

# **CHAPTER I**

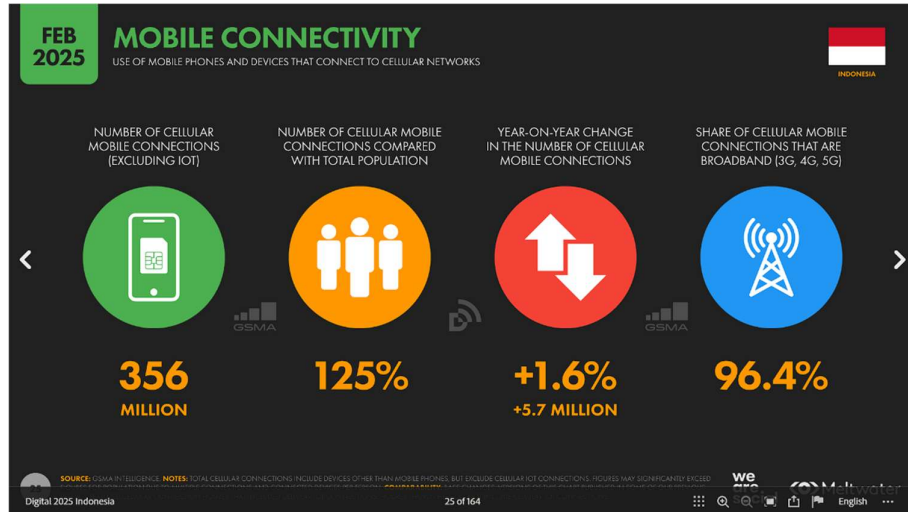
## **INTRODUCTION**

### 1.1. Research Background

Climate change is a term used to describe a long-term alteration in the Earth's climate system. This change can be recognized through shifts in the average conditions and patterns of weather over a prolonged period, usually lasting for decades or even longer according to Masson-Delmotte et al. (2019). These shifts should be a naturally occurring activities, such as variations in the sun's behavior and extensive volcanic activity. Since intervening human activities that dated back since the 1800s, we have been the main driver of climate change. Doing destructive activities that destroys the earth's landscape and ecosystems (i.e. the use of fossil fuels, including coal, petroleum, and gas, through burning processes).

In recent years, growing awareness of climate-related crises and ecological deterioration has encouraged industries and companies across various sectors to adopt a more sustainable business practice. Global frameworks, such as the United Nations' Sustainable Development Goals (SDGs), emphasize the importance of corporate responsibility in environmental protection, urging organizations to align their operations with sustainability objectives. Amongst various sectors contributing significantly to energy use and carbon emissions, the telecommunications

industry has come under increasing scrutiny due to its extensive digital infrastructure and rapidly growing consumer base.

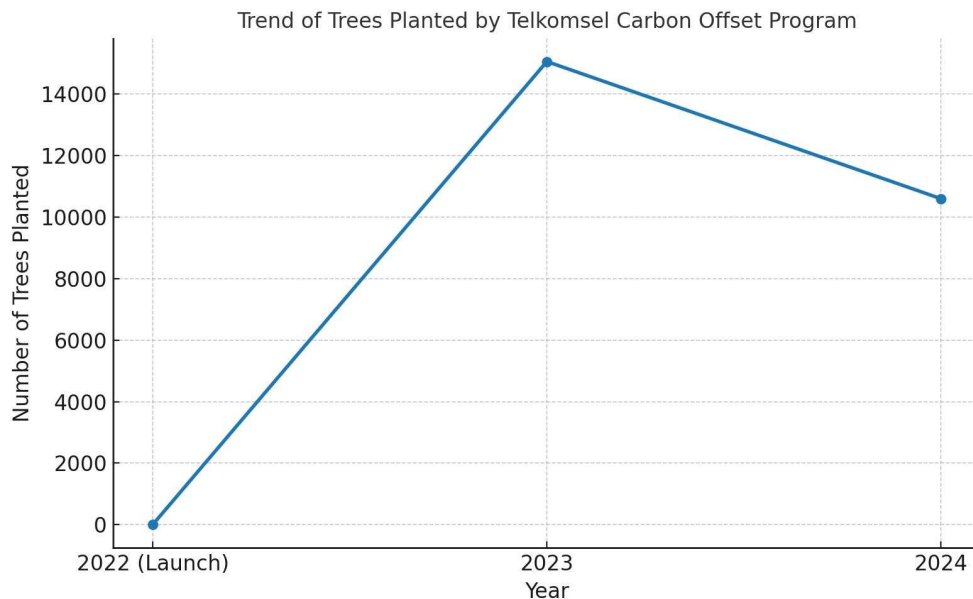


**Figure 1.1 Indonesia Mobile Connectivity**

Source: GSMA Intelligence, Digital Report 2025: Indonesia

Indonesia itself, uses over 356 million mobile connections and a mobile penetration rate of more than 125%, making them as one of the largest digital markets in Southeast Asia. Telekomunikasi Seluler, or in short Telkomsel is one of the nation's largest mobile network operators, with a market of approximately 55% which holds a significant influence and responsibility in this climate change conversation. At this scale, Telkomsel's operational footprint consisting of network infrastructure to millions of daily data transactions, carries a substantial environmental cost. This positions the company not merely as a participant in Indonesia's digital economy, but as a major stakeholder in its environmental future. The sheer size of Telkomsel's customer base means that even small behavioral shifts among its users, if systematically encouraged, could produce meaningful environmental outcomes at scale.

Responding to this responsibility, Telkomsel launched a Carbon Offset Program in 2022 as part of its broader *Jaga Bumi* sustainability strategy. The program was designed to compensate for greenhouse gas emissions by funding environmental projects such as mangrove reforestation and wetland restoration, initiatives that align with Indonesia's national commitments under the Paris Agreement and the SDGs. Crucially, the program was built around an accessible consumer mechanism: customers are invited to convert their accumulated Telkomsel POIN (the company's existing loyalty reward currency) into environmental contributions. This design was intended to lower the barrier to participation by embedding green action within an already familiar transactional behavior.



**Figure 1.2 Mangrove Trees Planted by Telkomsel**  
Source: Telkomsel Sustainability Report (2023)

Given the size and growth trajectory of Telkomsel's customer base, the program's participation rate should, in theory, reflect a correspondingly high level of engagement. A growing market translates to a growing pool of POIN-eligible customers, each accumulating points through routine service usage. If even a fraction of this base were actively converting their POIN toward environmental goals, the program's impact would be considerable. However, Telkomsel's official sustainability reporting has focused primarily on output metrics such as the number of mangroves planted, with no transparent disclosure of the number of customers who have actually participated. This absence of participation data, combined with the program's limited visibility within the MyTelkomsel application and the lack of proactive customer communication about the POIN conversion option, suggests that actual participation remains far below what the customer base would theoretically allow.

### Among Indonesia's consumers who are very familiar with various eco-labels, how do different age groups compare?

Q: How familiar are you with the following eco-labels? (showing % adults in Indonesia who indicate "Very familiar, I know exactly what this eco-label means")



YouGov

YouGov RealTime Omnibus: Apr 2022 • Embed

**Figure 1.3 Indonesian Consumers Familiarity with Various Eco-Labels**

Source: YouGov Data (2022)

At the same time, environmental awareness among Indonesian consumers is growing. A survey held by YouGov data in April 2022 found that 66% of Indonesians aged 18–34 is familiar with the “*Ramah Lingkungan*” eco-label. These younger age groups also consistently report higher recognition levels than their older cohorts. This demographic is crucial since it represents a substantial portion of Telkomsel’s digital customer base, which are mostly Indonesians in their youth.

The intersection of a large and growing customer base, an underutilized environmental program, and rising green consumerism raises a vital question for this research: what factors drive customer participation in Telkomsel's Carbon Offset Program, and what role do green trust, environmental awareness, and customer loyalty play in that process? Understanding these dynamics is essential not only for evaluating the program's current effectiveness, but for identifying the strategic levers through which Telkomsel and similar telecommunications companies can convert latent environmental concern into active, sustained participation.

In an effort to do so, examining variables surrounding its initiative is crucial to help understanding this phenomenon. Customer participation as one, refers to the extent to which customers engage in Telkomsel’s carbon efforts. This is rooted in the concept of *value co-creation*, where customers are seen not as passive recipients but as active collaborators in generating social and environmental value in accord of Prahalad & Ramaswamy (2004). Customer loyalty as second variable is often

conceptualized as a sustained, committed relationship between customer and brand that extends beyond transactional interactions and incorporates emotional and ethical dimensions Aaker (1991); Oliver (1999). Environmental awareness is defined as a consumer's level of knowledge, concern, and behavioral intention regarding ecological issues, which may influence how they perceive and respond to sustainability initiatives as claimed by Liobikiene & Poškus (2019). And lastly, green trust as the fourth variable has been described as an integral model to enhance green purchase intentions amongst four novel constructs; green perceived value, green perceived risk, green trust, and green purchase intentions as stated by Y. S. Chen & Chang (2012). The authors define it as a willingness to depend on an object based of either belief or expectation about its environmental performance.

Although several studies have examined the relationship between green initiatives and consumer behavior such as Y. S. Chen & Chang (2013); Yadav & Pathak (2017), few have specifically addressed how customer participation in carbon offset programs affects loyalty in the context of telecommunications. Furthermore, there is limited empirical investigation into whether customer loyalty mediates this relationship, particularly within the Indonesian market. As such, addressing an important research gap by analyzing the interplay of green trust, environmental awareness, customer loyalty and customer participation using Telkomsel as a case study will be proven helpful.

## 1.2. Research Problem

Despite growing corporate emphasis on green trust and environmental responsibility, the effectiveness of customer engagement in sustainability programs particularly in fostering brand loyalty and enhance participation remains underexplored. Telkomsel's Carbon Offset Program offers a unique case in which customers are invited to participate in green initiatives by converting their loyalty points into environmental contributions. However, the extent to which such participation influences customer loyalty, and whether this relationship is contingent upon the individual's level of green trust and environmental awareness, is not yet thoroughly established. Thus, the research problem can be formulated as follows:

1. To what extent does green trust in Telkomsel's Carbon Offset Program influence customer loyalty?
2. To what extent does environmental awareness in Telkomsel's Carbon Offset Program influence customer loyalty?
3. To what extent does customer loyalty mediates the relationship between green trust, environmental awareness, and customer participation?

### 1.3. Research Objectives

#### 1.3.1. General Objectives

This research aims to empirically examine the mediating role of customer loyalty in the relationship between green trust, environmental awareness, and customer participation in Telkomsel's Carbon Offset Program.

#### 1.3.2. Special Objectives

The special objectives for this study are as follows:

- To analyze the effect of green trust in Telkomsel's Carbon Offset Program on customer loyalty.
- To analyze the effect of environmental awareness in Telkomsel's Carbon Offset Program on customer loyalty.
- To examine whether customer loyalty significantly mediates the relationship between green trust, environmental awareness, and customer participation.

### 1.4. Research Benefits

The findings of this research are expected to provide contributions in the following areas such as:

#### 1.4.1. Theoretical Benefits

Academically, this research enriches the academic literature on green marketing and consumer behavior by investigating the role of customer loyalty in environmental programs and its impact on participation. It also advances understanding of customer loyalty as

a mediating variable in the relationship between green trust, environmental awareness and participation, particularly in the Indonesian telecommunications context.

#### 1.4.2. Practical Benefits

Practically, this research may guide Telkomsel and other similar companies in designing a more effective sustainability programs that encourage customer engagement and strengthen customer loyalty. Insights from this research will help marketers develop targeted communication strategies that consider customers' environmental awareness levels. Socially, by highlighting the importance of green purchase in driving participation, this study supports efforts to promote sustainable consumer behavior. Increased public involvement in carbon offset programs can contribute to broader environmental conservation goals, thus benefiting society at large.

#### 1.5. Theoretical Study

##### 1.5.1. Green Trust Theory

Y. S. Chen & Chang (2012) introduced the concept of Green Trust as part of an integrated model examining the antecedents of green purchase intention. They define Green Trust as the willingness to depend on a product, service, or brand based on the belief or expectation arising from its environmental credibility, benevolence, and capability. Critically, Green Trust is distinguished from general

brand trust by its specifically environmental referent: it is built or eroded through a company's demonstrated commitment to sustainability, the perceived authenticity of its green claims, and its track record in environmental performance.

#### 1.5.2. Environmental Awareness Theory

Stern (2000) developed the Value-Belief-Norm (VBN) theory to explain how values influence pro-environmental behavior through a chain of beliefs and moral norms. According to this theory, individuals who hold strong biospheric values and concern for the environment beyond personal gain, developing beliefs about the consequences of environmental degradation and a sense of personal responsibility to act. This internalized sense of obligation ultimately produces pro-environmental behavioral intentions and actions. This awareness may strengthen the relationship between participation in environmental programs and loyalty, as consumers perceive alignment between their values and the brand's mission.

#### 1.5.3. Customer Loyalty Theory

Oliver (1999) conceptualized loyalty as more than repeat purchases; it includes affective attachment and advocacy. Loyalty arises when customers feel satisfied and emotionally connected to a brand. Participation in CSR initiatives can foster such attachment by enhancing trust and demonstrating brand values that align with customers' ethical expectations.

#### 1.5.4. Customer Participation Theory

Vargo & Lusch (2004) introduced the Service-Dominant (S-D) Logic, which argues that value is co-created by companies and customers through interactions. In the context of corporate social responsibility (CSR), customer involvement in sustainability programs like the Carbon Offset Program is seen as a form of value co-creation. Through their participation, customers are repositioned from passive recipients of goods and services into active collaborators in the value generation process. They then become part of the value generation process, reinforcing their psychological and emotional connection with the brand.

#### 1.6. Previous Research

**Table 1.1 Previous Research**

No	Title and Researcher	Variable	Sample and Analysis Method	Research Results
1	Determinants of Consumers' Green Purchase Behavior in a Developing Nation: Applying and Extending the Theory of Planned Behavior – Yadav & Pathak (2017)	Behavioral beliefs, perceived value, green purchase intention.	620 educated urban Indian consumers, SEM.	Participation in green programs positively influences trust and loyalty.
2	Towards green trust: The influences of green perceived quality, green perceived risk, and green satisfaction – Chen & Chang (2013)	Green perceived quality, risk, satisfaction, and trust.	248 consumers with purchase experience in electronics from Taiwan, SEM.	Green perceives quality affects both satisfaction and trust. Green satisfaction mediates quality and risk with green trust.

No	Title and Researcher	Variable	Sample and Analysis Method	Research Results
3	Consumer–Company Identification: A Framework for Understanding Consumers’ Relationships with Companies – Bhattacharya & Sen (2003)	CSR perception, emotional attachment.	Conceptual model, literature review.	Identification with CSR initiatives increases emotional commitment to the brand.
4	The Influence of Green Perceived Quality and Green Brand Image on Green Trust – Lin & Huang (2012)	Green perceived quality, brand image, trust.	253 Taiwanese green consumers, survey.	Environmental consciousness affects satisfaction and strengthens loyalty.
5	Green products: An Explanatory Study on the Consumer Behaviour in Emerging Economies – Biswas & Roy (2015)	Environmental concern, green behaviour.	Exploratory study, Indian consumer.	High environmental awareness is linked to stronger eco-behaviour and preferences.
6	Environmental Quality Awareness, Green Trust, Green Self-efficacy, and Environmental Attitude in Influencing Green Purchase Behaviour – Sh. Ahmad (2022)	Quality awareness, green trust, green purchase behaviour, environmental attitude, green self-efficacy.	321 recorded Malaysian consumers.	Green Trust, green self-efficacy and environmental attitude affect green purchase behaviour positively.

### 1.7. Relationship Between Research Variables

The relationships proposed in this research are grounded in a consecutive theoretical logic that connects Green Trust and Environmental Awareness as antecedent variables, Customer Loyalty as a mediating

construct, and Customer Participation as the primary behavioral outcome. Each proposed relationship is explained below.

#### 1.7.1. Green Trust and Customer Loyalty

Green Trust reflects on individuals' willingness to depend on either a product or service that is based on the belief or expectations that results from its credibility, benevolence and ability on its environmental performance by Sh. Ahmad et al. (2022). When customers believe that a company's environmental commitments are real and consistent, they are more likely to develop a sustained and affective attachment to said brand. Trust itself is one of the foundational antecedents of loyalty, which reduces perceived risk, strengthens confidence in the brand's intentions, and fosters the kind of emotional commitment that Oliver (1999) identifies as the core of true loyalty. In the context of this research, customers who trust that the company's green initiatives are credible and not merely performative are expected to exhibit stronger loyalty behaviors; repurchase intention, brand advocacy, and resistance to switching. This relationship is supported empirically by Y. S. Chen & Chang (2013).

#### 1.7.2. Environmental Awareness and Customer Loyalty

Environmental awareness mirrors the consumer's level of concern for environmental issues and understanding of ecological consequences in line with Stern (2000). Consumers with high

environmental awareness may respond more favorably to brands that engage in green practices, as they perceive an alignment between their personal values and the brand's mission. This perceived value alignment has been linked to stronger brand satisfaction and emotional attachment, both of which are precursors to loyalty Biswas & Roy (2015); Lin & Huang (2012).

### 1.7.3. Customer Loyalty and Customer Participation

Customer Loyalty represents the psychological and behavioral commitment of a customer to a brand over time, encompassing not only repurchase intention but also advocacy and resistance to switching Oliver (1999). Within the framework of Service-Dominant Logic, loyal customers are theoretically better positioned to engage in value co-creation activities such as participation in corporate sustainability programs because their existing emotional investment in the brand lowers the psychological cost of active engagement Vargo & Lusch (2004). Furthermore, Bhattacharya & Sen (2003) argue that customers who strongly identify with a company are more motivated to support its CSR initiatives, as participation becomes a means of reinforcing and expressing that identification. Customer Loyalty is therefore proposed as a mediating variable in this research: the mechanism through which Green Trust and Environmental Awareness are expected to translate into active participation. The rationale is that

trust and awareness build loyalty, and loyalty in turn motivates the behavioral step of program engagement.

#### 1.7.4. Green Trust and Customer Participation

Beyond its indirect path through Customer Loyalty, Green Trust is also expected to directly influence Customer Participation. Prahalad & Ramaswamy (2004) argued that value co-creation is fundamentally driven by the level of trust customers place in a company. Without trust, customers are unlikely to invest effort or resources, including the conversion of loyalty points, into brand-led initiatives. Y.-S. Chen (2010) further demonstrated that green trust generates positive green brand equity and drives active pro-environmental behaviors among customers, including direct participation in brand-led environmental programs. In the context of the research, customers who has trust in the company's environmental stance are expected to be more willing to actively contributes, independently of whether said trust has deepened into loyalty.

#### 1.7.5. Environmental Awareness and Customer Participation

Environmental Awareness is also proposed to exert a direct effect on Customer Participation, operating through the motivational logic of the Value-Belief-Norm Theory Stern (2000). Customers who are ecologically conscious and who feel a personal moral obligation toward environmental stewardship are more likely to

respond to and engage with sustainability programs that offer a concrete, low-barrier mechanism for action. Biswas & Roy (2015) found that high environmental awareness is linked to stronger eco-behavior and brand preferences in emerging economies, while Ongkowijoyo & Alamsyah (2025) demonstrated that green awareness positively affects green purchase intention directly, bypassing intermediate attitudinal variables. This suggests that environmental awareness can function as an independent behavioral motivator, driving participation without the intermediate step of deepened brand loyalty.

#### 1.7.6. The Mediating Role of Customer Loyalty

Taken together, the relationships described above give rise to a mediation model in which Customer Loyalty is hypothesized to mediate the paths from both Green Trust and Environmental Awareness to Customer Participation. The theoretical justification for this mediation is as follows: Green Trust and Environmental Awareness represent attitudinal and values-based antecedents that, when sufficiently strong, are expected to foster brand loyalty. That loyalty in turn provides the motivational foundation for active behavioral engagement. However, this mediation is not assumed to be the only operative pathway. Both Green Trust and Environmental Awareness are also proposed to use direct effects on Customer Participation, reflecting the possibility that trust and awareness can

motivate action independently of loyalty, particularly in contexts where the participation mechanism is frictionless and the environmental cause is relevant. The dual-path structure of this model allows the research to empirically distinguish between mediated and direct routes to participation, producing a more nuanced understanding of what actually drives customer engagement in corporate green programs.

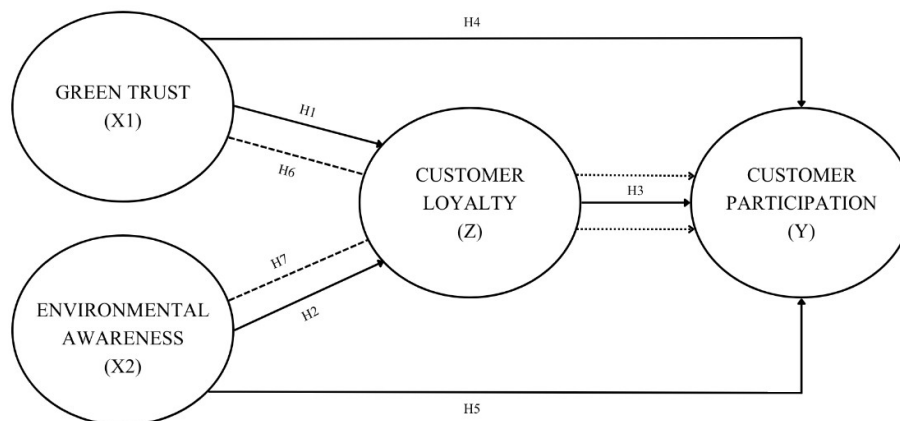
Based on these theoretical foundations and empirical evidence, this research proposes that:

- Green trust and environmental awareness help customers create perceived alignment towards the brand's mission while also fosters affective attachment necessary for long-term loyalty.
- Customer loyalty pushes costumers to engage in programs such as Telkomsel's Carbon Offset Program as a form of reinforcing their emotional connection to the brand.
- Customer participation reflects the behavioral outcome of the preceding constructs, where customers who trust the brand's environmental credibility and hold strong ecological values are more likely to actively engage in value co-creation through the Carbon Offset Program.

#### 1.8. Hypotheses

Based on the literature review and theoretical framework, the following hypotheses are proposed:

- H1: Green trust has a significant effect on customer loyalty.
- H2: Environmental awareness has a significant effect on customer loyalty.
- H3: Customer loyalty has a significant effect on customer participation in Telkomsel's Carbon Offset Program.
- H4: Green trust has a significant effect on customer participation in Telkomsel's Carbon Offset Program.
- H5: Environmental awareness has a significant effect on customer participation in Telkomsel's Carbon Offset Program.
- H6: Customer loyalty mediates the relationship between green trust and customer participation in Telkomsel's Carbon Offset Program.
- H7: Customer loyalty mediates the relationship between environmental awareness and customer participation in Telkomsel's Carbon Offset Program.



**Figure 1.4 Hypotheses Model**

### 1.9. Conceptual Definition

The concepts used and referred to in this research are based of established theories and definitions formulated from esteemed researches former studies. The purpose of defining these concepts is to provide and lay the groundwork of the variables that form the foundation of this research.

**Table 1.2 Conceptual Definition**

No	Variable	Conceptual Definition	Sources
1	Green Trust	The individual's willingness to depend on a product or service based on its environmental performance.	Y. S. Chen & Chang (2013); Sh. Ahmad et al. (2022)
2	Environmental Awareness	The individual's knowledge, concern, and action-oriented behaviour toward environmental issues.	Biswas & Roy, (2015); Lin & Huang (2012); Liobikiene & Poškus (2019); Stern (2000)
3	Customer Loyalty	Commitment to continuously use and support Telkomsel's services, including repurchase, advocacy, and resistance to switching.	Aaker (1991); Y.-S. Chen (2010); Du et al. (2010); Oliver (1999)
4	Customer Participation	The extent of involvement in Telkomsel's Carbon Offset Program (e.g., point conversion, eco-activities, program knowledge).	Bhattacharya & Sen (2003); Prahalad & Ramaswamy (2004); Yadav & Pathak (2017)

### 1.10. Operational Definition

To empirically examine the relationships among customer participation, customer loyalty, and environmental awareness within the context of Telkomsel's Carbon Offset Program, each variable in this study

is defined operationally using validated instruments and established frameworks from prior literature. The operationalization aims to ensure that the variables are measurable, quantifiable, and contextually relevant to the Indonesian telecommunications and sustainability landscape.

#### 1.10.1. Green Trust

Green Trust refers to a willingness to depend on a product, service, or brand based on the belief or expectation resulting from its credibility, benevolence, and ability about its environmental performance according to Sh. Ahmad et al. (2022). Its measurement includes: (1) feeling the brand's environmental commitments as generally reliable, (2) feeling the brand's environmental performance as generally dependable, (3) feeling the brand's environmental argument as generally trustworthy, (4) the brand's environmental concern meets your expectations, and (5) the brand keeps promises and commitments for environmental protection in line with Y. S. Chen (2010).

#### 1.10.2. Environmental Awareness

Environmental awareness refers to the level of knowledge, concern, and behavior that individuals demonstrate toward environmental issues. This variable is operationalized through indicators derived from the Value-Belief-Norm Theory by Stern (2000), including: (1) recognition of climate change as a critical issue, (2) personal responsibility in contributing to environmental solutions, (3) frequency of engaging in eco-friendly behaviors such as recycling or supporting green brands, and (4) preference

for companies that adopt sustainable practices. These items are measured using a 5-point Likert scale to assess the degree of ecological consciousness among respondents.

#### 1.10.3. Customer Loyalty

Customer loyalty is defined as the psychological and behavioral commitment of a customer to continue using Telkomsel's services over time. This construct includes three key indicators: (1) repurchase intention, or the willingness to keep using Telkomsel despite alternative options; (2) brand advocacy, such as recommending Telkomsel to others; and (3) resistance to switching, or loyalty in the face of price or service-based competition. These indicators are adapted from loyalty literature by Oliver (1999), Chen (2010), and Du et al. (2010), and are assessed using Likert-scale items capturing both attitudinal and behavioral loyalty.

#### 1.10.4. Customer Participation

Customer participation refers to the degree of customer engagement in Telkomsel's Carbon Offset Program. This variable is measured through indicators adapted from the concepts of value co-creation by Prahalad & Ramaswamy (2004) and customer identification with CSR initiatives by Bhattacharya & Sen (2003). The specific indicators include: (1) frequency of converting Telkomsel POIN into environmental initiatives such as tree planting, (2) the extent of knowledge or awareness about the Carbon Offset Program, (3) willingness to recommend or promote the program, and (4) voluntary participation in related green activities. These indicators capture

behavioral, cognitive, and affective dimensions of participation and are measured on a 5-point Likert scale.

## 1.11. Research Methodology

### 1.11.1. Types of Research

This research adopts a quantitative approach using a cross-sectional survey design. Data will be collected through online questionnaires distributed to Telkomsel users aware of or involved in the Carbon Offset Program. Since Telkomsel has a very large customer base of approximately 1.7 million population in Semarang city (Badan Pusat Statistik Kota Semarang (2024), this study aims to use Slovin's formula to determine the survey size.

### 1.11.2. Population and Sample

The population for this study comprises Telkomsel customers in Semarang city, which is estimated at approximately 1.7 million people who are eligible to participate in the Carbon Offset Program through Telkomsel POIN based on population data and Telkomsel's market share. Given the specificity of the target group, purposive sampling is used to select respondents who are aware of and have experience with the program. The Slovin Formula ( $n = \frac{N}{1+Ne^2}$ ) uses the total population and a chosen error tolerance to calculate how many people needed for the survey. With a 10% margin of error, the calculation is:

$$n = \frac{1,700,000}{1+1,700,000 \times 0.10^2} = \frac{1,700,000}{1+17,000} = \frac{1,700,000}{17,001} \approx 99.99$$

Or approximately 100 respondents.

### 1.11.3. Sampling Techniques

Using questionnaire as the primary source for purposive sampling needed for this study. The questionnaire will consist respondents that fits the criteria of these multiple parts:

- Basic respondent information (e.g., age, gender, location, educational background, occupation, income and Telkomsel usage period),
- Awareness of Telkomsel's Carbon Offset Program,
- Likert-scale questions measuring green trust, environmental awareness, customer loyalty, and customer participation.

The questionnaire items will be adapted from validated scales used in previous research from Bhattacharya & Sen (2003); Stern (2000).

### 1.11.4. Types of Data and Data Sources

Primary data will be collected using an online questionnaire distributed via social media, email, and Telkomsel customer networks. Secondary data will be collected from literature reviews of articles and data from Telkomsel that is available online.

### 1.11.5. Measurement Scale

The questionnaire draft will be divided into 5 different sections to ensure the data's validity.

First section is the Demographics section, which includes filling in participant's age, gender, location, duration of Telkomsel usage spanning

from less than 1 year to more than 5 years, and lastly respondent's familiarity with Telkomsel's Carbon Offset Program.

The second section is the Environmental Awareness, which consists of indicators like knowledge, responsibility, eco-friendly behavior and brand preference.

The third section is the Green Trust section, which comprises indicators about customers' willingness to depend on the brand's beliefs regarding the company's environmental credibility and performance.

The fourth section is the Customer Loyalty section, which includes specific indicators such as repurchase, advocacy and resistance to switching.

The fifth and final section of the questionnaire is the Customer Participation section, which includes indicators about point conversion, program knowledge, advocacy and the program's eco-activity involvement.

All items from the second to fifth section will be measured using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

#### 1.11.6. Data Collection Techniques

##### 1. Questionnaire

This research questionnaire will be based on Google Form that will be distributed online throughout social media, email, and Telkomsel customer networks. Data will be collected through a series of 5-point Likert style scale questionnaire.

## 2. Literature Studies

Literature studies used are to support the theoretical study and conceptual definition of this research. Sources are mainly from books, journals, and articles relevant to the research.

### 1.11.7. Data Processing Techniques

After all the data needed has been collected completely, the research will then proceed to process the following data by following these several important steps, mainly:

#### a. Editing

As the first step, it involves reviewing each questionnaire response to identify and correct errors or inconsistencies. It will also include checking for incomplete answers, double responses and logical inconsistencies. Responses that are deemed invalid (i.e. those with more than 20% missing data) may be excluded from the analysis completely.

#### b. Coding

After editing process is completed, responses are assigned to their own numerical values. For example, Likert-scale responses such as "Strongly Disagree" to "Strongly Agree" are coded from 1 to 5. Each item is labeled with a specific variable code to facilitate accurate entry into statistical software.

c. Scoring

Composite scores for each latent variable such as; Customer Participation, Environmental Awareness, and Customer Loyalty are computed. This typically involves averaging the item scores within each construct, assuming equal weighting. Items that are reverse-worded will be adjusted during this step to maintain scoring consistency.

d. Tabulating

The dataset is checked for outliers, missing values, and response patterns that could bias the analysis (e.g., straight-lining). Frequency tables and descriptive statistics are generated to summarize the characteristics of the sample and ensure the data is ready for inferential analysis.

#### 1.11.8. Research Instruments

The research instrument used in this study is a structured questionnaire designed to measure four latent constructs: Green Trust, Environmental Awareness, Customer Loyalty, and Customer Participation. Instrument quality will be evaluated through reliability and validity testing following PLS-SEM guidelines through Cronbach's Alpha and Composite Reliability (CR), with acceptable thresholds  $>0.7$ . Convergent validity will be ensured through Confirmatory Factor Analysis (CFA), especially through the concept of Average variance Extracted (AVE) where values  $>0.5$  are considered acceptable. And lastly, Discriminant Validity will be

evaluated using Fornell-Larcker and HTMT criteria to ensure constructs are distinct.

- Internal Consistency Reliability

Internal consistency reliability will be assessed using Cronbach's Alpha ( $\alpha$ ) and Composite Reliability (CR). Values greater than 0.70 indicate acceptable reliability.

Cronbach's Alpha is calculated as:

$$\alpha = \frac{\kappa}{\kappa - 1} \left( 1 - \frac{\sum \sigma_t^2}{\sigma_t^2} \right)$$

Where:

$\kappa$  = number of indicators

$\sigma_t^2$  = variance of each indicator

$\sigma_t^2$  = total variance

Composite Reliability (CR) is calculated as:

$$CR = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum Var(\epsilon_i)}$$

Where:

$\lambda_i$  = standardized outer loading

$Var(\epsilon_i)$  = indicator error variance ( $1 - \lambda_i^2$ )

CR is preferred in PLS-SEM since it will account for different indicator loadings.

- Convergent Validity

Convergent validity will be evaluated using Average Variance Extracted (AVE). AVE values above 0.50 indicate that a construct explains more than half of the variance of its indicators.

The AVE formula is:

$$AVE = \frac{\Sigma\lambda_i^2}{\Sigma\lambda_i^2 + \Sigma Var(\epsilon_i)}$$

The formula will ensure that indicators truly represent their latent construct.

- Discriminant Validity

Discriminant validity will be analyzed using: Fornell-Larcker Criterion, where the square root of AVE for each construct must exceed its correlations with other constructs. There's also Heterotrait-Monotrait Ratio (HTMT), where acceptable values of below 0.90 are accepted.

This methodological approach provides a rigorous framework that satisfied all reliability and validity criteria for testing the structural model analysis of research hypotheses and contributing to knowledge on green customer engagement and brand loyalty.

#### 1.11.9. Data Analysis Techniques

Data will be analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS software. PLS-SEM is suitable for this study because it supports predictive analysis, handles complex models with mediating variables, and is robust with relatively small sample sizes Hair et al. (2019). The steps in analysis will include:

Measurement model evaluation or outer model evaluation will be assessed through:

- Indicator Reliability; outer loadings  $\geq 0.70$  is considered acceptable.
- Internal consistency reliability; will be evaluated using cronbach's alpha and composite reliability of  $> 0.70$ .
- Convergent validity; will be assessed using AVE of  $> 0.50$ .
- Discriminant validity; will be evaluated using Fornell-Larcker criterion and HTMT of  $< 0.90$ .

Structural model evaluation or inner model evaluation will be assessed through:

- Collinearity assessment; used to examine Variance Inflation Factor (VIF). With the formula stated below:

$$VIF = \frac{1}{1 - R^2}$$

VIF values below 5 indicate no multicollinearity problems.

- Path coefficients and Hypothesis testing; to evaluate bootstrapping. Coefficient of Determination ( $R^2$ ); to measure the variance explained by predictor variables where 0.25 is weak, 0.50 is moderate and 0.75 is substantial

Effect size ( $F^2$ ); is calculated with the formula:

$$F^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

Where in interpretation 0.02 is small, 0.15 is medium and 0.35 is large.

- Mediation analysis to test whether Customer Loyalty mediates the relationship between Green Trust, Environmental Awareness and Customer Participation. Indirect effects will be tested using bootstrapping. A mediation effect is considered significant when the indirect path shows that  $p < 0.05$ . Partial mediation occurs when both direct and indirect effects are significant. Whereas, Full mediation occurs when the indirect effect is significant while the direct effect becomes insignificant.