

## إعادة تدوير النفايات باستخدام الطاقة المتجددة

## Recycling Waste Using Renewable Energy

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Mohammed Awad Omar

Supervised by:

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## General Introduction:

Waste management is a critical issue facing our global society today. With the ever-increasing population and consumption patterns, the generation of waste has reached unprecedented levels. Improper waste disposal and management pose significant environmental, social, and economic challenges. To address these challenges, recycling waste has emerged as an essential practice to reduce the burden on landfills, conserve resources, and mitigate environmental impacts. In parallel, the growing demand for clean and sustainable energy has led to an increased focus on renewable energy sources. Renewable energy, derived from sources like sunlight, wind, water, and biomass, offers a promising alternative to traditional fossil fuels.

The aim of this report is to explore the concept of recycling waste using renewable energy in-depth. It examines the interplay between waste management practices and renewable energy technologies, highlighting the benefits, challenges, and opportunities associated with this integrated approach. Through a comprehensive analysis, this report seeks to contribute to the understanding and advancement of sustainable waste management practices and renewable energy utilization.

# 1 Understanding Waste and Renewable Energy:

## 1.1 Definitions and Types of Waste:

To comprehend the concept of recycling waste using renewable energy, it is essential to understand the definitions and various types of waste. Waste refers to any discarded material or substance that is no longer useful or required. It can be categorized into different types, including municipal solid waste (**household waste**), **industrial waste**, **hazardous waste**, **electronic waste** (e-waste), **construction and demolition waste**, and **agricultural waste**. Each type of waste presents unique challenges and requires specific recycling and disposal methods.

Household waste:



Electronic waste (e-waste):



## 1.2 Overview of Renewable Energy Sources:

Renewable energy sources are derived from natural processes that are replenished continually and sustainably. Here is a brief overview of the main renewable energy sources:

- ✓ **Solar Energy:** Solar power harnesses the energy from the sun through solar photovoltaic (PV) panels or solar thermal systems, converting sunlight into electricity or heat.
- ✓ **Wind Energy:** Wind turbines capture the kinetic energy from the wind and convert it into electrical energy. Wind power is a widely used and rapidly growing renewable energy source.
- ✓ **Hydropower:** Hydropower involves harnessing the energy of flowing or falling water to generate electricity. It can be derived from rivers, tides, or ocean currents.
- ✓ **Geothermal Energy:** Geothermal energy utilizes the heat stored beneath the Earth's surface. It is harnessed through geothermal power plants, which convert the heat into electricity.

### 1.3 Advantages and Limitations of Renewable Energy for Waste Recycling:

Renewable energy offers several advantages when applied to the recycling of waste:

- ✓ **Lower Carbon Footprint:** Renewable energy sources have significantly lower greenhouse gas emissions compared to fossil fuels, reducing the overall carbon footprint of waste recycling operations.

- ✓ **Resource Conservation:** Renewable energy reduces the need for conventional energy sources, such as coal or natural gas, preserving valuable fossil fuel reserves for essential applications.
- ✓ **Potential Synergies:** Waste recycling operations often generate organic waste or byproducts that can be used as feedstock for certain renewable energy technologies, such as anaerobic digestion or biomass power plants.

However, there are some limitations and considerations to be aware of when integrating renewable energy into waste recycling:

- ✓ **Intermittency:** Some renewable energy sources, such as solar and wind, are intermittent in nature, dependent on weather conditions. This intermittency may require additional energy storage or backup systems to ensure a consistent power supply for waste recycling operations.
- ✓ **Cost and Infrastructure:** The initial investment costs for renewable energy technologies can be higher compared to conventional energy systems. The availability of suitable

infrastructure and transmission networks may also impact the feasibility of implementing renewable energy solutions.

- ✓ **Regional Variations:** The suitability and availability of different renewable energy sources can vary based on geographical location, climate conditions, and local resources. This may influence the choice of renewable energy technologies for waste recycling on a regional level.

## **2 Waste Recycling Process Using Renewable Energy:**

### **2.1 Waste Collection and Sorting:**

The first crucial step in the waste recycling process is the collection and sorting of waste materials. Effective waste collection systems involve the systematic collection of waste from households, commercial establishments, and industrial sites. The waste is then transported to recycling centers or sorting facilities.

At these facilities, advanced sorting technologies are employed to separate different types of waste materials. Manual sorting and automated processes such as conveyor belts, optical sorting systems, and magnetic separators are utilized to categorize waste into specific streams.

This segregation ensures that recyclable materials are separated from non-recyclable or hazardous waste, enabling efficient recycling and resource recovery.

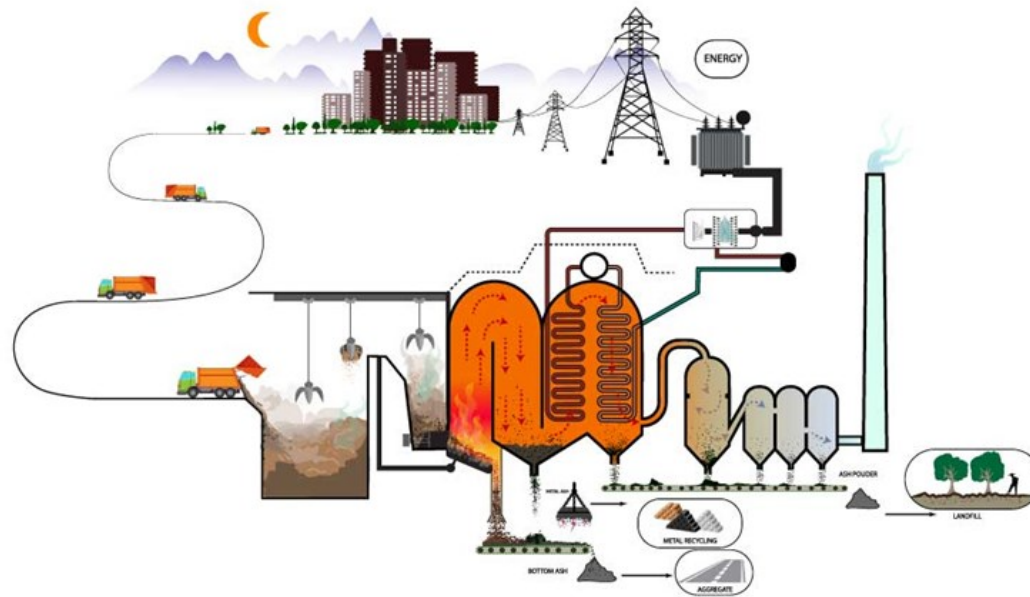
## 2.2 Energy Conversion Technologies for Waste Recycling:

Once waste materials are sorted, energy conversion technologies come into play to process and transform them into usable forms, often utilizing renewable energy sources. Some key technologies include:

- ✓ **Anaerobic Digestion:** Anaerobic digestion is a process that breaks down organic waste in the absence of oxygen, producing biogas (primarily composed of methane) and nutrient-rich digestate. Biogas can be used as a renewable energy source for electricity and heat generation, while digestate can be used as a nutrient-rich fertilizer.
- ✓ **Waste-to-Energy (WtE):** Waste-to-energy technologies involve the combustion or gasification of non-recyclable waste materials to produce heat or electricity. Renewable energy sources such as biomass or biogas can be co-fired with the waste to enhance energy generation and reduce environmental impacts.
- ✓ **Biomass Conversion:** Biomass waste, including agricultural residues and wood waste, can be converted into biofuels, such as biodiesel or biogasoline, through various processes like pyrolysis or fermentation. These biofuels can serve as renewable alternatives to fossil fuels.

- ✓ **Solar and Wind Power:** Renewable energy sources like solar and wind power can be directly utilized to power waste recycling operations. Photovoltaic panels or wind turbines can be installed on-site to generate electricity, reducing reliance on the grid and fossil fuel-based energy.

Here is a picture of the waste recycling process.



## 2.3 Examples of Waste Recycling Projects and Initiatives Using Renewable

### Energy:

Numerous projects and initiatives worldwide showcase the successful integration of waste recycling and renewable energy. Here are a few examples:

- ✓ **Waste-to-Energy Plants:** Waste-to-energy plants, such as the Klemetsrud Waste-to-Energy Plant in Norway and the Bykilian Plant in Germany, utilize municipal solid waste as fuel to generate heat and electricity, reducing landfill use and producing renewable energy.
- ✓ **Anaerobic Digestion Facilities:** The Centralized Anaerobic Digestion Facility in Vancouver, Canada, processes organic waste from the city's food and yard waste collection program, generating biogas used to produce renewable natural gas for transportation.
- ✓ **Solar-Powered Recycling Centers:** Solar-powered recycling centers, like the Island Recovery Integrated Recycling Center in Hawaii, utilize solar panels to generate electricity for sorting, processing, and storing recyclable materials.

- ✓ **Biogas from Landfill Sites:** Landfill gas recovery projects, such as the Puente Hills

Landfill in California, capture methane emitted from decomposing waste and convert it into renewable energy for power generation.

### 3 Environmental and Economic Benefits of Recycling Waste Using Renewable Energy:

#### 3.1 Reduction of Greenhouse Gas Emissions and Pollution:

Recycling waste using renewable energy offers several environmental benefits, including a significant reduction in greenhouse gas emissions and pollution:

- ✓ **Greenhouse Gas Reduction:** By diverting waste from landfills and utilizing renewable energy sources, the recycling process emits fewer greenhouse gases compared to traditional waste disposal methods like landfilling or incineration. This contributes to mitigating climate change and reducing carbon footprints.
- ✓ **Air and Water Pollution Reduction:** Recycling waste minimizes the release of harmful pollutants into the air and water. Landfills and incinerators can produce toxic gases,

leachate, and ash that can contaminate the environment. Utilizing renewable energy technologies reduces these pollutants, leading to improved air and water quality.

### 3.2 Conservation of Natural Resources and Energy:

Recycling waste using renewable energy helps conserve valuable natural resources and reduces energy consumption:

Resource Conservation: Recycling waste reduces the demand for raw materials, conserving natural resources such as timber, minerals, and metals. By reusing and recycling materials, we can extend their lifespan and minimize the need for extracting and processing virgin resources.

Energy Savings: Recycling waste requires less energy compared to extracting and manufacturing materials from scratch. Utilizing renewable energy sources further reduces the reliance on fossil fuels, leading to energy savings and a more sustainable energy mix.

## 4 Case Studies and Best Practices:

### 4.1 Examples of Countries and Regions Successfully Implementing Waste

#### Recycling Using Renewable Energy:

Several countries and regions have successfully implemented waste recycling initiatives using renewable energy. Here are a few notable examples:

- ✓ **Sweden:** Sweden is renowned for its efficient waste management system. The country has achieved a recycling rate of over 99% for household waste. Waste-to-energy plants, equipped with advanced air pollution control technologies, generate heat and electricity from non-recyclable waste.
- ✓ **Germany:** Germany has made significant strides in waste recycling using renewable energy. The country has implemented an extensive waste sorting and recycling infrastructure, coupled with numerous biogas and biomass plants. These facilities convert organic waste into biogas, providing renewable energy for heat and power generation.
- ✓ **Singapore:** Despite limited land availability, Singapore has developed a robust waste management system. The country focuses on waste-to-energy technologies, such as the

Tuas Nexus Integrated Waste Management Facility, which converts municipal solid waste into electricity and produces industrial-grade steam.

- ✓ **California, United States:** California has adopted innovative approaches to waste recycling using renewable energy. The state emphasizes anaerobic digestion facilities, such as the East Bay Municipal Utility District's wastewater treatment plant, which converts organic waste into biogas for electricity generation.

#### 4.2 Innovative Initiatives and Emerging Technologies in Waste Recycling:

The field of waste recycling continues to witness innovative initiatives and emerging technologies. Here are a few notable examples:

- ✓ **Advanced Sorting Technologies:** Advanced sorting technologies, such as robotic systems and artificial intelligence, are revolutionizing waste recycling. These technologies can identify and separate recyclable materials more accurately, enhancing the efficiency and quality of recycling processes.
- ✓ **Chemical Recycling:** Chemical recycling, also known as feedstock recycling, aims to convert waste plastics back into their original chemical building blocks or fuels. This

emerging technology offers a potential solution for recycling difficult-to-recycle plastics, reducing plastic waste and enabling resource recovery.

- ✓ **Circular Economy Models:** Several organizations and communities are implementing circular economy models to achieve more sustainable waste management. These models emphasize waste prevention, product design for recyclability, and the establishment of closed-loop systems that promote resource conservation and minimize waste generation.



**RESEARCH ON**

**THE IMPACT OF RECYCLING WASTE USING RENEWABLE ENERGY ON  
ENVIRONMENTAL SUSTAINABILITY IN WORLD**

**QUESTIONNAIRE BOOKLET**

Master's Candidate  
**Mohammed Mohajer  
Mohammed Omar**

**Dear Respondent,**

I am a master's candidate (Project Management) at The Midocean University. Currently, I  
to examine the This study aims am conducting a study titled " **The impact of Recycling  
Waste using Renewable Energy on Environmental Sustainability "**

I would like to request your cooperation to answer this questionnaire. Any information obtained  
will be kept confidential and only used for academic purposes. Your cooperation is highly  
appreciated.

Thank you in advance for agreeing to participate in this study. If you have any questions, please  
do not hesitate to contact my honorable supervisor, **Associate Professor Dr Waleed Suliman,**  
or myself

**Mohammed Mohajer, Mohammed Omar** (Master Candidates).

**Supervisor**  
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MOHMMDMAR18@GMAIL.COM  
Mohajerm11@gmail.com  
**Phone #**

**Section A:****A: Demographic Characteristics**

Please tick (✓) the appropriate choice

1- **Gender:** Male ☐ Female ☐

2- **Age:** 20 - 30 years old ☐ 31 - 39 years old ☐  
40 - 49 years old ☐ 50 years old and over ☐

3- **Years of Experience:** 5 years & less ☐ 5-10 years ☐  
11-20 years ☐ 21 years & above ☐

**Section B:**

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

| The following set of statements assesses the Integration of Recycling Waste with Renewable Energy: Please mark according to your level of agreement. |                                                                                                          |                           |               |              |            |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| Section A: Recycling waste                                                                                                                           |                                                                                                          |                           |               |              |            |                        |
| Item No                                                                                                                                              |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| ASTI1                                                                                                                                                | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            |                        |
| ASTI2                                                                                                                                                | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            |                        |
| II. Waste Recycling Process                                                                                                                          |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| ASRII1                                                                                                                                               | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               |              |            |                        |
| ASRII2                                                                                                                                               | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              |            |                        |

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRII1                                   | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         |       |                |
| ASRII2                                   | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         |       |                |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASAI1                                    | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          |         |       |                |
| ASAI2                                    | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          |         |       |                |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         |       |                |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         |       |                |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   |          |         |       |                |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          |         |       |                |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRII1                                   | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         |       |                |

|                                               |                                                                                                                                                                   |                   |          |         |       |                |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| BSRII2                                        | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                   |          |         |       |                |
| <b>III. Environmental and Economic Impact</b> |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BMIII1                                        | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                   |          |         |       |                |
| BMIII2                                        | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                   |          |         |       |                |
| <b>IV. Case Studies and Innovations</b>       |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BEIV1                                         | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                   |          |         |       |                |
| BEIV2                                         | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                   |          |         |       |                |
| <b>V. Future Trends and Challenges</b>        |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSSV1                                         | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                   |          |         |       |                |
| BSSV2                                         | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                   |          |         |       |                |

### SECTION C: OPEN-ENDED QUESTIONS

**C1) Please provide ANY other comments regarding this study.**

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

**C2) Please provide any comments regarding any aspect that appears to be LACKING in this study.**

While the study provides a comprehensive overview of recycling waste using renewable energy, I feel that it could delve deeper into the economic feasibility and potential barriers of implementing such projects on a larger scale. Additionally, exploring specific case studies that highlight both successful and unsuccessful attempts at integrating recycling and renewable energy could provide valuable insights into practical challenges and lessons learned. Including real-world examples and cost analyses might enhance the practical applicability of the research findings and provide a more well-rounded perspective on the topic

**Gratitude:**

We appreciate you for sparing your time to fill out the survey. Your involvement means a lot to us and we highly value it. The information you shared is significant to our analysis and will enable us to make improvements in our bank's performance.

Once again, we are very grateful for your contribution.

Sincerely  
Mohammed Mohajer  
Mohammed Omar  
Midocean University

**Reviewed by:**

**Ahmad Mansour  
Procurement specialist**

**Comment:  
Clear and reasonable survey  
No additional details need to be added.**

## Conclusion

In conclusion, this report highlights the importance of recycling waste using renewable energy sources. By integrating effective recycling practices with renewable energy technologies, it is possible to reduce greenhouse gas emissions, preserve natural resources, create new economic opportunities, and improve air and water quality.

However, there are challenges to consider, such as technical and logistical complexities, high initial costs, and public awareness. Overcoming these challenges requires collaboration among governments, industries, and civil society to promote waste recycling using renewable energy

In conclusion, combining waste recycling with the use of renewable energy is a promising approach for a sustainable future. It can reduce environmental impacts, promote resource conservation, and facilitate the transition to a greener and circular economy. To fully realize these benefits, continued investment in research, development, and implementation of innovative waste recycling and renewable energy technologies is essential.

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BBVA. (n.d.). 5 Best Recycling Practices from Around the World. Retrieved from <https://www.bbva.com/en/sustainability/5-best-recycling-practices-from-around-the-world/>

### Section A:

#### A: Demographic Characteristics

Please tick (✓) the appropriate choice

1- Gender: Male ☒ Female ☐

2- Age: 20 - 30 years old ☒ 31 - 39 years old ☐  
40 - 49 years old ☐ 50 years old and over ☐

3- Years of Experience: 5 years & less ☒ 5-10 years ☐  
11-20 years ☐ 21 years & above ☐

### Section B:

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

| The following set of statements assesses the Integration of Recycling Waste with Renewable Energy: Please mark according to your level of agreement. |                                                                                                          |                           |               |              |            |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| Section A: Recycling waste                                                                                                                           |                                                                                                          |                           |               |              |            |                        |
| Item No                                                                                                                                              |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| <b>I. Understanding Waste and Recycling</b>                                                                                                          |                                                                                                          |                           |               |              |            |                        |
| ASTI1                                                                                                                                                | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            | ✓                      |
| ASTI2                                                                                                                                                | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            | ✓                      |
| <b>II. Waste Recycling Process</b>                                                                                                                   |                                                                                                          |                           |               |              |            |                        |
| ASRII1                                                                                                                                               | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               | ✓            |            |                        |
| ASRII2                                                                                                                                               | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              | ✓          |                        |

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRII1                                   | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         | ✓     |                |
| ASRII2                                   | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         | ✓     |                |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASAI1                                    | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          | ✓       |       |                |
| ASAI2                                    | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          |         | ✓     |                |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         | ✓     |                |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         | ✓     |                |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   |          |         |       | ✓              |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          |         |       | ✓              |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRI1                                    | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         | ✓     |                |

|                                        |                                                                                                                                                                   |                   |          |         |       |                |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| BSRII2                                 | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                   |          |         | ✓     |                |
| III. Environmental and Economic Impact |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BMIII1                                 | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                   |          |         |       | ✓              |
| BMIII2                                 | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                   |          |         | ✓     |                |
| IV. Case Studies and Innovations       |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BEIV1                                  | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                   |          |         |       | ✓              |
| BEIV2                                  | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                   |          |         |       | ✓              |
| V. Future Trends and Challenges        |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSSV1                                  | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                   |          |         | ✓     |                |
| BSSV2                                  | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                   |          |         |       | ✓              |

### SECTION C: OPEN-ENDED QUESTIONS

C1) Please provide ANY other comments regarding this study.

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

**Section A:**

**A: Demographic Characteristics**

Please tick (✓) the appropriate choice

- 1- Gender: Male ☒ Female ☐
- 2- Age: 20 - 30 years old ☒ 31 - 39 years old ☐  
40 - 49 years old ☐ 50 years old and over ☐
- 3- Years of Experience: 5 years & less ☒ 5-10 years ☐  
11-20 years ☐ 21 years & above ☐

**Section B:**

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

| Following set of statements assesses the Integration of Recycling and Renewable Energy. Please mark according to your level of agreement |                                                                                                          |                           |               |              |            |                        |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| Section A: Recycling waste                                                                                                               |                                                                                                          |                           |               |              |            |                        |
| Item No                                                                                                                                  |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| <b>I. Understanding Waste and Recycling</b>                                                                                              |                                                                                                          |                           |               |              |            |                        |
| AST11                                                                                                                                    | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            | ✓                      |
| AST12                                                                                                                                    | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            | ✓                      |
| <b>II. Waste Recycling Process</b>                                                                                                       |                                                                                                          |                           |               |              |            |                        |
| ASRI11                                                                                                                                   | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               |              | ✓          |                        |
| ASRI12                                                                                                                                   | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              | ✓          |                        |

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRIII1                                  | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         | ✓     |                |
| ASRIII2                                  | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         |       | ✓              |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASAIIV1                                  | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          | ✓       |       |                |
| ASAIIV2                                  | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          |         | ✓     |                |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         |       | ✓              |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         | ✓     |                |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   |          |         | ✓     |                |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          | ✓       |       |                |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRII1                                   | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         | ✓     |                |

|                                               |                                                                                                                                                                   |                   |          |         |       |                |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| BSRII2                                        | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                   |          |         |       | ✓              |
| <b>III. Environmental and Economic Impact</b> |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BMIII1                                        | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                   |          |         |       | ✓              |
| BMIII2                                        | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                   |          | ✓       |       |                |
| <b>IV. Case Studies and Innovations</b>       |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BEIV1                                         | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                   |          |         | ✓     |                |
| BEIV2                                         | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                   |          |         |       | ✓              |
| <b>V. Future Trends and Challenges</b>        |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                               |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSSV1                                         | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                   |          |         | ✓     |                |
| BSSV2                                         | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                   |          |         | ✓     |                |

#### SECTION C: OPEN-ENDED QUESTIONS

C1) Please provide ANY other comments regarding this study.

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

### Section A:

#### A: Demographic Characteristics

Please tick (✓) the appropriate choice

1- Gender: Male ☒ Female ☐

2- Age: 20 - 30 years old ☐ 31 - 39 years old ☒  
40 - 49 years old ☐ 50 years old and over ☐

3- Years of Experience: 5 years & less ☐ 5-10 years ☒  
11-20 years ☐ 21 years & above ☐

### Section B:

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

| Section A: Recycling waste           |                                                                                                          |                           |               |              |            |                        |
|--------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| Item No                              |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Neutral | 4<br>Agree | 5<br>Strongly<br>Agree |
| I. Understanding Waste and Recycling |                                                                                                          |                           |               |              |            |                        |
| ASTI1                                | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            | ✓                      |
| ASTI2                                | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            | ✓                      |
| II. Waste Recycling Process          |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Neutral | 4<br>Agree | 5<br>Strongly<br>Agree |
| ASRII1                               | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               |              |            | ✓                      |
| ASRII2                               | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              |            | ✓                      |

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRIII1                                  | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         |       | ✓              |
| ASRIII2                                  | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         |       | ✓              |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASAIV1                                   | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          | ✓       |       |                |
| ASAIV2                                   | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          |         |       | ✓              |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         | ✓     |                |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         | ✓     |                |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   |          |         | ✓     |                |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          |         | ✓     |                |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRIII1                                  | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         |       | ✓              |

|                                               |                                                                                                                                                                   |                        |               |              |            |                     |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|--------------|------------|---------------------|
| BSRII2                                        | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                        | ✓             |              |            |                     |
| <b>III. Environmental and Economic Impact</b> |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BMIII1                                        | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                        |               |              | ✓          |                     |
| BMIII2                                        | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                        |               | ✓            |            |                     |
| <b>IV. Case Studies and Innovations</b>       |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BEIV1                                         | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                        |               |              |            | ✓                   |
| BEIV2                                         | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                        |               |              |            | ✓                   |
| <b>V. Future Trends and Challenges</b>        |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BSSV1                                         | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                        |               | ✓            |            |                     |
| BSSV2                                         | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                        |               |              | ✓          |                     |

#### SECTION C: OPEN-ENDED QUESTIONS

C1) Please provide ANY other comments regarding this study.

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

### Section A:

#### A: Demographic Characteristics

Please tick (✓) the appropriate choice

- 1- Gender: Male ☐ Female ☒
- 2- Age: 20 - 30 years old ☐ 31 - 39 years old ☒  
 40 - 49 years old ☐ 50 years old and over ☐
- 3- Years of Experience: 5 years & less ☐ 5-10 years ☒  
 11-20 years ☐ 21 years & above ☐

### Section B:

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

The following set of statements assesses the Integration of Recycling with Renewable Energy. Please mark according to your level of agreement.

**Section A: Recycling waste**

| Item No                                     |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| <b>I. Understanding Waste and Recycling</b> |                                                                                                          |                           |               |              |            |                        |
| AST11                                       | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            | ✓                      |
| AST12                                       | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            | ✓                      |
| <b>II. Waste Recycling Process</b>          |                                                                                                          |                           |               |              |            |                        |
| ASRJ11                                      | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               |              |            | ✓                      |
| ASRJ12                                      | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              |            | ✓                      |

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRII1                                   | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         |       | ✓              |
| ASRII2                                   | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         |       | ✓              |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASAI1                                    | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          |         | ✓     |                |
| ASAI2                                    | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          |         |       | ✓              |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         | ✓     |                |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         | ✓     |                |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   |          |         | ✓     |                |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          |         |       | ✓              |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRII1                                   | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         | ✓     |                |

|                                        |                                                                                                                                                                   |                   |          |         |       |                |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| BSRII2                                 | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                   | ✓        |         |       |                |
| III. Environmental and Economic Impact |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BMIII1                                 | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                   |          |         | ✓     |                |
| BMIII2                                 | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                   |          | ✓       |       |                |
| IV. Case Studies and Innovations       |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BEIV1                                  | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                   |          |         |       | ✓              |
| BEIV2                                  | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                   |          |         | ✓     |                |
| V. Future Trends and Challenges        |                                                                                                                                                                   | 1                 | 2        | 3       | 4     | 5              |
|                                        |                                                                                                                                                                   | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSSV1                                  | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                   |          |         | ✓     |                |
| BSSV2                                  | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                   |          |         | ✓     |                |

#### SECTION C: OPEN-ENDED QUESTIONS

C1) Please provide ANY other comments regarding this study.

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

### Section A:

#### A: Demographic Characteristics

Please tick (✓) the appropriate choice

- 1- Gender: Male ☐ Female ☒
- 2- Age: 20 - 30 years old ☐ 31 - 39 years old ☐  
40 - 49 years old ☒ 50 years old and over ☐
- 3- Years of Experience: 5 years & less ☐ 5-10 years ☐  
11-20 years ☒ 21 years & above ☐

### Section B:

Please indicate your degree of agreement or disagreement with the following statements, so please sign (✓) for the choice that reflects your opinion by choosing one of the five alternatives.

| The following set of statements assesses the Integration of Recycling Waste with Renewable Energy: Please mark according to your level of agreement. |                                                                                                          |                           |               |              |            |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------|------------|------------------------|
| Section A: Recycling waste                                                                                                                           |                                                                                                          |                           |               |              |            |                        |
| Item No                                                                                                                                              |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| AST11                                                                                                                                                | The classification of waste into different types, such as organic, plastic, paper, and electronic waste. |                           |               |              |            | ✓                      |
| AST12                                                                                                                                                | The significance of proper waste management and its potential impact on the environment.                 |                           |               |              |            | ✓                      |
| II. Waste Recycling Process                                                                                                                          |                                                                                                          |                           |               |              |            |                        |
|                                                                                                                                                      |                                                                                                          | 1<br>Strongly<br>Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly<br>Agree |
| ASRI11                                                                                                                                               | Being aware of the waste collection and sorting methods that are essential for effective recycling.      |                           |               |              |            | ✓                      |
| ASRI12                                                                                                                                               | Understanding the different energy conversion technologies used in waste recycling processes.            |                           |               |              | ✓          |                        |

|                                               |                                                                                                                                                                   |                        |               |              |            |                     |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|--------------|------------|---------------------|
| BSRII2                                        | Comprehending the process of converting biomass into renewable energy and its applications in both residential and industrial settings.                           |                        |               | ✓            |            |                     |
| <b>III. Environmental and Economic Impact</b> |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BMIII1                                        | Being aware of the potential reduction in carbon emissions associated with transitioning from fossil fuels to renewable energy sources.                           |                        |               |              | ✓          |                     |
| BMIII2                                        | Identification of the potential economic advantages of investing in renewable energy technologies for long-term energy sustainability.                            |                        |               | ✓            |            |                     |
| <b>IV. Case Studies and Innovations</b>       |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BEIV1                                         | The ability to identify examples of cities or communities that have successfully transitioned to renewable energy systems.                                        |                        |               |              | ✓          |                     |
| BEIV2                                         | Having knowledge of innovative approaches, such as energy storage solutions, that enhance the reliability of renewable energy sources.                            |                        |               |              |            | ✓                   |
| <b>V. Future Trends and Challenges</b>        |                                                                                                                                                                   | 1<br>Strongly Disagree | 2<br>Disagree | 3<br>Natural | 4<br>Agree | 5<br>Strongly Agree |
| BSSV1                                         | The likelihood of renewable energy becoming the dominant source of power in the next few decades.                                                                 |                        |               |              | ✓          |                     |
| BSSV2                                         | I would like to know your opinion on the necessary technological advancements or policy changes to accelerate the adoption of renewable energy on a global scale. |                        |               |              | ✓          |                     |

#### SECTION C: OPEN-ENDED QUESTIONS

C1) Please provide ANY other comments regarding this study.

As an advocate for sustainable practices, I believe the concept of recycling waste using renewable energy is a crucial step towards a greener future. Integrating these two elements not only addresses the pressing issue of waste management but also contributes significantly to our efforts in achieving cleaner and more sustainable energy sources. This study sheds light on the potential benefits and challenges of this approach, and I'm excited to see how it can revolutionize waste management practices while advancing our renewable energy transition.

| III. Environmental and Economic Benefits |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASRIII1                                  | Recognize the role of recycling waste in reducing greenhouse gas emissions and pollution                                      |                   |          |         |       | ✓              |
| ASRIII2                                  | Being aware of the importance of conserving natural resources and energy through waste recycling.                             |                   |          |         | ✓     |                |
| IV. Case Studies and Best Practices      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASATV1                                   | Identification of countries or regions that have successfully implemented waste recycling initiatives using renewable energy. |                   |          | ✓       |       |                |
| ASATV2                                   | Shouldn't be familiar with innovative waste recycling projects that have utilized emerging technologies.                      |                   |          | ✓       |       |                |
| V. Future Prospects and Challenges       |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| ASEV1                                    | Being optimistic about the growth of waste recycling practices that integrate renewable energy in the coming years.           |                   |          |         |       | ✓              |
| ASEV2                                    | I am hopeful about the growth of waste recycling practices that incorporate renewable energy in the coming years.             |                   |          |         |       | ✓              |
| Section B: Renewable Energy              |                                                                                                                               |                   |          |         |       |                |
| Item No                                  | I. Understanding Renewable Energy                                                                                             | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSAI1                                    | Understanding the processes by which solar energy is converted into electricity for various uses.                             |                   | ✓        |         |       |                |
| BSAI2                                    | Don't be aware of the different methods of harnessing wind energy and its potential as a renewable power source.              |                   |          | ✓       |       |                |
| II. Renewable Energy Implementation      |                                                                                                                               | 1                 | 2        | 3       | 4     | 5              |
|                                          |                                                                                                                               | Strongly Disagree | Disagree | Natural | Agree | Strongly Agree |
| BSRII1                                   | I am considering the possibility of installing solar panels or wind turbines to supplement my energy consumption.             |                   |          |         | ✓     |                |