation for a sustainable energy program in Borongan City. The prospects encompass resource availability, technological feasibility, policy support, community awareness, and environmental considerations, which are collectively explained through the Diffusion of Innovations Theory, Awareness Theory, and Sustainable Development Theory. Conversely, the identified limitations include high initial investment costs, limited technical expertise, inadequate infrastructure, gaps in policy implementation, and resistance to technological change. These barriers are interpreted through the Technology Acceptance Model, Ohm's Law, and the Endless Situation Awareness Theory, which together explain the interaction between human behavior and technical constraints affecting renewable energy adoption. The interaction between these opportunities and challenges ultimately determines the extent to which renewable energy technologies are adopted within Borongan City and, consequently, their contribution to sustainable development outcomes that support national priorities and global commitments toward clean energy and climate action.

The study is likewise supported by the National Structural Code of the Philippines, recognizing that renewable energy development requires not only technological innovation but also structurally safe and disaster resilient infrastructure. The National Structural Code of the Philippines provides the engineering standards necessary for the safe installation and operation of renewable energy systems, including solar panel mounting structures, wind turbine foundations, battery storage facilities, and power distribution systems. The NSCP 2015, which serves as the seventh edition of the country's official structural standard, establishes minimum design requirements that enable buildings and other structures to withstand earthquakes, typhoons, high wind loads, and other natural hazards common in the Philippines. It specifies technical safety requirements for supporting gravity, lateral, environmental, and operational loads while strengthening the resilience of structures against seismic and wind related hazards. As a technical companion to the National Building Code of the Philippines, it provides engineers with scientific and mathematical methodologies necessary for regulatory compliance. The code also incorporates updated wind load provisions based on Philippine wind data, revised seismic maps identifying Seismic Zone 4, performance-based design approaches that improve engineering flexibility while optimizing resources, and comprehensive guidance for structural concrete, steel, wood, and masonry. Published by the Association of Structural Engineers of the Philippines, the NSCP 2015 aligns international engineering principles with local environmental conditions.

Building upon these standards, the NSCP 2025 introduces further improvements that strengthen disaster resilience through updated seismic and wind load provisions derived from the latest hazard and climate information, expanded performance-based design methodologies, stronger integration of climate risk assessment within structural design, and enhanced safety standards for critical infrastructure and essential facilities. These developments are particularly significant for renewable energy systems located in hazard prone regions such as Eastern Samar because they help ensure that renewable energy installations remain functional during and after extreme environmental events. Compliance with both the NSCP 2015 and NSCP 2025 therefore supports the implementation of renewable energy programs that prioritize structural integrity, operational reliability, disaster resilience, and long-term sustainability, thereby reinforcing the overall objective of advancing a safe, resilient, and sustainable renewable energy transition in Borongan City.

## Statement of the problem

This study aimed to assess renewable energy sources in Borongan City, Eastern Samar, toward the development of a sustainable energy program.

Specifically, it sought to answer the following:

1. What is the demographic profile of the respondents in terms of age, gender, educational attainment, occupation or stakeholder category, and length of residency in Borongan City?
2. What is the status of awareness of respondents regarding renewable energy in terms of awareness of renewable energy, perceived benefits, accessibility and affordability, environmental sustainability, and policy and government support?
3. What are the perceived benefits of adopting renewable energy in Borongan City as to economic benefit and environmental benefit?
4. What challenges were encountered in renewable energy adoption in terms of cost and funding issues, lack of technical expertise or skilled labor, limited government support, public misconceptions, and geographic and environmental constraints?
5. What is the relationship between the stakeholders' level of awareness of renewable energy and their perceived limitations in the adoption of renewable energy resources, and between the stakeholders' perceived benefits of renewable energy and their perceived limitations in the adoption of renewable energy resources?
6. Based on the findings, what sustainable energy program may be developed for Borongan City, Eastern Samar?

## METHODOLOGY

This study used a descriptive-correlational design to assess the awareness and perception of residents and local stakeholders regarding renewable energy, and to determine the relationship between these perceptions and the perceived prospects and limitations of adopting such energy sources. The descriptive aspect of the design captures current attitudes, while the correlational aspect examines relationships between variables. Essential data were collected on respondents' profiles, including age, gender, civil status, education, income, electricity source, and household size, alongside core variables grouped into input categories consisting of perceived prospects related to economic and environmental benefits, social acceptance, government incentives, and natural resource availability, as well as perceived limitations related to high initial costs, technical constraints, policy gaps, misconceptions, and geographic barriers. Data were gathered using a validated questionnaire, with the necessary approvals secured from the local government unit.

The study followed three procedural stages. The pre-data gathering stage involved securing permissions and validating the research instrument through expert review and pilot testing. The data gathering stage involved administering questionnaires to selected respondents while ensuring confidentiality and adherence to ethical standards. The post-data gathering stage involved organizing, cleaning, and analyzing the data using descriptive statistics, specifically frequency, mean, and standard deviation. Through this process, the study produced a comprehensive profile of respondents, an assessment of awareness and perception of renewable energy, an evaluation of perceived prospects for adoption, an identification of limitations or barriers, and a set of insights and recommendations intended to inform local energy policy, promote sustainable development, and enhance public understanding. The perceived limitations examined in the study were further organized into four clusters. Financial limitations encompassed high initial capital costs, limited access to financing, and affordability concerns among households and institutions. Technical and infrastructure limitations encompassed the lack of technical expertise, insufficient maintenance capability, grid limitations, and inadequate supporting infrastructure. Institutional and policy limitations encompassed policy implementation gaps, bureaucratic delays, limited local capacity, and weak enforcement of energy-related regulations. Social and behavioral limitations encompassed resistance to change, low awareness, perceived complexity of renewable energy systems, and lack of community trust or acceptance. Overall, the study was designed to provide evidence-based insights and policy recommendations to help local government units, energy stakeholders, and community organizations develop effective strategies and programs that advance renewable energy initiatives and promote sustainable energy development in the region.

Borongan City, a component city in Eastern Samar, is geographically situated in an area vulnerable to climate-related disasters such as typhoons and flooding. These conditions not only disrupt daily life but also threaten the reliability of traditional energy infrastructure. In response, the adoption of renewable energy sources such as solar, wind, and hydro offers a viable pathway toward energy security and climate resilience. The Department of Energy (DOE, 2020) has identified the Eastern Visayas region, where Borongan City is located, as having high potential for renewable energy development, yet utilization remains limited due to economic, technical, and political barriers. Scholars agree on the transformative potential of renewable energy. Sovacool (2017) emphasized that renewable energy systems can significantly reduce greenhouse gas emissions and enhance energy independence, particularly in developing economies. Likewise, Painuly (2001) noted that the main challenges to renewable energy deployment in low-income areas include financing, lack of awareness, and insufficient policy mechanisms. Villafuerte and Almo (2021) further argued that rural communities in the Philippines are often left out of clean energy programs despite their openness to sustainable alternatives.

The research respondents covered in this study were the residents and local stakeholders of Borongan City, Eastern Samar, who are directly or indirectly involved in energy utilization and management within the community. The research population consisted of selected households, local business owners, and key community stakeholders who were in a position to provide meaningful insights regarding renewable energy awareness, perception, opportunities, and challenges in the city. To ensure relevant and accurate data, the researcher specifically employed a non-probability sampling technique using purposive sampling, an approach that focused on respondents who were most knowledgeable and directly affected by energy programs in Borongan City. A total of 150 respondents were selected for the study, distributed across the various geographical divisions of the city's 61 barangays, which are broadly divided

into Poblacion (Purok A to H), coastal and suburban barangays such as Alang-alang, Sabang, and Songco, and island barangays such as Ando and Divinubo. Of the 150 respondents, 123, or 82.0%, came from Coastal or Suburban Barangays, 21, or 14.0%, came from Poblacion or Urban Barangays, and 6, or 4.0%, came from Island Barangays, for a total of 150 respondents or 100.0%. This distribution indicated that the majority of respondents were drawn from the coastal and suburban barangays, followed by the urban barangays within the Poblacion, with the island barangays comprising the smallest share of the sample.

The research instrument constructed by the researcher was utilized in the study, employing questionnaires as the primary tool to gather data regarding the profile of respondents, awareness, perception, and engagement in renewable energy initiatives in Borongan City, Eastern Samar. The researcher utilized standard items as inputs to the research questionnaire, which was administered to collect data and information about the respondents' demographic profile, level of awareness, perception, and the opportunities and challenges associated with renewable energy sources. The questionnaire was composed of seven parts. Part I described the demographic characteristics of the respondents, including gender, age, educational attainment, occupation, and length of residency in Borongan City, information that provided context for interpreting the awareness and perception of renewable energy initiatives in the city. Part II measured the respondents' level of awareness and perception regarding renewable energy programs in Borongan City, with respondents rating their awareness and perception using a Likert scale of Very High, High, Moderate, Low, and Very Low, enabling the researcher to quantify respondents' understanding and attitudes toward renewable energy. Part III evaluated the respondents' perception of the sustainability and long-term viability of renewable energy programs in Borongan City, where sustainability referred to the ability of renewable energy initiatives to provide reliable, affordable, and environmentally responsible energy solutions over time while benefiting both the community and the local economy; respondents assessed this sustainability using the same Likert scale of Very High, High, Moderate, Low, and Very Low, with items focused on key sustainability dimensions such as environmental protection, economic viability, social acceptability, and long-term energy reliability. Part IV evaluated the respondents' perceptions of the benefits, opportunities, and potential impacts of adopting renewable energy in the city, with sub-variables including environmental sustainability, economic benefits, energy security, and social impact, and responses recorded using a Likert scale of Strongly Agree, Agree, Disagree, and Strongly Disagree. Part V identified the challenges and barriers encountered in the promotion or adoption of renewable energy programs, including items on technological, financial, policy-related, and community acceptance challenges, rated using the same Likert scale. Part VI examined the relationship between the perceived opportunities, or prospects, and the challenges, or limitations, of renewable energy utilization in Borongan City, specifically investigating whether the respondents' perception of potential benefits from renewable energy programs was significantly related to the obstacles they encounter in adopting or supporting these initiatives; the analysis used statistical tools such as correlation or chi-square tests to determine the strength and direction of this relationship, an understanding that is essential because it reveals whether communities that recognize more opportunities in renewable energy also perceive fewer challenges, or conversely, whether perceived challenges might hinder the realization of identified opportunities. Part VII, based on the findings from awareness, perception, sustainability, and the correlation between opportunities and challenges, outlined a proposed Sustainable Energy Program for Borongan City, Eastern Samar.

In constructing the instrument, the researcher modified the questionnaire based on relevant literature, expert advice, and previous studies to ensure its applicability to the Borongan City context, undertaking consultations with the research adviser to ensure that standard questionnaires were utilized appropriately and that proper citations were observed.

For validation, after integrating the suggestions of the adviser and securing final approval for the draft, the researcher requested the assistance of local energy experts and stakeholders to validate the modified questionnaire; feedback and recommendations were considered, and revisions were incorporated to ensure the questionnaire's reliability and validity.

Prior to distributing the questionnaires, the researcher sought permission from respondents to ensure their comfort and confidentiality, and a Letter of Request was sent to the respondents to conduct the survey. Upon approval, the researcher distributed the questionnaires and explained the items to ensure that respondents fully understood the questions. After collecting all questionnaires, responses were collated, tabulated, and analyzed, with frequencies and percentages calculated and scales assigned according to the extent of awareness, perception, and perceived opportunities and challenges regarding renewable energy. The results provided a foundation for identifying community needs and opportunities for sustainable energy programs in Borongan City. In terms of administration, the researcher sought approval from the adviser, who was an expert in renewable energy and sustainable development, to conduct the survey, and the questionnaires were administered to the target respondents, who included both households and local business owners. Additionally, a focus group discussion was conducted with a representative number of respondents, which allowed the researcher to benchmark good practices, verify questionnaire responses, and collect qualitative insights to complement the quantitative data. This discussion served as a basis for interpreting findings and formulating recommendations for sustainable energy initiatives in Borongan City.

The data gathered from the respondents were quantified using a Likert-type scale, with responses assigned weights ranging from 1 as the lowest to 5 as the highest, and these weights corresponded to verbal interpretations to provide a measurable evaluation of awareness, perception, sustainability, opportunities, and challenges related to renewable energy utilization. Frequency distribution and percentage were employed to process and analyze the demographic profile of respondents, such as gender, age, educational attainment, and occupation, with the use of frequency and percentage enabling a clear presentation of the composition of respondents and ensuring that the analysis was grounded in the characteristics of the study population. The weighted mean was used to determine the respondents' level of awareness, perception, and sustainability of renewable energy programs, following a scale in which a Likert value of 5 with a weighted mean range of 4.21 to 5.00 was described as Very High/Strongly Agree, a value of 4 with a weighted mean range of 3.41 to 4.20 was described as High/Agree, a value of 3 with a weighted mean range of 2.61 to 3.40 was described as Moderate/Neutral, a value of 2 with a weighted mean range of 1.81 to 2.60 was described as Low/Disagree, and a value of 1 with a weighted mean range of 1.00 to 1.80 was described as Very Low/Strongly Disagree. Responses were thus categorized into five levels ranging from Strongly Disagree/Very Low to Strongly Agree/Very High Awareness. Mean scores between 4.21 and 5.00 indicated Strongly Agree/Very High, reflecting a very high level of agreement among respondents. Mean values from 3.41 to 4.20 corresponded to Agree/High, signifying a high level of agreement. Scores falling between 2.61 and 3.40 were interpreted as Neutral/Moderate, suggesting neither agreement nor disagreement. Mean scores ranging from 1.81 to 2.60 represented Disagree/Low, indicating low agreement, while values between 1.00 and 1.80 denoted Strongly Disagree/Very Low, reflecting very low agreement. This scale provided a systematic basis for interpreting respondents' perceptions and attitudes toward the measured variables.

For purposes of clarity, several terms central to this study are defined as follows. The Awareness Cluster referred to the extent to which residents and stakeholders were informed

about renewable energy sources, including their types such as solar, wind, hydro, and biomass, basic principles of operation, environmental benefits, and government-supported renewable energy programs. The Perception Cluster pertained to the attitudes, beliefs, and opinions of respondents regarding renewable energy, including perceived benefits, perceived risks, trust in renewable technologies, and perceived relevance to local energy needs in Borongan City. The Technical Prospects Cluster included the availability of renewable energy resources, technological feasibility, system reliability, safety standards, and compatibility with existing infrastructure. The Economic Prospects Cluster referred to perceived economic benefits such as long-term cost savings, job creation, local investment opportunities, and reduced dependence on conventional energy sources. The Environmental Prospects Cluster focused on environmental benefits, including reduced greenhouse gas emissions, climate change mitigation, environmental protection, and disaster resilience. The Institutional and Policy Support Cluster included government incentives, local ordinances, national energy policies, and international commitments that encourage renewable energy development. The Financial Limitations Cluster referred to high initial capital costs, limited access to financing, and affordability concerns among households and institutions. The Technical and Infrastructure Limitations Cluster included lack of technical expertise, insufficient maintenance capability, grid limitations, and inadequate supporting infrastructure. The Institutional and Policy Limitations Cluster pertained to policy implementation gaps, bureaucratic delays, limited local capacity, and weak enforcement of energy-related regulations. Finally, the Social and Behavioral Limitations Cluster included resistance to change, low awareness, perceived complexity of renewable energy systems, and lack of community trust or acceptance.

## RESULTS AND DISCUSSION

This chapter presents the results of the study and provides a discussion of the findings gathered from 150 respondents, comprising residents and local stakeholders of Borongan City, Eastern Samar, who were selected through purposive sampling. The discussion is grounded strictly in the data collected using a researcher-constructed and validated questionnaire, and the results are analyzed and interpreted in direct relation to the study's objectives of determining the respondents' demographic profile, their level of awareness of renewable energy, their perceptions of its economic and environmental benefits, the challenges encountered in its adoption, and the relationships among these variables. Frequency and percentage distributions were used to describe the respondents' profile, weighted means were used to determine levels of awareness, perception, and perceived challenges, and Pearson correlation analysis was used to test the significance of relationships among the study's major variables at the 0.05 level of significance.

Information related to the respondents was obtained through their profile data, which included age and gender, civil status, highest educational attainment, and number of years of professional experience. Profiling the respondents was essential to this study, as these characteristics provide important context for understanding their awareness, perceptions, and attitudes toward renewable energy within Borongan City, a locality situated in one of the economically disadvantaged provinces in the Philippines. Educational attainment was particularly relevant in this context, as access to advanced education and technical resources may be more limited in poorer provinces, and respondents with higher educational backgrounds are more likely to have broader exposure to energy-related concepts and policy discussions, which may influence their evaluation of renewable energy options and their support for local renewable energy initiatives. Years of professional experience were included to contextualize respondents' perspectives, as experience may shape how individuals assess feasibility, costs, and implementation considerations associated with renewable energy projects in a provincial

setting, supporting a more nuanced interpretation of differences in awareness and perception across respondent groups.

The age and gender distribution of respondents were categorized into four groups following the classification proposed by Moores and Chang (2006), a categorization that allows for the examination of demographic variations in awareness and perceptions of renewable energy within the socio-economic context of Borongan City. The age distribution revealed that the largest group of participants belonged to the 18 to 25 years old bracket, accounting for 47 respondents or 31.3% of the total population, followed by the 46 to 55 years old group with 35 respondents or 23.3%, the 26 to 35 years old group with 33 respondents or 22.0%, the 36 to 45 years old group with 23 respondents or 15.3%, the 56 to 65 years old group with 11 respondents or 7.3%, and the 66 years old and above group with 1 respondent or 0.7%, for a total of 150 respondents or 100.0%. The concentration of respondents in the younger generations, aged 18 to 35 years, who collectively make up more than half of the sample at 53.3%, was notable, as this age group is typically considered to have higher levels of digital literacy and exposure to global discourse regarding climate change and environmental sustainability. Additionally, the significant representation of the 46 to 55 age group at 23.3% was significant, since this age group often represents household heads or established professionals in the community who carry the direct responsibility for utility expenses, including electricity bills.

With respect to gender, respondents were predominantly male, with 82 respondents or 54.7%, while females comprised 66 respondents or 44.0%, and a small proportion of 2 respondents or 1.3% preferred not to disclose their gender, for a total of 150 respondents or 100.0%. This distribution indicates a relatively balanced gender representation, suggesting that perceptions toward renewable energy were gathered from both male and female perspectives, which strengthens the inclusivity and representativeness of the findings.

In terms of educational attainment, most respondents had attained college-level education, comprising 85 respondents or 56.7%, followed by those with graduate studies at 48 respondents or 32.0%, high school level at 13 respondents or 8.7%, and elementary level at 4 respondents or 2.7%, for a total of 150 respondents or 100.0%. This relatively high educational background suggests that respondents were capable of understanding energy-related issues, policies, and technologies, lending credibility to their responses regarding renewable energy awareness, benefits, and challenges.

Regarding occupation, the largest group of respondents were government employees, comprising 60 respondents or 40.0%, followed by housewives and students at 23 respondents or 15.3%, professionals at 21 respondents or 14.0%, service and sales workers at 13 respondents or 8.7%, skilled agricultural, forestry, and fishery workers at 13 respondents or 8.7%, clerical support workers at 6 respondents or 4.0%, managers at 5 respondents or 3.3%, craft and related trade workers at 3 respondents or 2.0%, technicians and associate professionals at 3 respondents or 2.0%, self-employed individuals at 2 respondents or 1.3%, and elementary occupations at 1 respondent or 0.7%, for a total of 150 respondents or 100.0%. This composition suggests that many respondents were directly or indirectly involved in governance, education, or service sectors, which are relevant stakeholders in renewable energy planning and policy discussions at the local level.

Finally, with respect to length of residency, the majority of respondents, comprising 105 respondents or 70.0%, had lived in Borongan City for more than 10 years, while 21 respondents or 14.0% had resided in the city for less than 1 year, 19 respondents or 12.7% for 1 to 5 years, and 5 respondents or 3.3% for 6 to 10 years, for a total of 150 respondents or 100.0%. This implies that most respondents possess long-term familiarity with the city's energy conditions, environmental challenges, and development needs, making their perceptions

particularly valuable for assessing renewable energy prospects and limitations. Overall, the profiling of respondents strengthened the analytical rigor of the study by linking demographic and professional characteristics to key variables such as awareness, perceived prospects, and perceived limitations of renewable energy, ensuring that the findings are grounded in the local realities of Borongan City and are directly relevant to the formulation of a renewable energy-based Sustainable Energy Program responsive to local needs and constraints.

With regard to the level of awareness of residents and stakeholders regarding renewable energy, the overall mean of 4.06 indicated that respondents generally agreed that they were aware of renewable energy concepts. Specifically, respondents rated their awareness of different types of renewable energy such as solar, wind, and hydro at 4.37, verbally interpreted as Very High, their understanding of how renewable energy systems are used to generate power at 4.27, also Very High, their familiarity with renewable energy projects in the Philippines at 3.97, interpreted as High, their understanding of how renewable energy systems generally work at 3.93, also High, and their being updated on national policies or regulations related to renewable energy at 3.77, interpreted as High, yielding an overall mean of 4.06 verbally interpreted as High. High ratings were observed in awareness of different renewable energy types and understanding of how systems generate power, suggesting that while conceptual knowledge is high, policy literacy remains comparatively limited, as slightly lower scores were noted for awareness of national policies. This finding aligned with studies emphasizing that public awareness often focuses more on technology than on policy frameworks (Bayola et al., 2023), implying that information campaigns by local government units and national agencies should strengthen public dissemination of renewable energy policies and regulations. Studies in the Philippines confirm similar patterns, wherein general awareness is high but knowledge of local initiatives and regulations is moderate (Cruz & Mendoza, 2023; DOE, 2024).

Respondents likewise demonstrated a very strong positive perception of renewable energy benefits, with an overall mean of 4.44 verbally interpreted as Very High. Respondents rated their agreement that renewable energy can provide cleaner power compared to fossil fuels at 4.41, that it can reduce dependence on imported energy at 4.43, that it improves environmental protection at 4.51, that it promotes sustainable development at 4.48, and that it offers long-term affordability at 4.37, all verbally interpreted as Very High, yielding an overall mean of 4.44. Environmental protection and sustainable development received the highest ratings, reflecting strong environmental consciousness among stakeholders and supporting Sustainable Development Goal 7 on Affordable and Clean Energy and SDG 13 on Climate Action. This strong perception of benefits indicates favorable conditions for renewable energy advocacy and community acceptance, which policymakers can leverage when introducing new projects, and programs should leverage these strong benefit perceptions in advocacy and adoption campaigns. Literature supports that Filipinos associate renewable energy with environmental gains and energy security (IRENA, 2023; Cruz & Mendoza, 2023).

In terms of accessibility and affordability, an overall mean of 3.82 indicated that respondents were highly aware that renewable energy is accessible and affordable, though ratings were lower compared to perceived benefits. Respondents rated their agreement that renewable energy systems are accessible for local households at 3.96, that renewable energy systems are financially affordable at 3.75, that renewable energy technologies are available locally at 3.81, that maintenance of renewable energy systems is affordable at 3.71, and that accessing renewable energy information is easy in the community at 3.84, all interpreted as Agree, yielding an overall mean of 3.82 also interpreted as Agree. This suggests cautious optimism, wherein residents recognize availability but may still have concerns regarding cost and maintenance, implying that financial mechanisms such as subsidies, micro-financing, or installment schemes could improve adoption rates by addressing affordability concerns. Prior

research highlights net-metering and financing as critical enablers for household adoption in the Philippines (DOE, 2024; ADB, 2023).

With regard to environmental sustainability, respondents were very highly aware that renewable energy supports environmental sustainability, with an overall mean of 4.37. Respondents rated their agreement that renewable energy can reduce carbon emissions at 4.41, that it can help mitigate climate change at 4.41, that it is compatible with Borongan's natural resources at 4.28, that it helps in conserving local ecosystems at 4.39, and that it supports the city's sustainability goals at 4.34, all verbally interpreted as Very High, yielding an overall mean of 4.37, also Very High. Statements on reducing carbon emissions and mitigating climate change scored highest, while compatibility with Borongan's resources was slightly lower but still strongly positive, suggesting that environmental narratives are powerful drivers for adoption and should be integrated into local climate and resilience plans. This finding supported sustainability theory, which emphasizes renewable energy as a pathway to ecological balance (UN, 2023), and confirmed literature indicating that renewable energy significantly reduces emissions and aligns with sustainability goals globally and in the Philippines (IRENA, 2023; Santos et al., 2022). The result implies that environmental framing should remain central in local renewable energy initiatives, especially in climate-vulnerable areas like Eastern Samar.

Regarding policy and government support, an overall mean of 3.77, interpreted as High, indicated reasonable confidence in government support. Respondents rated their agreement that the local government unit actively promotes renewable energy programs at 3.87, that government provides adequate incentives for renewable energy at 3.61, that local policies support the use of renewable energy at 3.81, that government provides enough information on renewable energy at 3.71, and that government partnerships support renewable energy expansion at 3.83, all interpreted as High, yielding an overall mean of 3.77. While respondents acknowledged existing local government unit efforts, perceptions of incentives and information dissemination were less strong, with incentives rated lowest at 3.61. This implies that strengthening visible policy actions and incentive programs could enhance public trust and participation in renewable energy initiatives. Studies note that while the Renewable Energy Act provides strong legal backing, implementation and enforcement remain inconsistent (DOE, 2024; CCPI, 2024).

Turning to the respondents' perception of economic benefits, an overall mean of 4.41, interpreted as Very High, suggested that respondents strongly perceive renewable energy as economically beneficial, including through job creation, energy cost stability, and local economic growth. Respondents particularly rated incentives at 4.47 and local government unit promotion at 4.41, both Very High, contributing to the overall mean of 4.41. This finding contrasted with the earlier, comparatively lower rating for policy support in general terms (mean = 3.77), suggesting that when framed specifically as economic benefits, policies were perceived more positively. Similar findings were reported by Rosauro et al. (2025), who emphasized renewable energy's role in stimulating local economies, implying that economic arguments can be strategically used to gain support from investors and local communities, and that emphasizing job creation, cost savings, and investment opportunities can enhance adoption. Literature highlights renewable energy's potential to generate employment and reduce energy import dependence in the Philippines (IRENA, 2023; World Bank, 2024).

With respect to environmental benefits, respondents strongly agreed that renewable energy reduces pollution, protects natural resources, and enhances local climate resilience, yielding an overall mean of 4.43, interpreted as Very High. Respondents rated their agreement that renewable energy can reduce pollution at 4.47, that it protects natural resources at 4.39, and that it enhances local climate resilience at 4.43, all Very High, with the overall mean of

4.43 reinforcing earlier findings on environmental sustainability and reflecting consistency in respondents' environmental values. Items on climate resilience and sustainability solutions scored consistently high, implying that renewable energy initiatives should be integrated into Borongan's long-term climate adaptation and disaster resilience planning, and that programs should highlight renewable energy's role in environmental protection and resilience planning. Research supports renewable energy as a key strategy for emissions mitigation and ecosystem conservation (IRENA, 2023; Santos et al., 2022).

In examining the challenges encountered in renewable energy adoption, an overall mean of 4.06, interpreted as Agree, indicated that high costs were perceived as a major barrier. Respondents agreed that renewable energy systems are too expensive to install at 4.02, that there is a lack of financial support from government or banks at 4.11, that high upfront costs discourage households from using renewable energy at 4.00, that investors are hesitant due to high capital requirements at 3.99, and that maintenance costs are seen as financially burdensome at 4.17, yielding an overall mean of 4.06. High installation costs and lack of financial support were identified as major concerns, consistent with findings in developing regions where financial barriers remain dominant (Egieya et al., 2024), and studies identify cost as the most critical barrier to renewable energy adoption in Southeast Asia (ADB, 2023; DOE, 2024). This implies that public-private partnerships and financial incentives, along with financing schemes, subsidies, and maintenance support, are critical to reducing cost-related barriers.

Regarding the lack of technical expertise and skilled labor, an overall mean of 3.94, interpreted as Agree, indicated that technical capacity is perceived as limited locally. Respondents agreed that there are not enough trained technicians in Borongan at 3.90, that renewable energy equipment is hard to repair locally, that local infrastructure is not ready for renewable energy expansion at 3.85, that technical training programs are limited at 4.03, and that renewable energy systems lack consistent technical support, yielding an overall mean of 3.94. Limited training programs and insufficient technicians were noted as key concerns, suggesting that the lack of trained technicians and technical support may hinder the sustainability of renewable systems. This implies that investment in local training programs and technical education is necessary for long-term system reliability, with literature emphasizing urgent needs for skilled labor in photovoltaic installation and maintenance in the Philippines (TESDA, 2023; IRENA, 2023), pointing to the value of scaling TESDA-led training programs and establishing local service hubs.

With respect to limited government support as a barrier, an overall mean of 3.96, interpreted as Agree, indicated that respondents agreed that limited coordination, slow approvals, and weak enforcement affect renewable energy implementation. Respondents rated their agreement that local policies do not strongly support renewable energy implementation at 3.83, that incentives for renewable energy are insufficient at 3.97, that government agencies lack coordination on renewable energy projects at 3.99, that approvals for renewable energy projects are slow at 3.99, and that policy enforcement is weak at the local level at 4.00, yielding an overall mean of 3.96. Incentives were seen as insufficient at 3.97, and studies confirm that while frameworks exist, execution remains slow (CCPI, 2024; DOE, 2024), implying that improved inter-agency coordination and streamlined approval processes are needed at the local level.

Regarding public misconceptions or resistance, an overall mean of 3.79, interpreted as Agree, indicated that misconceptions and resistance still exist, particularly regarding reliability and cost. Respondents agreed that many residents distrust renewable energy technologies at 3.69, that some believe renewable energy is unreliable at 3.53, that there is fear of high costs associated with renewable energy at 3.92, that some residents prefer traditional electricity sources at 3.92, and that misconceptions hinder community acceptance at 3.91, yielding an

overall mean of 3.79. Fear of high costs and preference for traditional sources were common concerns, supporting the Technology Acceptance Model, which highlights perception and trust as key adoption factors. Research shows that misinformation can erode support, but structured debunking improves acceptance (Cruz & Mendoza, 2023; IRENA, 2023), implying that community education and demonstration projects can help address misinformation and build confidence.

Finally, with respect to geographic or environmental constraints, an overall mean of 4.08, interpreted as Agree, indicated that respondents agreed that geographic factors such as typhoons and weather variability pose challenges. Respondents rated their agreement that typhoons hinder renewable energy installations at 4.13, that geographic location limits renewable energy options, that some renewable energy sites are inaccessible at 4.05, that weather conditions affect energy production at 4.09, and that environmental risks limit renewable energy expansion at 4.12, yielding an overall mean of 4.08. Given Eastern Samar's exposure to extreme weather, this concern was contextually valid, and literature advocates distributed solar-plus-storage solutions for disaster-prone areas (IRENA, 2023; Santos et al., 2022), implying that renewable energy systems in Borongan City must be climate-resilient and disaster-adaptive, adopting typhoon-rated designs and microgrid solutions for resilience.

The relationships between the respondents' perceived benefits and their perceived challenges encountered in renewable energy adoption were examined using Pearson correlation analysis, significant at the 0.05 level, two-tailed. The results showed that economic benefits were significantly and positively correlated with high initial costs and funding constraints ($r = 0.228$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.225$, $p < 0.05$), limited government support ($r = 0.264$, $p < 0.05$), public misconceptions or resistance ($r = 0.182$, $p < 0.05$), and geographic or environmental constraints ($r = 0.267$, $p < 0.05$). Likewise, environmental sustainability was significantly and positively correlated with high initial costs and funding constraints ($r = 0.290$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.338$, $p < 0.05$), limited government support ($r = 0.306$, $p < 0.05$), public misconceptions or resistance ($r = 0.241$, $p < 0.05$), and geographic or environmental constraints ($r = 0.373$, $p < 0.05$). Since all p-values were less than 0.05, the null hypothesis was rejected in each case, confirming that the relationships were statistically significant. These significant positive correlations, ranging from $r = 0.182$ to $r = 0.373$, indicated that higher awareness of economic and environmental sustainability was associated with stronger recognition of challenges, suggesting that greater recognition of benefits coexisted with awareness of barriers rather than obscuring them. Research confirms that informed stakeholders often identify more constraints, which is healthy for planning purposes (Rogers, 2003; Cruz & Mendoza, 2023), implying that awareness programs should include balanced discussions of benefits and challenges to promote informed decision-making, and that benefit messaging should be paired with barrier-removal strategies.

A broader correlational analysis was likewise conducted between the respondents' level of awareness on renewable energy and their perceived challenges encountered in adoption issues. The results showed that awareness of renewable energy was significantly and positively correlated with high initial costs and funding constraints ($r = 0.359$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.345$, $p < 0.05$), limited government support ($r = 0.375$, $p < 0.05$), public misconceptions or resistance ($r = 0.375$, $p < 0.05$), and geographic or environmental constraints ($r = 0.346$, $p < 0.05$). Perception of benefits was significantly and positively correlated with high initial costs and funding constraints ($r = 0.232$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.270$, $p < 0.05$), limited government support ($r = 0.244$, $p < 0.05$), public misconceptions or resistance ($r = 0.234$, $p < 0.05$), and geographic or

environmental constraints ($r = 0.293$, $p < 0.05$). Accessibility and affordability were significantly and positively correlated with high initial costs and funding constraints ($r = 0.197$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.243$, $p < 0.05$), limited government support ($r = 0.325$, $p < 0.05$), public misconceptions or resistance ($r = 0.420$, $p < 0.05$), and geographic or environmental constraints ($r = 0.224$, $p < 0.05$). Environmental sustainability was significantly and positively correlated with high initial costs and funding constraints ($r = 0.252$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.314$, $p < 0.05$), limited government support ($r = 0.260$, $p < 0.05$), public misconceptions or resistance ($r = 0.270$, $p < 0.05$), and geographic or environmental constraints ($r = 0.282$, $p < 0.05$). Policy and government support was significantly and positively correlated with high initial costs and funding constraints ($r = 0.224$, $p < 0.05$), lack of technical expertise or skilled labor ($r = 0.351$, $p < 0.05$), limited government support ($r = 0.331$, $p < 0.05$), public misconceptions or resistance ($r = 0.485$, $p < 0.05$), and geographic or environmental constraints ($r = 0.272$, $p < 0.05$). Since all p-values were less than 0.05, the null hypothesis was rejected across all pairings, indicating a meaningful relationship between awareness and perception on one hand and perceived challenges on the other. All correlations were positive and significant, with the strongest relationship observed between policy and government support and public misconceptions or resistance ($r = 0.485$). This justified the correlational analysis proposed in the study and supported the premise that awareness influences stakeholder outlook. Diffusion theory suggests increasing trialability and observability to convert awareness into adoption (Rogers, 2003; DOE, 2024), implying that adoption strategies should combine education with practical solutions, and that policymakers should engage informed stakeholders in planning processes, as they provide nuanced perspectives.

Lastly, respondents' willingness to adopt renewable energy was assessed, yielding an average mean of 4.45 with a standard deviation of 0.68. Of the 150 respondents, 80 or 53.3% strongly agreed, 60 or 40.0% agreed, 7 or 4.7% were neutral, 3 or 2.0% disagreed, and 0 or 0.0% strongly disagreed with their willingness to adopt renewable energy, for a total of 150 respondents or 100.0%. This high average mean, with over 93% of respondents agreeing or strongly agreeing, indicated a strong willingness to adopt renewable energy, demonstrating readiness and positive social acceptance within the community. Philippine surveys echo this finding, showing that willingness is strong when affordability is addressed (DOE, 2024; Cruz & Mendoza, 2023), implying that focus should shift from awareness to execution, financing, technical support, and resilience standards.

Taken together, the findings of this study demonstrate that the 150 respondents of Borongan City possess a high level of awareness of renewable energy (overall mean of 4.06), a very high perception of its benefits (overall mean of 4.44), high awareness of its accessibility and affordability (overall mean of 3.82), a very high perception of its environmental sustainability (overall mean of 4.37), and a high perception of policy and government support (overall mean of 3.77), alongside very high perceptions of both its economic benefits (overall mean of 4.41) and environmental benefits (overall mean of 4.43). At the same time, respondents identified significant challenges to adoption in terms of cost and funding constraints (overall mean of 4.06), lack of technical expertise or skilled labor (overall mean of 3.94), limited government support (overall mean of 3.96), public misconceptions or resistance (overall mean of 3.79), and geographic or environmental constraints (overall mean of 4.08). The Pearson correlation results confirm statistically significant positive relationships between awareness and perceived benefits on one hand and perceived challenges on the other, with the null hypothesis rejected across all tested pairs at the 0.05 level of significance, ranging from $r = 0.182$ to $r = 0.485$. These results directly address the study's objectives by establishing that residents and stakeholders of Borongan City are simultaneously well informed about, favorably disposed toward, and realistically aware of the barriers to renewable energy adoption, and that

this awareness does not diminish but rather coexists meaningfully with recognition of financial, technical, institutional, social, and geographic constraints. Complemented by the notably strong willingness to adopt renewable energy (mean = 4.45, SD = 0.68), these findings contribute to the field by empirically demonstrating, within the context of a climate-vulnerable, economically disadvantaged provincial city, that public readiness for renewable energy transition already exists and that the principal task ahead lies in addressing structural barriers related to financing, technical capacity, policy enforcement, misconceptions, and climate resilience. Collectively, these results provide the empirical foundation for the Sustainable Energy Program to be presented in the succeeding chapter, which is designed to translate the identified strengths in awareness and perception, together with the identified barriers to adoption, into a responsive, evidence-based program for advancing renewable energy initiatives in Borongan City, Eastern Samar.

## CONCLUSION

The study concluded that renewable energy adoption in Borongan City has a strong foundation because respondents demonstrated high awareness of renewable energy concepts, positive perceptions of its environmental and economic benefits, and very high willingness to adopt renewable energy systems. The findings showed that respondents had a high level of awareness of renewable energy concepts, with a mean of 4.06, although their familiarity with related policies and regulations remained moderate. Their perception of renewable energy benefits was strongly positive, as shown by the mean of 4.44, while their perception of environmental sustainability was also highly favorable, with a mean of 4.37. Economic benefits were likewise highly valued, with a mean of 4.41. These results indicate that the community recognizes renewable energy as a practical and meaningful pathway toward environmental protection, economic improvement, and long-term energy sustainability. Furthermore, willingness to adopt renewable energy was very high, with 93.3 percent of respondents agreeing or strongly agreeing and an overall mean of 4.45, suggesting that Borongan City possesses substantial social readiness for renewable energy implementation.

The demographic and socio-economic profile of the respondents provided important context for interpreting these findings. The study involved 150 respondents, composed of 54.7 percent male respondents, 44.0 percent female respondents, and 1.3 percent who preferred not to disclose their gender. This relatively balanced gender distribution allowed the study to capture diverse perspectives on renewable energy awareness, decision-making, and engagement. In terms of occupation, the largest group consisted of government employees at 40.0 percent, followed by housewives and students at 15.3 percent, professionals at 14.0 percent, service and sales workers at 8.7 percent, skilled agricultural, forestry, and fishery workers at 8.7 percent, clerical support workers at 4.0 percent, managers at 3.3 percent, and craft or technical workers at 2.0 percent. This occupational diversity strengthened the findings by incorporating views from public sector stakeholders, households, students, professionals, workers, and community members. Moreover, 70.0 percent of respondents had lived in Borongan City for more than 10 years, while 14.0 percent had lived there for less than one year, 12.7 percent for 1 to 5 years, and 3.3 percent for 6 to 10 years. The high proportion of long-term residents suggests that many respondents had sufficient familiarity with the city's energy conditions, environmental challenges, and community needs, which made their perceptions of renewable energy adoption more contextually informed.

Despite the strong support for renewable energy, the study also concluded that willingness alone is not sufficient to ensure successful adoption because respondents identified several significant barriers. Accessibility and affordability were rated as agreeable but uneven, with a mean of 3.82, indicating that cost and maintenance remain practical concerns. Policy and government support received a moderate mean of 3.77, suggesting that while support mechanisms exist, they are not yet perceived as fully sufficient or consistently implemented. Among the specific challenges, high initial costs and funding constraints received a total mean of 4.06, showing that respondents viewed the financial burden of renewable energy systems as a major obstacle. The perception that systems are expensive to install, with a mean of 4.02, and the lack of financial support from government or banks, with a mean of 4.11, indicate that households, small businesses, and potential investors may be discouraged by upfront costs, maintenance expenses, and limited financing options.

The findings further revealed that lack of technical expertise and skilled labor remains a significant challenge, with a total mean of 3.94. Respondents agreed that there is a shortage of trained technicians in the locality, with a mean of 3.90, and that renewable energy equipment is difficult to repair, with a mean of 3.91. Limited technical training programs, with a mean of 4.03, and inconsistent technical support, with a mean of 4.00, further demonstrate the need to strengthen local capacity for installation, operation, and maintenance. Limited government support also emerged as a notable concern, with a total mean of 3.96. Respondents perceived local policies as not strongly supportive of renewable energy implementation, with a mean of 3.83, while incentives were viewed as insufficient, with a mean of 3.97, and policy enforcement as weak, with a mean of 4.00. Slow approval processes and poor coordination among agencies, both with means of 3.99, further suggest that local implementation must be improved through stronger governance, clearer policy execution, and better institutional coordination.

Public misconceptions and resistance were identified as moderate but still relevant barriers, with a total mean of 3.79. Respondents expressed concerns related to distrust in renewable energy technologies, with a mean of 3.69, beliefs that renewable energy systems may be unreliable, with a mean of 3.53, fear of high costs, with a mean of 3.92, preference for traditional electricity sources, with a mean of 3.92, and prevailing misconceptions, with a mean of 3.91. These findings show that although overall willingness to adopt renewable energy is high, community education and participatory engagement remain necessary to build trust, correct misinformation, and encourage wider acceptance. The most significant challenge identified was geographic and environmental constraints, which received a total mean of 4.08. Respondents agreed that typhoons hinder renewable energy installations, with a mean of 4.13, geographic location limits available options, with a mean of 4.01, certain sites are difficult to access, with a mean of 4.05, weather conditions affect energy production, with a mean of 4.09, and environmental risks remain a major concern, with a mean of 4.12. These results highlight the vulnerability of Borongan City to natural hazards and underscore the need for renewable energy systems that are resilient, site appropriate, and capable of maintaining functionality during extreme weather events.

The correlation analysis further indicated that greater awareness and stronger perceptions of renewable energy benefits co-occurred with a clearer recognition of adoption challenges. This suggests that informed respondents were not merely optimistic about renewable energy but were also realistic about the barriers that must be addressed. Such a pattern is favorable for participatory planning because it indicates that stakeholders can support renewable energy initiatives while also contributing practical insights regarding cost, technical capacity, policy implementation, social acceptance, and environmental risks. Overall, the findings indicate that Borongan City is ready to pursue renewable energy development, provided that implementation strategies directly address affordability, technical support, policy clarity, community awareness, and disaster resilience.

In light of these conclusions, the study recommends that renewable energy development in Borongan City should be pursued through an integrated approach that combines policy strengthening, financial support, technical capacity building, public education, disaster resilient design, and multi-stakeholder collaboration. Local government units should intensify policy literacy and community awareness through barangay orientations, social media campaigns, and local information drives that explain renewable energy policies, incentives, and benefits. Affordability should be improved through low-interest loans, subsidies, and cooperative based financing models that reduce upfront costs for households and small and medium enterprises. Technical capacity should also be strengthened through partnerships with TESDA and local universities to provide training programs on renewable energy installation, repair, and maintenance, along with the establishment of local service hubs that can provide consistent technical support.

The study further recommends that policy execution be accelerated by streamlining permitting processes, improving coordination among agencies, and publicizing available programs such as the Green Energy Auction to attract investors and developers. Public misconceptions should be addressed through myth busting campaigns, community demonstrations, and practical showcases of renewable energy reliability and cost savings. Given Borongan City's exposure to typhoons, flooding, and other environmental risks, renewable energy systems should adopt typhoon rated designs, hybrid systems, microgrids, and storage technologies to ensure energy continuity during extreme weather events. Finally, local government units, non-government organizations, academic institutions, and the private sector should work together in joint renewable energy projects and pilot initiatives for schools, health centers, and other essential community facilities. Through these combined strategies, Borongan City can transform strong community willingness into actual adoption and advance a renewable energy program that is affordable, technically sustainable, socially accepted, disaster resilient, and aligned with broader goals of clean energy transition and sustainable development.

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