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Strategic Partnerships: Mediating Service Diversification and Environmental Performance for Waste Management Sustainability in Cement Company

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Abstract

This research investigates the role of strategic partnership as a mediator in the relationship between service diversification, environmental performance, and sustainability in waste management within the cement industry, focusing on PT Bangun Jaya Indonesia Tbk (AFR Division). This research aims to analyze the direct effect of service diversification and environmental performance on sustainability business, examine their direct effect on strategic partnership, test the direct effect of strategic partnership on sustainability business, and analyze the mediating role of strategic partnership in the relationship between service diversification and environmental performance on sustainability business. Using a quantitative approach with a correlational and experimental design, data were collected from all 121 employees using a structured questionnaire and supported by secondary data from company reports. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to analyze direct and mediated relationships among variables. The results indicate that service diversification does not directly affect sustainability business performance but significantly influences strategic partnerships. Environmental performance directly contributes to sustainability business but does not significantly affect strategic partnerships. Strategic partnerships have a positive and significant direct effect on sustainability business and mediate the impact of service diversification. However, strategic partnerships do not mediate the effect of environmental performance, as environmental initiatives are implemented independently by the company. These findings highlight the critical role of strategic partnerships in translating service diversification into sustainable business outcomes, while environmental performance operates directly. The research provides empirical evidence for cement companies to leverage partnerships strategically to enhance sustainable operational performance in waste management.

INTRODUCTION

The growth industry in Indonesia is developing rapidly thanks to technological progress and the development of vital sectors such as manufacturing, agro-industry, construction, and health services. In a constellation of continuing globalization and increasingly sharp business competition, business entities are forced to have a comprehensive development strategy designed to achieve competitive advantage and long-term success (Coe & Yeung, 2015; Jacoby, 2018). A strong strategic foundation must be oriented toward a long-term vision for the realization of objectives over a number of years to come (Bibri, 2018; Farhan et al., 2025; Hickman & Silva, 2018).

The contribution of the manufacturing sector to the Indonesian economy, including GDP, employment absorption, and exports, is very large, as stated by Hutauruk and Yanti (2025). The cement industry, which falls under the manufacturing category, has a fundamental role as a support for infrastructure and property development in the country. However, the operations of this important cement industry are faced with significant environmental problems, especially in waste management and carbon emission control (Chatziaras et al., 2016; Dunuweera & Rajapakse, 2018; Elehinafe et al., 2022; Ighalo & Adeniyi, 2020).

As an energy- and resource-intensive industry, cement production generates substantial volumes of waste, including solid material, liquid, and gas releases (CO_2, NO_x, SO_x). The pressure that comes from various parties, such as government authorities, communities, and investors, demands that cement companies apply sustainable and environmentally conscious operational principles. At this point, sustainability in business operations is no longer seen as an obstacle but rather as a fundamental need and a driver of competitive advantage (Bari et al., 2022; Morioka et al., 2017; Porter & Kramer, 2018; Wang et al., 2023).

In reaction to existing conditions, cement companies are switching from a linear production concept that ends in disposal (take-make-dispose) toward the principle of a circular economy. Service diversification in waste management has become one of the most aggressive strategies undertaken. This covers not only the handling of the company's internal waste but also the opening of waste management services for companies in other industries (Mastos et al., 2020; Salmenperä et al., 2021).

Hazardous and Toxic Waste (B3) management activities, as regulated in Regulation of the Minister of Environment and Forestry Number 6 of 2021 concerning Procedures and Requirements for B3 Waste Management, include the stages of storage, collection, utilization, transportation, and processing of waste.

In the context of B3 waste management, Aji et al. (2024) stated that this activity aims to minimize and/or remove the hazardous aspects of B3 waste. The thermal method, namely the utilization of a furnace in a cement factory (co-processing), is one of the general processing methods carried out. B3 and non-B3 waste from diverse industries, such as slag, fly ash, bottom ash, used sawdust (saw dust), rejected plastic, and contaminated soil, are processed so that they can function as alternative fuel or alternative raw materials within the cement rotary kiln furnace.

Wicaksono (2024), in his research, concluded that there is no causal connection between environmental performance and a company's financial performance. Meanwhile, Suila et al. (2025) present interesting findings, stating that good environmental aspects contribute positively to a company's performance achievements.

In the cement industry, the management of hazardous and non-hazardous waste represents a type of business service diversification. Hilda et al. (2025) underlined that diversification means penetrating new markets or product/service lines that present higher risk but can become a foundation for long-term success. This form of service diversification not only produces alternative current income but also proactively supports the improvement of environmental performance through the reduction and substitution of fossil fuel, the decline of Greenhouse Gas (GHG) emissions, as well as the minimization of waste disposal to landfill.

Patandean et al. (2025), in their study, report that diversification strategy is capable of strengthening the resilience of a business entity and has a good impact on the sustainability of

its operations. However, research conducted by Hutauruk and Yanti (2025) actually concludes that business diversification activity does not have a significant influence on a company's financial performance indicators.

The implementation of strategies to expand the range of services and improve environmental performance is faced with challenges in the form of operational difficulty, demands for specific technology, rigid regulatory limitations, as well as rejection from the local community. Successful implementation is highly dependent on a sustainable waste supply, the availability of appropriate processing technology, and the enforcement of strict regulations. At this point, the concept of strategic partnership becomes very important.

According to the findings of Widyanti et al. (2025), strategic partnership relationships make a positive contribution to business sustainability. On the other hand, April et al. (2024), in their study, indicate that the public-private partnership approach is assessed as ineffective in resolving garbage service problems.

Through the formation of partnerships with waste generators from various industries such as chemical, automotive, manufacturing, pharmaceutical, and electricity power generation, which function as suppliers of raw materials and alternative fuels, a continuous, consistent waste supply that is appropriate to technical standards can be ensured. Establishing cooperation with research institutions and environmental technology entities has the potential to drive innovative progress in waste processing methods, as well as to facilitate the acquisition of resources, insight, technology, and market access. Partnership with the government at the regional level is very crucial for supervising regulatory compliance and obtaining incentives. It is presumed that strategic partnership functions as a strengthening agent connecting the correspondence between service diversity and environmental performance, for the realization of long-term business resilience.

The dimensions of business sustainability in this study cover three essential components, namely profit (economic resilience), planet (environmental impact), and people (social role). Service diversification efforts that are not supported by effective partnership are at risk of producing less than optimal achievements, thus reducing the impact on environmental performance and business sustainability as a whole. Departing from that thinking, this research is focused on the empirical verification and analysis of the role of strategic partnership in mediating the connection between service diversification and environmental performance toward the operational sustainability of waste management in the cement industry.

PT Bangun Jaya Indonesia Tbk ("SBI") is a company operating in the field of manufacturing that produces cement under the "Dynamix" brand. Over time, SBI has diversified its business, namely in the field of waste management services, both B3 and non-B3 waste. In addition, SBI also develops this service diversification through a laboratory testing service business. All of these diversification activities are managed by the Alternative Fuel and Raw Material Division (AFR Division) unit, under the "Nathabumi" services brand. SBI's waste management service business was first run in 2005, when the company was still named PT Holcim Indonesia Tbk. The Nathabumi brand was launched in 2019 following the acquisition of PT Holcim Indonesia Tbk by PT Semen Indonesia (Persero) Tbk in the same year. The AFR Division operates the waste management business in an integrated manner with the AFR Laboratory sub-unit, which provides waste and non-waste analysis services.

SBI has its own Risk-Based Business Licensing from the OSS (Online Single

Submission) Management and Organizing Institution with Business Identification Number (NIB) 9120409812015. Under that business license, the company obtained business permission with the following Indonesian Standard Classification of Business Fields (KBLI) numbers, namely the cement industry (KBLI 23941), B3 waste management (KBLI 38220), non-B3 waste management (KBLI 38211), and laboratory testing services (KBLI 71202).

In operating its business, the company applies the Triple Bottom Line principle, which includes three (3) aspects, namely Economic, Environmental, and Social. These principles are delivered to stakeholders periodically every year through the Annual Report and the Sustainability Report. The implementation of these principles aims to create sustainable development and achieve the Sustainable Development Goals (SDGs).

Economically, SBI strives to provide solutions in the form of powerful products and service creations to answer environmental problems, such as garbage accumulation, the flood phenomenon, declining air quality, and the threat of climate change. In the context of environmental management, this company has a strong commitment to managing the environment through various efforts, including the reduction of pollution levels, the diversification of renewable energy source use, hydrological system management, as well as biodiversity conservation action. On the social side, SBI directs its efforts to produce a significant increase in value for stakeholder interests, by giving special attention to employees as a crucial asset, as well as the community that becomes the direct recipient of benefits and the parties interacting with the company's operational activities.

In operating its waste management and laboratory testing service business, the company weaves strategic partnerships in the form of cooperation with companies, agencies, and the government. SBI collaborates with waste generators, waste collectors, waste processors, and waste transporters. The company also establishes cooperation with government institutions such as the Directorate General of Customs and Excise and the Environmental Service.

Partnership with district, city, and provincial governments takes the form of the management of domestic household waste or accumulated Municipal Solid Waste (MSW), which is processed into RDF (Refuse-Derived Fuel) material. In addition, SBI also participates in waste management service tenders held by oil and gas companies such as the Pertamina Group, Medco Energi Group, and Mubadala Energy, joining hands with other companies to form a waste management service consortium.

This study examines the role of strategic partnerships in mediating the influence of service diversification and environmental performance on the sustainability of waste management businesses in the cement industry. The research questions cover the direct influence of service diversification and environmental performance on business sustainability and the formation of strategic partnerships, as well as the mediating role of strategic partnerships in these relationships. The general objective of the study is to explain the mediating role of strategic partnerships, while the specific objectives include analyzing the direct influence of service diversification and environmental performance on business sustainability and strategic partnerships, as well as testing the mediating role of strategic partnerships in supporting business sustainability.

This research offers both theoretical and practical contributions. Theoretically, it enriches the strategic management and sustainability literature by demonstrating strategic partnerships as a mediator between service diversification, environmental performance, and business

sustainability in waste management, extending the Resource-Based View and Stakeholder Theory, while also advancing mediation analysis in the Indonesian cement industry context. Practically, it provides strategic guidance for cement companies, particularly PT Bangun Jaya Indonesia Tbk, in strengthening partnerships, optimizing service diversification, and enhancing environmental performance to achieve sustainable business continuity, while informing policymakers in designing supportive regulations and incentives for waste management partnerships and sustainable practices. Additionally, the study raises community awareness about environmentally responsible waste management and the private sector's role in the circular economy, while offering future researchers a robust empirical foundation for further investigations across different industrial contexts and geographical settings.

RESEARCH METHOD

Place and Time of Research

This study was implemented in the Alternative Fuel and Raw Material Division (AFR Division), PT Bangun Jaya Indonesia Tbk, with its main office located at the Narogong Factory, situated at Jl. Raya Narogong, Km. 7, Kembangkuning Village, Klapanunggal District, Bogor Regency, West Java Province. AFR Division employees are spread across four (4) factory/plant locations, namely the Narogong Factory (Bogor Regency, West Java Province), Cilacap Factory (Cilacap Regency, Central Java Province), Tuban Plant (Tuban Regency, East Java Province), and Lhoknga Factory (Aceh Besar Regency, Aceh Province), as well as two (2) Representative Offices, namely in Surabaya City (East Java Province) and Balikpapan City (East Kalimantan Province).

The time range of the study organization is seven (7) months, counting from October 2025 to May 2026, covering the phases of preparation, data acquisition, and final report completion.

Research Design

Analysis of the connection between variables in this study was implemented through a quantitative method using a correlational and experimental design. The variables studied are grouped into three, including the independent variables (X), the dependent variable (Y), and the intervening variable (Z). The independent variables used are Service Diversification (X_1) and Environmental Performance (X_2). Meanwhile, the dependent variable is Sustainability Business (Y), and the intervening variable is Strategic Partnership (Z).

According to Mulyanto and Wulandari (2019: 62), an intervening variable, which is also known as an intermediary or mediation variable, functions to bridge the connection between the independent and dependent variables being investigated. The influence that is channeled from the independent variable to the dependent variable through the intermediary intervening variable is called an indirect influence. In this study, strategic partnership is identified as the mediator that connects service diversification and environmental performance with business sustainability.

Formulation connection intervariable the Can done with utilise indicators following:

1. Diversification of Services with symbol X 1 which has five indicators, namely innovation services (X 1. 1), diversity product services (X 1. 2), quality service (X 1. 3), usage technology (X 1. 4), and support source Power human (X 1. 5).

2. Environmental Performance with symbol X 2 has five indicators, namely management performance environment (X 2. 1), compliance to environment (X 2. 2), environmental audit (X 2. 3), certification system management environment (X 2. 4), and reporting environment (X 2. 5).
3. Sustainability Business with symbol Y has seven indicators, namely profitability (Y 1), responsibility answer social / CSR (Y 2), satisfaction customers (Y3), management risk (Y 4), greenhouse gas emissions glass (Y 5), reduction cost energy (Y 6), and management source Power human (Y 7).
4. Strategic Partnership with symbol Z own seven indicators, namely connection term length (Z 1), solution problem together (Z 2), repair continuous improvement (Z 3), trust inter-partner (Z 4), exchange knowledge (Z 5), supervision / monitoring (Z 6), and evaluation partnership (Z 7).

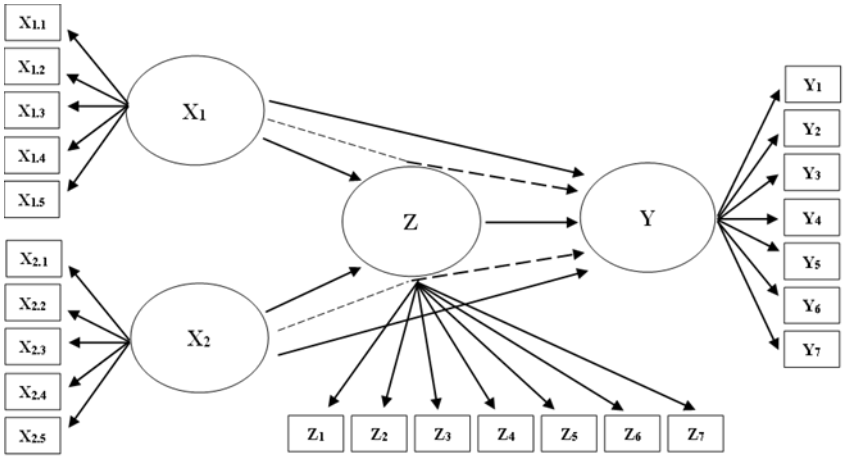

Figure 1. Research Design

Source: Authors' elaboration, 2026

Population, Sample, and Sampling Method

All over employees of the AFR Division business unit of PT Bangun Jaya Indonesia Tbk become population, which includes personnel from various contributing departments, both in a way direct and No directly, on diversification services, performance environment, sustainability business, as well as partnership strategic related companies with business management waste. Amount population in the study This as many as 121 employees, with details 92 men and 29 women. With amount population as many as 121 people, then studies This involving all over population the as sample study. Taking technique sample use saturated sampling technique or census, where all member population involved without except. This decision taken remember amount underpopulated of 130 people, so that allows researchers For reach out to and collect data from all over individual. Use all over population aim For increase accuracy, reducing sampling bias, and give a clearer picture comprehensive and representative about characteristics population in a way overall.

Method of collecting data

The data collection stage holds a vital role in a study to obtain the insights needed to answer the main problems and test the proposed hypothesis. In the context of this research, data collection involves two types of data, namely primary and secondary. The acquisition of primary data in this study was done directly from the source, namely the employees of the AFR Division, PT Bangun Jaya Indonesia Tbk, using a survey/questionnaire technique. The

questionnaire consists of closed statements with a Likert scale range of 1 to 5 to serve as the main research instrument. The questionnaire was then given to selected respondents who meet the sample criteria requirements, in order to collect data related to the variables Service Diversification (X_1), Environmental Performance (X_2), Sustainability Business (Y), and Strategic Partnership (Z).

Secondary data sourced from various documents, archives, and information that has been available, good from within the company and from source external relevant others. This data play a role in give support empirical for results obtained from questionnaire and enrich the resulting interpretation from analysis. The following is secondary data sources used:

1. Report Annual Report of PT Bangun Jaya Indonesia Tbk which includes profile data company, employee and performance company.
2. Report Sustainability Report of PT Bangun Jaya Indonesia Tbk which includes performance management environment and relationships social.
3. Document internal company policies and policies related companies with management environment and business management waste.
4. Review of related literature and publications with variables research, which was obtained from books and journals scientific.

Instrumentation Variables Study

Approach quantitative in study This depend on instrument in the form of questionnaire or questionnaire developed by researchers alone on each variables studied. Function main instrument study is as a medium for collecting data, which works measure Good phenomena in nature and in society. With Thus, the instrument study This become tool strategic For get description complete related something issue, phenomenon nature, or phenomenon social.

Study This use Likert scale as instrument For obtaining accurate data. Mulyanto and Wulandari (2019: 86) define Likert scale as tool measure data involving addition answer from more from One questions to clarify A construct.

Variables in the study This consists of on:

1. Variables Free (X):
   X 1: Diversification services, which are measured through indicator: innovation services, diversity product services, quality services, usage technology and support source Power man.
   X 2: Environmental performance, which is measured through indicator: assessment performance environment in management environment (PROPER), compliance to environment, environmental audit, certification system management environment, and reporting management environment.
2. Variable (Z):
   Z: Partnership strategic, which is measured through indicator: relationship term length, breakdown problem together, repair sustainable, trust inter-partner, exchange knowledge, supervision / monitoring, and evaluation partnership.
3. Variables Bound (Y):

Y: Sustainability business, which is measured through indicators: profitability, responsibility answer social, satisfaction customers, management risk, greenhouse gas emissions glass, reduction cost energy and management source Power man.

Analysis and Testing Methods

Study This apply method quantitative For data analysis, with Structural Equation Modeling (SEM) based Partial Least Squares (SEM-PLS) as approach central. The selection of SEM-PLS is based on his abilities in test interaction complicated between latent variables, including impact direct and indirect directly, and its capacity For handle models with Lots indicators, data that is not normally distributed, and the size sample limited. Device soft SmartPLS version latest used in data processing.

Study This adopt a model that includes a number of latent variables, where diversification services and performance environment play a role as variables independent, partnership strategic act as variables intervening, and sustainability business functioning as variables dependent. Measurement each variables done through developed indicators in questionnaire use Likert scale. Procedure the test Alone shared into two stages crucial, namely:

1. Measurement Model Testing (Outer Model)
   Stage This aim For test validity and reliability construct with see mark:
   - Outer Loading (≥ 0. 70),
   - Average Variance Extracted (AVE) (≥ 0. 50),
   - Composite Reliability (CR) (≥ 0. 70),
   - Cronbach's Alpha (≥ 0. 70).

   If the values This fulfilled, then indicator considered valid and reliable in measure the latent variable in question.
2. Structural Model Testing (Inner Model)
   Stage This test connection between latent variables with see:
   - Path Coefficient Value
   - R-Square (R 2) value is size contribution variables independent to dependent,
   - Significance Test using t- statistics and p-value through procedure bootstrapping.

In addition to primary data and questionnaires, quantitative data secondary is also utilized in studies this. Secondary data the sourced from report annual report and reports official sustainability report company. Statistics descriptive, such as total value, trends periodic, and analysis percentage, used For evaluate data to present description intact performance company. Use graphs and tables intended For support clarity interpretation of the resulting data.

RESULTS AND DISCUSSION

Research result

This chapter to describe findings obtained from study scientific that has implemented, in line with targets and questions research that has been formulated previously. The essence of studies This is For explore and measure impact from implementation of differentiation strategy service as well as achievement environment to sustainability operational business in the management domain waste, with positioning collaboration strategic as factor mediation, especially in the context of PT Bangun Jaya Indonesia Tbk. In order to achieve objective said,

the approach quantitative adopted in study this, which involves use of two different data categories:

1. Primary data collected through distribution instrument survey, namely questionnaire, which was designed For measure perception respondents to various variables that become focus study.
2. Secondary data collected from various source like report annual report published sustainability company, interview with source person expert in the field management environment, as well as regulations and internal company guidelines that have relevance with performance business environment and strategy in management waste.

Primary data processing is carried out through Structural Equation Modeling (SEM) using method Partial Least Squares (SmartPLS) to evaluate performance business entity during period six year previously. Use of secondary data aim For validate findings obtained from primary data and For deepen understanding and interpretation to results analysis that has been done.

Analysis Statistics Descriptive

Analysis statistics descriptive held to summarize view respondents related to each variable research. Data collected from 121 respondents through form survey processed with use scale Likert scoring ranges from numbers 1 to 5.

Variables Dependent: Sustainability Business

Business sustainability is assessed through seven indicators. Sustainability Business, with the symbol Y, has seven indicators, namely profitability (Y_1), corporate social responsibility/CSR (Y_2), customer satisfaction (Y_3), risk management (Y_4), greenhouse gas emissions (Y_5), energy cost reduction (Y_6), and human resource management (Y_7). Respondents totaling 121 people from the AFR Division employees of PT Bangun Jaya Indonesia Tbk provided the analyzed data. The results of the descriptive statistics indicate that all indicators show an average above 4.0. This indicates the positive reception of the majority of respondents toward the company's sustainable business practices, indicating that they have a view that the company has adopted a sustainable business model. The details are as follows:

1. Indicator Y_1 (profitability), with an average value of 4.26. This signifies the respondents' perception that the company obtains sustainable income from its waste management service activities.
2. Indicator Y_2 (corporate social responsibility), with the majority of respondents showing a strong belief that Corporate Social Responsibility (CSR) programs contribute to business sustainability. This is reflected in the indicator's average value of 4.44, which is the highest figure among all the indicators.
3. Indicator Y_3 (customer satisfaction), with an average value of 4.43, from which it can be concluded that the majority of respondents consider the company active in making feedback-based improvements derived from customer satisfaction surveys.
4. Indicator Y_4 (risk management), with an average score of 4.39. This finding implies that a large proportion of respondents have a view that the implementation of risk management has been running optimally in both the operational aspect and the corporate business environment.
5. Indicator Y_5 (greenhouse gas emission reduction), for which the average value achieved by respondents is 4.19, implying that the company is assessed as successful in operating sustainable business initiatives through efforts to minimize greenhouse gas emissions in recent years.

6. Indicator Y_6 (energy cost reduction), for which an average score of 4.07 was obtained, indicates the respondents' view that the utilization of energy-efficient technology is assessed as effective in lowering energy costs.
7. Indicator Y_7 (human resource management). The majority of respondents, as reflected in the average value of 4.36, assume that business independence can be improved through the cultivation of employee skills via effective training programs.

Respondents' perception of the company's business sustainability is generally assessed as positive and consistent, as reflected in the median value of each indicator, which ranges between 4 and 5. There is one indicator that records a minimum value of 1, indicating that a small group of respondents have a different view about the aspect of technology use and human resource management in business sustainability. However, with a maximum value reaching 5, the majority of respondents clearly give a positive evaluation of the sustainability aspects, especially those related to community environmental programs and customer satisfaction. Standard deviations varying from 0.55 to 0.81 describe the existence of sufficient variation in perception among respondents, although overall it can still be said to be relatively homogeneous.

Variables Independent

1. Diversification of Services

This study measures service diversification through five indicative elements, namely service innovation ($X_{1.1}$), service product diversity ($X_{1.2}$), service quality ($X_{1.3}$), technology use ($X_{1.4}$), and human resource support ($X_{1.5}$), which overall describe the company's strategy in understanding the market and creating competitive advantage. Based on an analysis of the questionnaire from 121 respondents, service diversification is assessed positively, with a mean value of 4.55 and a median of 5. This implies that a large proportion of respondents agreed that the service diversification strategy has been implemented optimally and consistently. The note of a minimum value of 2 indicates the existence of perceptual diversity among a small proportion of respondents about one element of service diversification, especially that related to digital technology adaptation. However, the achievement of a maximum value of 5 shows that the majority of respondents give a high ranking to service diversification, especially in the dimension of product diversity and the innovations introduced. The standard deviation figure of 0.58 indicates an adequate level of homogeneity in respondents' perception, with little deviation in evaluation.

By reviewing the existing indicators, it can be assumed that the company has implemented its waste management service diversification business strategy optimally. Comprehensively, this service diversification strategy plays a fundamental role in supporting the company's business sustainability. The high rating figures from respondents underline that this strategy is not only well formulated but also implemented evenly and brings tangible benefit across all aspects of the company.

2. Environmental Performance

This study measures environmental performance through five specific indicators, namely environmental management performance ($X_{2.1}$), environmental compliance ($X_{2.2}$), environmental audit ($X_{2.3}$), environmental management system certification ($X_{2.4}$), and environmental reporting ($X_{2.5}$). The company displays its commitment to caring for and maintaining environmental sustainability through this performance. Based on the questionnaire data analysis of the 121 respondents, the average score was 4.69 and the

median was 5, which implies that respondents widely consider the company's environmental performance to be adequate and stable.

The respondents' evaluation of the company's environmental performance is within the value range of 3 to 5, with none of them giving a very negative perception. A standard deviation of 0.48 indicates that respondents' views on this performance tend to be uniform and have minimal variation. Overall, the company is indicated to have positive environmental performance, which is proven by its compliance with environmental regulations and standards. Its implementation is realized through the company's environmental policy, where the execution of national-level environmental programs and continuous environmental quality supervision become the main focus.

3. Variable: Partnership Strategic

This study looks at Strategic Partnership as an intervening variable that relates the influence of the independent variables, namely service diversification and environmental performance, to the dependent variable, namely the company's business sustainability. Strategic Partnership is measured using seven essential indicators, namely long-term relationships (Z_1), joint problem-solving (Z_2), continuous improvement (Z_3), inter-partner trust (Z_4), knowledge exchange (Z_5), supervision/monitoring (Z_6), and partnership evaluation (Z_7). The waste management service business run by the company operates through strategic collaboration with work partners, as reflected in the seven indicators that describe the achievement of business sustainability strategies.

The result of the average calculation of the questionnaire data involving 121 study subjects is 4.34, which indicates a generally very positive evaluation by respondents toward strategic partnership. This is a reflection of the favorable view that the company's effort to build business cooperation through strategic partnership has proven effective in supporting business sustainability.

In addition, the median distribution of 4 indicates that more than half of the respondents evaluate the strategic partnership indicators positively, with a focus on the aspects of supervising the implementation of cooperation and the trust woven between partners. The note of a lowest value of 1 indicates the existence of perceptual inconsistency in a smaller segment of respondents related to the aspect of knowledge sharing in waste management, which is an important component of strategic partnership. On the other hand, the highest value of 5 confirms that the majority of respondents have a positive view of strategic partnership, especially concerning the element of monitoring the achievement of KPI targets between partners in the business realm.

With a standard deviation of 0.66, it is visible that the respondents' answers tend to be similar and do not show significant differences. This indicates the existence of similarities in views among respondents, that strategic collaboration contributes positively and stably to the achievement of the company's business sustainability. The overall descriptive statistical analysis for the strategic partnership variable indicates that the company has wisely established waste management cooperation relationships with partners. This collaboration is proven effective in strengthening long-term relationship bonds and fostering mutual trust with partners, while at the same time contributing significantly to sustainable improvement through the transfer of knowledge and ideas. The stability of positive perception from the respondents toward all the measured indicators

further confirms the crucial function of strategic partnership as a vital bridge for the achievement of the company's business sustainability.

Quantitative Data Analysis

Study This processing quantitative data through method Structural Equation Modeling (SEM) with framework Partial Least Square (PLS), using application SmartPLS version 4. 1. This method chosen Because its effectiveness in estimating complex structural models, which involves Lots latent and indicator variables, at the same time give optimal handling of unused data follow normal distribution.

Study exploratory, predictive, and involving size relative sample a little bit too good applied with SEM-PLS method, as proposed by Hair, et. al. (2021). Focus main method This is on prediction variables bound and estimated the relationship between latent variables, as well as offered as alternative popular replace SEM based covariance such as LISREL and AMOS. More furthermore, Chin (1998) added that PLS is effective in build theory and develop relation between variables, at the same time flexible in manage data that has multicollinearity and not normally distributed.

Evaluation of Measurement Model (Outer Model)

Evaluation This designed For analyze level quality and credibility instrument measurements used in quantification latent concept. Testing to validity instrument done through:

1. Convergent Validity: reviewed from outer loading value that should be is at 0. 70 or more height, and value Average Variance Extracted (AVE) is 0. 50 or more. (Hair, et. al. , 2021).
2. Discriminant Validity: evaluated through ratio Heterotrait-Monotrait (HTMT). According to Henseler, et. al. (2015), an HTMT value below 0. 90 indicates adequate discrimination interconstruct
3. Construct Reliability: measured with Composite Reliability (CR) and Cronbach's Alpha, where the value ideally is 0. 70 or more high (Nunnally & Bernstein, 1994).

Assessment of the measurement model (outer model) through method Partial Least Squares Structural Equation Modeling (PLS-SEM) requires evaluation validity convergent based on the outer loading value and Average Variance Extracted (AVE). According to Hair, et. al. (2019) guide, adequate outer loading value is above 0. 70, which reflects height donation indicators on the construct being measured. Although Thus, the indicator with inner outer loading range 0. 40–0. 70 still have a chance maintained if AVE and reliability construct fulfil minimum threshold. Otherwise, deletion indicator the become recommended steps For increase validity the whole model.

Validity convergent assessed based on three gauge measuring statistics key:

1. Outer Loading: Outer Loading measure to what extent each indicator contribute to the construct latent; values above 0. 70 are considered adequate (Hair, et al. , 2019), whereas range 0. 40–0. 70 can accepted if AVE and reliability construct fulfilled
2. Average Variance Extracted (AVE): Average Variance Extracted (AVE) reflects proportion variance explained by the construct from the indicators relatively to

variance error, with minimum threshold of 0. 50 which implies construct capable explain at least half variance indicators (Fornell & Larcker, 1981)

3. Composite Reliability: Composite Reliability (CR) evaluates internal consistency, is considered more superior from Cronbach's Alpha in SEM-PLS analysis, with desired value exceeds 0. 70 for signify level harmony tall inter-indicator in measure same concept.

Structural Model Evaluation (Inner Model)

The next step in the Partial Least Squares Structural Equation Modeling (PLS) methodology, after the outer model (measurement model) is proven to be valid and reliable through convergent and discriminant validity testing, is the evaluation of the inner model (structural model). The objective of this evaluation is to determine the intensity of the connection between latent constructs and to verify the direct as well as indirect influences between variables, including the influence of the intervening variable. Hair et al. (2017) explained that the evaluation of the inner model in PLS-SEM is oriented toward the model's capacity to explain endogenous constructs and to evaluate predictive validity. On the other hand, Chin (1998) suggested the need for inner model testing based on main criteria such as the path coefficient, R-square value (R^2), and significance test of direct and indirect influence through bootstrapping, which is very essential when there are mediation or intervening variables.

In the framework of this study, the inner model is applied to test how Service Diversification and Environmental Performance contribute to Business Sustainability, both directly and indirectly through the role of Strategic Partnership as an intermediary. The use of SmartPLS 4 is favored for the evaluation, considering its capabilities in handling complex models, data with a non-normal distribution, as well as a limited to moderate sample size.

Evaluation to the structural model completed through a series stages crucial, which is explained as following:

a. Testing Multicollinearity (Inner VIF) was performed For verify that variables independent No show excessive correlation, in order to prevent bias in the results modeling. The VIF value is considered Good is under 5, but greater value safe is below 3. 3 (Hair, et. al. , 2021).
b. Significance Test Relationship (Path Coefficients) are used For evaluate significance connection between construct, utilize statistics - t-statistic and p-value from the bootstrapping process. Testing This become base For accept or reject hypothesis study.
c. Size Test The effect (f 2) aims For measure size impact variables exogenous to endogenous variables.
   Criteria: f 2 = 0. 02 (small), 0. 05 (medium), 0. 35 (large)
d. Model Fit (SRMR) (can chosen in PLS-SEM)
   - SRMR: Standardized Root Mean Square Residual
   - According to Henseler, et. al (2014), an SRMR value below 0. 08 indicates good model fit.

As In addition, the Adjusted R-square value was measured For give more views accurate related how much big percentage variance successful endogenous construct explained by the combination all over construct exogenous in model framework.

With accommodate amount variables predictors involved, value Adjusted R2 give more reflection Good about performance the whole model, especially for models with significant complexity. Assessment This essential For evaluate capability predictive models and their relevance in explain the relationship between the constructs being studied, as well as ensure that model construction has strength Good in a way statistics and substantive (Hair, et. al., 2021) (Henseler, et. al., 2016).

Multicollinearity Test (Inner VIF)

In the framework of evaluating the structural model (inner model), the inspection of multicollinearity between exogenous constructs becomes crucial, the quantification of which is done through the Variance Inflation Factor (VIF). VIF, as explained by Hair et al. (2017), works to detect potential high correlation or multicollinearity between independent constructs, which, if it occurs, can compromise the accuracy of model estimation. The presence of significant multicollinearity has the potential to distort the interpretation of relationships between variables and reduce the stability of path coefficients. The magnitude of the inner VIF indicates the extent to which the exogenous variables each contribute to explaining an exogenous construct. In general, a VIF with a value of up to 5 can still be accepted (Hair et al., 2021), although a number of experts suggest an optimal limit below 3.3 (Diamantopoulos & Siguaw, 2006). If the VIF exceeds this limit, the model structure needs to be reviewed again because of the possible existence of overlap between two or more exogenous constructs. The analysis is simple: if all inner VIF values for one endogenous construct are below the established criteria, multicollinearity problems are not detected. As an example, if "Sustainability Business" is influenced by "Service Diversification" and "Environmental Performance," both exogenous variables will each be assessed by VIF against the endogenous construct. A low VIF value signifies contributions of an independent and non-excessive nature from these constructs in explaining the target variable.

In this study, the inspection of multicollinearity was implemented by reviewing the Variance Inflation Factor (VIF) value for each connection between the existing constructs in the structural model. The function of VIF is to detect potential high correlation between independent variables, which can impact the instability of model parameter estimation. Based on the data analysis, all measured VIF values turned out to be lower than 3.0. The details are as follows: Service Diversification to Sustainability Business recorded 2.663, Service Diversification to Strategic Partnership 1.692, Environmental Performance to Sustainability Business 1.753, Environmental Performance to Strategic Partnership 1.692, and Strategic Partnership to Sustainability Business 2.343. All of these scores are far below the maximum permitted limit for multicollinearity, namely 5. Thus, it can be concluded that there is no indication of multicollinearity between the constructs in this research model. This indicates that every independent and intervening construct is exclusive in nature and does not overlap in giving explanation to the dependent variable, so that the model's suitability for further testing can be guaranteed.

Coefficient Determination (Adjusted R-square)

With consider amount construct exogenous, Adjusted R-square functioning as version correct R-square which offers estimate more accurate about model capacity in explain

endogenous variables. In contrast with R-square standards that can be increase along with addition predictor, Adjusted R 2 give description quality more model predictions realistic and free from problem overfitting. Indicator this, as proposed by Hair, et. al. (2021), is very important For evaluate efficiency as well as relevance of the model, especially in context analysis multivariate such as PLS-SEM.

2 Result of 0. 734 for Sustainability Business indicates that 73. 4% of the variability can explained by factors independent in the model, such as Service Diversification, Environmental Performance, and Strategic Partnerships. Adjusted R2 Value of 0. 727 confirms ability very good predictive model, even after take into account amount construct exogenous. Based on Chin 's criterion (1998), R2 value between 0. 33–0. 67 is considered moderate, while range 0. 67–1. 00 is categorized strong. Therefore that, Sustainability Business show strength substantial predictive.

Next, Partnership Strategic (Z – intervening) records R2 value of 0. 573, showing that approximately 57. 3% change in Partnership Strategic can attributed to variables exogenous, including Service Diversification and Environmental Performance. Magnitude Adjusted R2 validate consistency and meaningfulness influence variables these, classify them as strength prediction moderate in predictive modeling framework.

1. Magnitude Test Influence (Effect Size – f 2)

   Diversification of Services and Environmental Performance, as variables exogenous, giving impact direct which tends to small or weak on sustainability Business, reflected from the value of f 2 which is in range 0. 02–0. 15, indicating influence weak. This is underline domination influence No what happened directly through Partnership Strategic.

2. Model Fit (SRMR)

   SRMR (Standardized Root Mean Square Residual) works as gauge measure that measures level structural model suitability in reflect the observed data, as reflected in matrix correlation.

   Identified SRMR value of 0. 080 which indicates the model has compatibility approaching the ideal level, because the ideal limit is set is SRMR < 0. 08 and the value of 0. 08 - 0. 10 is included category tolerance that can accepted.

   - SRMR < 0. 08 → Model has suitability (fit) that Good
   - SRMR 0. 08 – 0. 10 → Moderate model fit / acceptable accepted
   - SRMR > 0. 10 → Model does not own adequate suitability

   One of gauge measuring compatibility in PLS-SEM is Standardized Root Mean Square Residual (SRMR). This value reflect how much good structural model reproduce matrix observed correlation. Research This produce SRMR value of 0. 080, which indicates that the model is still fulfil criteria acceptance. Hanseler, et. al. (2014) stated that SRMR value below 0. 10 meets the requirements eligibility statistics, while below 0. 08 indicates a very good model fit. Hair, et. al. (2021) also argues that SRMR value < 0. 10 still can tolerated, especially in exploratory model context or complicated. With Thus, the findings of SRMR in research this is very satisfying, confirm that the model used own sufficient compatibility Good For to be continued to stage analysis.

Testing Hypothesis

Evaluation of the measurement model (outer model) and structural model (inner model) has been carried out. finished, continued with testing hypothesis For identify significance statistics from connection between existing constructs in design research. In framework Partial Least Square-Structural Equation Modeling (PLS-SEM), procedure bootstrapping applied as method resampling For estimate data distribution and test significance coefficient path. Every hypothesis analyzed based on mark t-statistic and p-value, using criteria significance standard t-statistic ≥ 1. 96 and p ≤ 0. 05, which is appropriate with level 95% confidence interval This will confirm whether construct exogenous (e. g. , Service Diversification and Environmental Performance) have effect significant on the endogenous construct (Partnership Strategic and Business Sustainability), both in a way direct and through role variables intervening. With Thus, testing hypothesis This become foothold crucial For interesting conclusion about dynamics causal construction in the research model This.

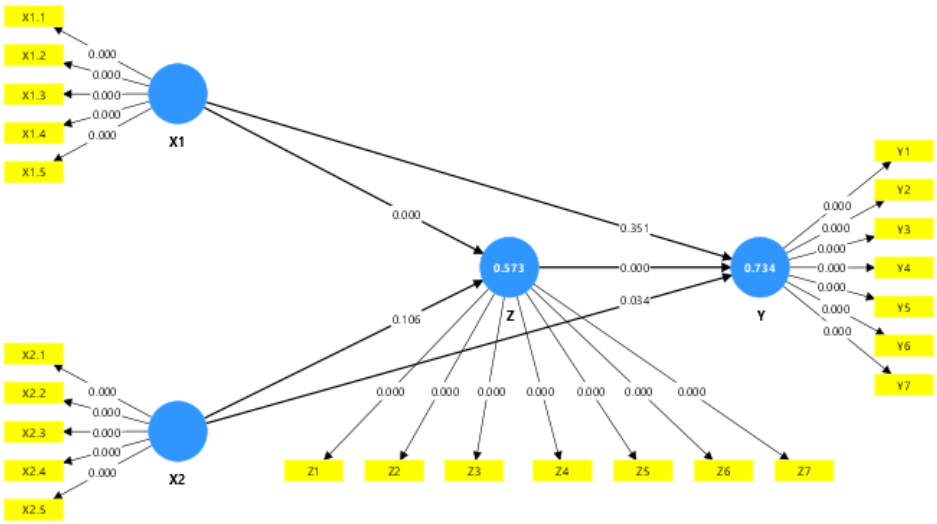

Figure 2. Bootstrapping Results

Source: PLS Output (Data processed, 2026)

The bootstrapping test of the structural model was carried out using the SmartPLS method, at a maximum error level of 5% (α), indicating the existence of differing levels of influence between variables in this study, including both direct and indirect effects.

Service Diversification does not show a significant direct impact on Sustainability Business, as proven by a path coefficient (β) of −0.122, a t-statistic of 0.933, and a p-value of 0.351. On the other hand, Service Diversification has a meaningful influence on Strategic Partnership, with β = 0.405, a t-statistic of 6.176, and a p-value of 0.000. This indicates that a substantial improvement in the company's achievement through Service Diversification requires an increase in the number of partners in Strategic Partnership.

The Environmental Performance variable shows significant results directly on Sustainability Business (β = 0.014, t = 2.123, p = 0.034). However, on the contrary, the same direct influence is not observed on Strategic Partnership (β = −0.013, t = 1.618, p = 0.106). These analysis results conclude that Environmental Performance indicators contribute significantly and have a direct impact on Sustainability Business but do not contribute significantly to the formation of Strategic Partnership.

Sustainability Business is significantly influenced by Strategic Partnership, as proven by the regression coefficient value (β = 0.455), t-statistic (7.283), and p-value (0.000). This confirms that Strategic Partnership plays a fundamental role in ensuring the company's business continuity.

Next, the mediation analysis shows that Strategic Partnership is proven to mediate the connection between Service Diversification (independent variable) and Sustainability Business significantly, with a path coefficient (β) of 0.087, a t-statistic of 4.673, and a significance of p = 0.000. Different in this case, the mediation of Strategic Partnership in the relationship of Environmental Performance (independent variable) with Sustainability Business yields β = 0.066, a t-statistic of 1.552, and p = 0.121, which indicates the absence of a significant mediation effect.

Therefore, it can be stated that Strategic Partnership acts as a powerful and important mediation factor, which explains the connection between Service Diversification and the achievement of Sustainability Business. However, the mediation role of Strategic Partnership is not proven to significantly connect the impact of Environmental Performance on Sustainability Business.

This chapter to describe findings from the data that has been analyzed in the section previously. Focus discussion is interpretation results testing connection intervariable research, including effect direct and indirect directly, which then connected with framework relevant theories and literature previously.

Analysis This designed For answer question research and testing the hypothesis proposed, in specific highlight contribution diversification service as well as performance environment to sustainability business management waste company, good in a way direct and through mediation partnership strategic. More further discussion This study harmony between the primary quantitative data obtained from SmartPLS with secondary data, to strengthen validity results study.

Influence Diversification of Services to Sustainability Business

Analysis combined quantitative data from SmartPLS and secondary data indicates that diversification service No show influence significant direct to sustainability business, but in a way positive impact directly on the formation partnership strategic analysis primary quantitative, through structural model testing, reveals coefficient regression diversification service to sustainability business of β = -0. 122, with t-statistic of 0. 933 and p-value = 0. 352. The numbers This No fulfil significance threshold at the level 95% confidence, which means No There is support empirical to connection the.

Diversification service need other variables as mediators so that they can give significant influence in a way direct to sustainability business. In order to be able to walk with good service management various waste need support in provide waste that can used as material raw materials and materials burn alternatives to achieve sustainability operational companies, for example support from partners business.

Influence Diversification of Services to Partnership Strategic

Referring to primary quantitative research data, it is indicated that service diversification directly has a positive and significant influence on strategic partnership. The primary

quantitative analysis, through structural model testing, reveals a regression coefficient for service diversification on strategic partnership of β = 0.405, with a t-statistic of 6.176 and a p-value = 0.000. This value fulfills the significance criteria at the 95% confidence level (supported).

The formation of strategic partnership as a response to the diversity of waste management services gives a positive impact on the company's business sustainability. Referring to secondary data, the increase in TSR value as the main implication of the continued increase in the use of AFR materials is in line with the increase in the number of partnerships, which is depicted in Table 4.3. Thus, it can be concluded that the more the number of business partners increases, the more effective the waste management service diversification becomes.

Impact of Environmental Performance to Sustainability Business

Environmental performance shows its positive and significant influence directly on the company's sustainable business operations. The primary data obtained is a path coefficient (β) = 0.014, with a t-statistic of 2.123 and a p-value = 0.034. This value fulfills the significance criteria at the 95% confidence level (supported).

Secondary data indicates that the company's performance in preserving the environment is shown by the use of renewable energy through the utilization of waste as fuel material and alternative raw materials (AFR usage). This step contributes to the reduction of greenhouse gas emissions (CO_2), or decarbonization. Nugroho et al. (2023) revealed that decarbonization of the energy system is very important to reduce the impact of climate change and to encourage sustainable economic growth. These decarbonization efforts have a positive impact in creating a sustainable business in the cement industry. Thus, it can be concluded that the fewer greenhouse gas emissions produced in the company's cement production process, the more sustainable the business.

Impact of Environmental Performance to Partnership Strategic

The results of the primary data analysis from SmartPLS show that environmental performance does not have a significant direct influence on strategic partnership. This is proven by the obtained β value = −0.013, with a t-statistic of 1.618 and an obtained p-value of 0.106. These values do not fulfill the criteria at the 95% confidence level (not supported).

The formation of strategic partnership is significantly influenced by the corporate strategy through diverse waste management services. According to Lestari & Khomsiyah (2023), environmental performance, through PROPER rating evaluation, can increase company value. This reinforces that environmental performance does not have a significant influence on the improvement of strategic partnership.

CONCLUSION

Study This evaluate influence diversification services and performance environment to sustainability PT Bangun Jaya Indonesia Tbk's business in the AFR division, with partnership strategic as a mediator. Main results is: Diversification service No influential direct to sustainability business, but significant form partnership strategic. Environmental performance influential direct to sustainability business, but No significant to partnership strategic. Partnership strategic contribute significant to sustainability business and mediation influence

diversification service. Partnership strategic No mediate influence performance environment, because company implementing environmental programs in a way independent. With thus, the partnership strategic become factor important in bridging diversification strategies service going to business sustainable, whereas performance environment play a role direct without through a mediator.

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