PROCUREMENT STRATEGY FOR RECYCLED PAPER: CASE STUDY AT PT. KERTAS MAKMUR ABADI (PT KMA)

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Abstract

Background: Procurement practices nowadays has transcended from merely operational to a strategic objective in business. Studies have shown that procurement strategy create optimal value, increase competitiveness, and company resiliency during crisis if it is aligned with the overall organization's strategy, vision, goals, and value proposition to achieve company goals.

Purpose: This research aims to develop a sustainable procurement strategy to ensure the availability of PT Kertas Makmur Abadi (an alias, hereafter named PT KMA)'s recycled paper in 2024-2026.

Design/methodology/approach: This study used qualitative methods as the basis of research methods, namely questionnaires, interviews, observation, and analytical studies with existing theories. To ensure the availability of recycled paper, the company had to design a procurement strategy starting with determining the criteria used to select and evaluate suppliers. The determination of criteria was carried out using a pairwise comparison technique suggested by the Analytical Hierarchy Process. The design of the recycled paper procurement strategy was obtained from procurement portfolio analysis and market analysis using the Kraljic Portfolio Matrix method.

Findings/results: The results showed that recycled paper was a strategic material with high supply risk and profit impact, and therefore needed a partnership strategy. This study further resulted in a partnership strategy that comprised three procurement programs: exploitation, balanced, and diversification.

Conclusion: Therefore, the three programs are the most appropriate in procuring recycled paper for PT KMA for the 2024-2026 period to ensure the continued availability of PT KMA recycled paper.

Originality/value (State of the art): The current state of research emphasizes integrating advanced analytical methods like AHP and the Kraljic Portfolio Matrix with sustainability principles to develop an effective procurement strategy. The strategy addresses recycled paper's supply risk and profit impact and sets the foundation for sustainable procurement practices within organizations.

Keywords: analytical hierarchy process, kraljic portfolio matrix, procurement strategy recycled paper, sustainable procurement

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INTRODUCTION

The vision of PT Kertas Makmur Abadi (an alias, hereafter named PT KMA) is to become a world-class paper-producing company that generates value and quality from responsible recycling processes and is committed to achieving Environmental, Social, and Governance (ESG) materiality in 2024-2026, namely Sustainable Value Towards Suppliers. PT KMA has set a domestic recycled paper (RCP) procurement target until 2026 to anticipate RCP import restrictions, as shown in Table 1. Table 1 shows an increase in RCP domestic procurement by 4% each year so we can expect a decrease in RCP import volume. With increasingly strict import regulations and restrictions on RCP exports from Europe, PT KMA needs to find suppliers of imported recycled paper (RCP) from non-EU countries that can meet the quality standards set by the government. This, in turn, will cause the purchase price of RCP to be higher than similar companies from other countries, increasing the price of finished products to open up opportunities for finished products from other nations to enter Indonesia.

Procurement strategy is the implementation of appropriate procurement methods to build collaborative relationships with suppliers to obtain the best materials or products needed. Procurement strategy can help identify the suitable delivery model and provide mechanisms to create optimal value (Ahmed et al. 2023), increase competitiveness (Özkan et al. 2021) and company resiliency during crisis (Kähkönen & Patrucco, 2022). Procurement should be aligned with the organization's strategy, vision, goals, and value proposition to achieve company goals (Mena et al. 2018). The grouping of the company's purchasing strategies shows the procurement process's competitive priority to achieve company goals (Patrucco et al. 2023).

According to Kraljic (1983), companies need to analyze the company and supply situation to determine the right procurement strategy and reduce the risks that can arise from the strategy. The strategy can be adopted by service companies to ensure the effectiveness of firms' purchasing objectives (Ye, 2021). Two critical variables that need to be analyzed are (1) the added value of the product can be seen by the percentage of the cost of purchased goods to total costs and its impact on profitability, and (2) the complexity of the supply market as measured by the availability of supply, monopoly or oligopoly conditions, substitute goods, entry barriers, technological advances and the cost or complexity of logistics.

There are three main procurement strategies: exploit, balance, and diversify, as shown in Figure 1. Then, different purchasing strategies are determined for each procurement strategy, such as supplier selection, negotiation process, volume, price, material substitution, inventory policy, etc.

According to Rogetzer et al. (2017), more than 70% of the experts surveyed agreed that companies in the paper industry with recycled paper as their primary raw material should own and develop their collection network and have direct access to the primary sources of recycled paper so that there is a strategic commitment to the long-term supply of recycled paper. Therefore, this study aims to develop 1) a sustainable procurement strategy to ensure the availability of recycled paper at PT Kertas Makmur Abadi (PT KMA), and 2) an implementation plan for executing the selected procurement strategy. The findings benefit PT KMA in conducting strategic procurement programs and provide a guide for other companies in various industries.

Table 1. Target volume (recycled paper) sourcing domestic – PT KMA

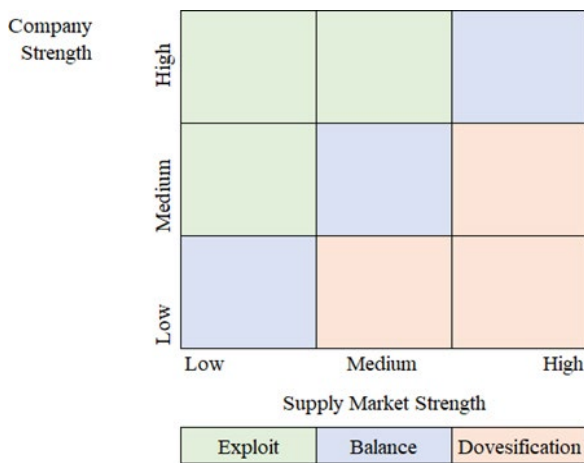|	2023	2024	2025	2026
% Volume RCP Domestic	67%	71%	74%	78%
Volume RCP Domestic (1.000 mt/year)	1.156	1.225	1.277	1.346
Volume RCP Domestic (1.000 mt/month)	101	107	111	117
Volume RCP Domestic (mt/day)	3.352	3.550	3.700	3.900

Figure 1. Kraljic Portfolio Matrix (Kraljic, 1983)

METHODS

This study was applied research designing PT KMA's recycled paper procurement strategy for 2024-2026. PT KMA was a manufacturing company that produced paper for the packaging industry. PT KMA used 100% recycled paper from local sources and imported it as raw material for production.

This study employed qualitative methods as the basis of research methods, namely questionnaires, interviews, observation, and analytical studies with existing theories. Research activities started with diagnosing existing procurement of RCP at PT KMA, collecting relevant data, and using management theory and analysis tools to obtain the expected procurement strategy design. The data collection took two months at the end of 2023. Table 2 detailed the types and sources of data, data collection techniques, and data analysis techniques.

This research used the Kraljic Framework to obtain the right procurement strategy, followed by ensuring the availability of PT KMA's recycled paper using a decision analysis framework. The Kraljic Matrix was most suitable for this PT KMA case as this approach aligned raw material characteristics and circumstances with strategy decisions for the company (Simchi-Levi et al. 2021). Furthermore, this study employed the AHP process, which could be used to determine detailed strategies and priority development programs for the company (Ichwani et al. 2019).

In Figure 2, PT KMA's RCP procurement data were collected then analyzed and profiled on the Kraljic Portfolio Matrix (1983). To obtain the most suitable RCP procurement strategy, some supplier analysis was conducted by collecting data from the RCP Sourcing and interviews with collectors.

Table 2. Data collection and researches

| Research Step	Data Collection	Data Source	Method
Company Target	Medium term target of RCP Sourcing	GM RCP Sourcing	Interview
Supplier Selection and Evaluation	Criteria of supplier selection and evaluation	Dept Head & GM RCP Sourcing	Interview
		Dept Head PPIC	
Supplier Analysis	Supplier strength and supplier needs, company strength	Dept Head & GM RCP Sourcing, Exim Manager RCP Suppliers	Interview Observation
Formulation of procurement strategy	Finding from step (1) to (3)	-	Data Analysis
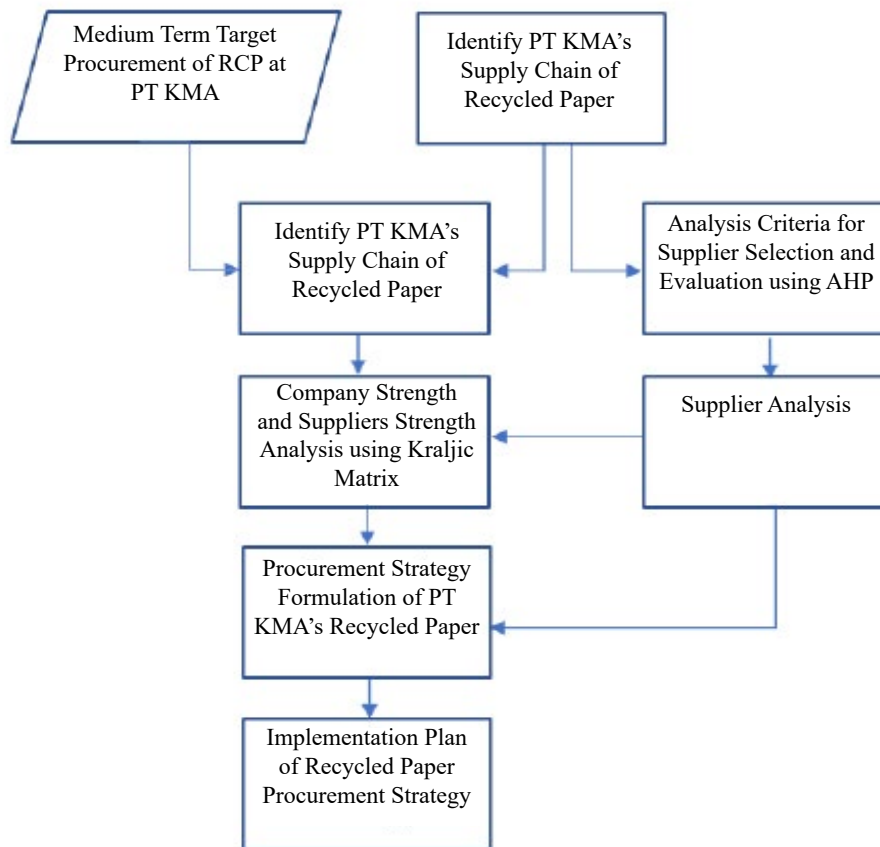
Figure 2. Analytical Framework

RESULTS

Target Recycled Paper (RCP) Sustainable Source

To ensure a sustainable source of recycled paper to anticipate risks that might occur in the future, PT KMA set the recycled paper procurement target as shown in Table 3. The recycled paper procurement target was obtained from an interview with the GM of RCP Sourcing as a representative of Management.

Phase 1 Kraljic Framework - Classification RCP PT KMA

From the discussion with GM RCP Sourcing, Head of Local RCP Sourcing - Business Development & Operation, and Head of Local RCP Sourcing - Planning, Marketing & Administration, it was concluded that recycled paper is a strategic item for PT KMA as shown in Figure 3, with the following considerations:

Profit Impact - High

1. Purchase volume: domestic RCP is required at 2,200 - 3,000 tons / day, equivalent to 60% of PT KMA's total raw material requirements.
2. RCP constitutes 55-60% of total production costs.
3. Improving the quality of RCP can directly increase the profit of PT KMA.

Supply Risk - High

1. The high demand and limited sources of RCP in Indonesia increase the risk of RCP supply. According to data released by the Directorate General of Agro-Industry (2022), there are 71 paper mills in Indonesia with a total production capacity of around 13 million tons/year, while the recovery rate in Indonesia is still very low at 41%. Several barriers to the procurement of imported RCP will increase competition for domestic RCP procurement.
2. The source of RCP in Indonesia is evenly distributed outside Jabotabek, so collectors/packers located outside Jabotabek require vehicles to deliver RCP to the mill. For locations outside Jabotabek, there is a dependence on large collectors, which increases the supply risk for PT KMA.

HIGH	Bottleneck Item	Strategic Items: Recycled Paper
LOW	Non-critical Items	Leverage Items
	LOW	HIGH

High Criteria:
- RCP Requirement: 2,200-3,000 mt/day
- RCP cost: 55-60% of total production cost
- RCP quality directly impact to profit of company

Low Criteria:
- Recycled paper is the main source for the company's product

Figure 3. Kraljic Matrix – RCP PT KMA (based on Kraljic, 1983)

Phase 2 Kraljic – Market Analysis

Criteria for Selection and Evaluation of Suppliers

Dickson (1966) used 23 criteria in his research conducted on 273 purchasers regarding decision making for supplier selection. Pandey et al. (2017) examined 4 criteria, namely economic aspects, lean practices, sustainability, and service, with 12 sub-criteria in sustainable supplier ownership. Romas and Martini (2021) used 5 criteria to determine the strategy for purchasing RCP in order to meet the needs of the paper industry, namely regulation, availability, price, quality, and impurity levels.

Multi-criteria Decision Making (MCDM) is an operational research method that is usually used to handle complex decision-making problems (Waris et al. 2019). The Analytical Hierarchy Process (AHP) is considered to be the most effective and commonly used MCDM method in various studies in different fields. The main steps in the formulation of the AHP framework are (1) setting up the hierarchy, (2) making pairwise comparisons, (3) finding relative weights, (4) consistency checks, and (5) synthesizing the results.

For the preparation of the recycled paper procurement strategy, the General Manager, Head of Local RCP Sourcing - Business Development & Operation, and Head of Local RCP Sourcing - Planning, Marketing & Administration selected 4 criteria and 6 sub-criteria (Table 4.) after evaluating 23 supplier selection/evaluation criteria obtained from research by Dickson

(1966). The selected criteria (Table 4.) are considered suitable for implementation and can support the sustainability of PT KMA's recycled paper supply. The criteria were then analyzed using a pairwise comparison technique from the Analytical Hierarchy Process method.

To determine the priority of the 6 sub-criteria, a questionnaire was made, which was filled in by GM RCP Sourcing, Local RCP Sourcing - Planning, Marketing & Administration Dept. Head, Production Optimization Manager, Production Optimization Section - Inventory Controller Dept. Head, Consumer Solution Services Dept. Head. The results of the pairwise comparison of 6 sub-criteria can be seen in Table 5, and the calculation of eigenvalue calculation and sub-criteria priority can be seen in Table 6.

Consistent

Data is acceptable if the consistency ratio is smaller than 10%. The calculation of the consistency ratio is done by first calculating the consistency index (CI), which will be divided by the random index (RI). The consistency index (CI) can be calculated by following the equation :

$$CI = (\lambda - n)/(n - 1)$$

Variables: λ max (highest eigen value = 1.13); n (number of sub-criteria = 6); CI = 0.017

Random Index (RI) with 6 sub-criteria according to Saaty & Vargas (2012) = 1.24 The consistency ratio (CR) is obtained as follows:

$$CR = CI/RI = 0,0137 (<10\%)$$

With CR below 10%, the results of pairwise comparison are considered consistent and can be used.

Suppliers List

To determine PT KMA's recycled paper procurement strategy, the company collected data from RCP suppliers/collectors and discussed it with suppliers/traders. There are 42 suppliers/collectors who collect and process recycled paper for delivery to paper mills. The total used capacity of the 42 collectors is 2,790 tons/day. This research then uses Decision Analysis to rank all collectors.

Table 3. Target Sustainable Source RCP PT KMA

Unit	2023	2024	2025	2026
% Volume Domestic RCP	67%	71%	74%	78%
Target Sustainable Source (%)	65%	68%	70%	75%
Total Requirement Domestic RCP (1.000 mt/month)	101	107	111	117
Target Sustainable Source (1.000 mt/month)	66	73	80	90
Target Sustainable Source (1 mt/day)	2.200	2.450	2.700	3.000
Existing Sustainable Source Volume (mt/day)	400	400	400	400
Additional Target Volume of Secure Source RCP	1.800	2.050	2.300	2.600

Table 4. Criteria for Selection and Evaluation of RCP Supplier

Criteria	Sub Criteria
Quality	Conformity with quality standards (1.1)
	Supply sustainability assurance (1.2)
	Availability all type of material (1.3)
Delivery	On-time delivery (2.1)
Services	Flexibility to demand change (3.1)
Supplier Performance	Development (potential to grow, quality improvement, sourcing share) (4.1)

Table 5. Pairwise comparison of sub-criteria supplier selection/evaluation

	1.1.	1.2.	1.3.	2.1.	3.1.	4.1.
1.1.	1	2.1779	2.3714	2.0362	1.1847	2.4122
1.2.	0.4592	1	1.4758	1.5518	1.2457	2.5365
1.3.	0.4217	0.6776	1	0.8027	0.5818	1.4034
2.1.	0.4911	0.6444	1.2457	1	0.7634	1.1847
3.1.	0.8441	0.8027	1.7188	1.3099	1	1.5518
4.1.	0.4146	0.3942	0.7125	0.8441	0.6444	1

Table 6. Eigen Value and Sub-criteria Priority

Sub-Criteria	1.1.	1.2.	1.3.	2.1.	3.1.	4.1.	Total	Priority	Eigen Value
1.1.	0.2754	0.3823	0.2782	0.2699	0.2186	0.2391	1.663	0.277	1.007
1.2.	0.1265	0.1755	0.1731	0.2057	0.2298	0.2514	1.162	0.194	1.103
1.3.	0.1161	0.1189	0.1173	0.1064	0.1073	0.1391	0.705	0.118	1.002
2.1.	0.1353	0.1131	0.1461	0.1325	0.1408	0.1174	0.785	0.131	0.988
3.1.	0.2325	0.1409	0.2016	0.1736	0.1845	0.1538	1.087	0.181	0.982
4.1.	0.1142	0.0692	0.0836	0.1119	0.1189	0.0991	0.597	0.099	1.004
TOTAL	1.00	1.00	1.00	1.00	1.00	1.00	6.00	1.00	6.085

Consistency Index = 0.017
RI = 1.24
Consistency Ratio = 0.0137036 (Consistent)

Decision Analysis at PT KMA was carried out by giving an assessment to the collectors on the fulfilment of 6 (six) sub-criteria according to the priority values in Table 6. Decision analysis is carried out by:
1. Assessment by RCP Sourcing Dept. Head.
2. Verification of assessment with GM of RCP Sourcing.
3. Assessment by the Exim Manager, who was previously the Purchasing Manager of RCP Sourcing.

Before the decision analysis is carried out, the assessment criteria that will be used in the decision analysis are determined (Table 7).

The weight of each sub-criteria uses the priority value obtained from AHP; then, an assessment is made of the vendors' ability to fulfill the sub-criteria in accordance with the decision analysis measurement criteria (Table 7). Then, the total score of each collector is calculated by summing the scores (value x weight) of all sub-criteria. A summary of the results of the decision analysis of all sellers is ranked, starting from the highest to the lowest total score.

The daily capacity of each vendor is summed up to obtain the total daily capacity of all vendors starting from the highest score. From the results of the decision analysis, the collectors who will be targeted as the main and sustainable source of recycled paper procurement at PT KMA are as follows :
1. 2024 - 25 collectors
2. 2025 - 29 collectors
3. 2026 - 36 collectors

Table 7. Assessment criteria for decision analysis

1.1. Conformity with quality standards	
3	Moist Occ ≤ 14%; Other OCC < 2%; Moist MXD ≤ 16%; Other MXD ≤ 10%
2	Moist Occ 15-16%; Other OCC < 2%; Moist MXD 17-20%; Other MXD 11-15%
1	Moist Occ >16%; Other2 OCC >2%; Moist MXD > 20%; Other2 MXD > 15%
1.2. Supply sustainability assurance	
3	Can provide sustainable supply, % share >60%, has good operational management
2	Can provide sustainable supply, willing to adapt to change, has successor, % share 40-60%
1	No Commitment, share <40%
1.3. Availability of all types of materials	
3	Flexible to changes in demand
2	Less flexible to changes in demand
1	Not flexible to changes in demand
2.1. On-time delivery	
3	Can deliver goods within the agreed time ± 1 day
2	Takes ± 3 days from the agreed time
1	Takes ± 1 week from the agreed time
3.1. Flexibility to demand changes	
3	Producing OCC, MXD, ONP and SWL
2	Produce only OCC and MXD
1	Produce only OCC
4.1. Development (potential to grow, quality improvement, sourcing share)	
3	Open to technological/regulatory changes/developments
2	Slow to accept technological/regulatory changes/developments
1	Unable to accept changes

Table 8. Company Strength

Company Strength	Description	Result	Value
Purchasing capacity	The company's capacity is up to 3,000 tons/day with a total availability of up to 4,850 tons/day.	High	3
Demand growth	Until 2026, the assumed growth of PT KMA demand is 15% of the current RCP purchasing capacity; while the waste recovery target in 2025 is: 70% (up 22.3% from 2022 waste recovery of 47.7%).	Medium	2
Utilized capacity of key units	Capacity utilized: 90-95%.	High	3
Market share and main competitors	Current market share around 30-35% (or around 1,800-2,000 tons/day).	High	3
Net profit of main product	Nett profit from main products : 5-10% (PT KMA's annual report 2022).	Medium	2
Cost and price structure	Cost structure for recycled paper : 55-60%.	Medium	2
Non-shipping costs	Potential costs incurred if quality is not up to scratch / delivery is not on time.	Medium	2
Production capacity	Do not have own recycled paper production capacity.	Low	1
Cost of obtaining supplies	Cost to source < 1% (Only operational cost of sourcing department - IDR 200,000,000/year) / cost to build recycled paper collection site: 3 - 3.5 M – PT KMA can still build a recycled paper collection unit.	Medium	2
Logistics	Does not have a unit for recycled paper pickup.	Low	1
TOTAL		Medium	21

Table 9. Purchasing portfolio evaluation criteria – collector RCP

Criteria	Weight		
	3	2	1
1. Market size versus supplier capacity	> 100 tons/day	50-100 tons/day	< 50 tons/day
2. Market growth versus capacity growth	Capacity growth > Market growth	Balanced	Capacity growth < Market growth
3. Capacity utilization or bottleneck risk	Capacity utilized < 50%	50-80% capacity utilized	Capacity utilized > 80%
4. Competition structure	Low competition, no papermill	Medium competition, 1-2 papermills	High competition, there are > 2 papermills
5. ROI and/or ROC	NOT APPLICABLE		
6. Cost and price structure	NOT APPLICABLE		
7. Break-even stability	NOT APPLICABLE		
8. Product uniqueness and technology stability	NOT APPLICABLE		
9. Entry barriers (Cost and know-how)	Investment > 3M or more	Investment : 500 Million - 3 M	Investment < 500 Million
10. Logistics situation	Own trucks for pickup and delivery	Own truck for pick up material	On-site receiving only

Company and Supplier Strength Analysis

The assessment of the company and suppliers' strengths was conducted using purchasing portfolio evaluation criteria (Kraljic, 1983) by conducting discussions with the GM Recycled Paper Sourcing and the Exim Manager. The assessment is done by giving a score from 1 (low) to 3 (high). From the discussion, the company strengths are summarized in Table 8. To assess the strength of suppliers, first determine the purchasing portfolio evaluation criteria to be used and the weighting criteria to be given (Table 9). The grouping of supplier positions follows the agreed criteria: Low - average score < 2; Medium - average score 2 - 2.6; High - average score > 2.6.

Strategic Positioning - Purchasing Portfolio Matrix

The company's strengths and the strengths of its suppliers are mapped on the purchasing portfolio matrix (Figure 5.) to determine the most suitable procurement strategy.

Plan Strategic Implementation

The most appropriate procurement strategy for RCP, which is a strategic material for PT KMA, is long-term partnership. Before designing a long-term partnership program, interviews were conducted with 5 collectors from a total of 42 suppliers in accordance with the MIL-STD-105E (1989) sampling technique. From the interviews, the collector's consideration in choosing a mill to supply RCP is relationships that have been established for a long time, competitive prices in the market, acceptable quality standards, on-time payment, reliable quality checks, fast unloading process, bonus program issued by the company, provision of facilities to support production. From the interview result, a long-term partnership program for RCP collectors was designed to ensure the sustainability of the supply of RCP at PT KMA (Table 10) and an implementation plan for one sample program is made as described in Table 11.
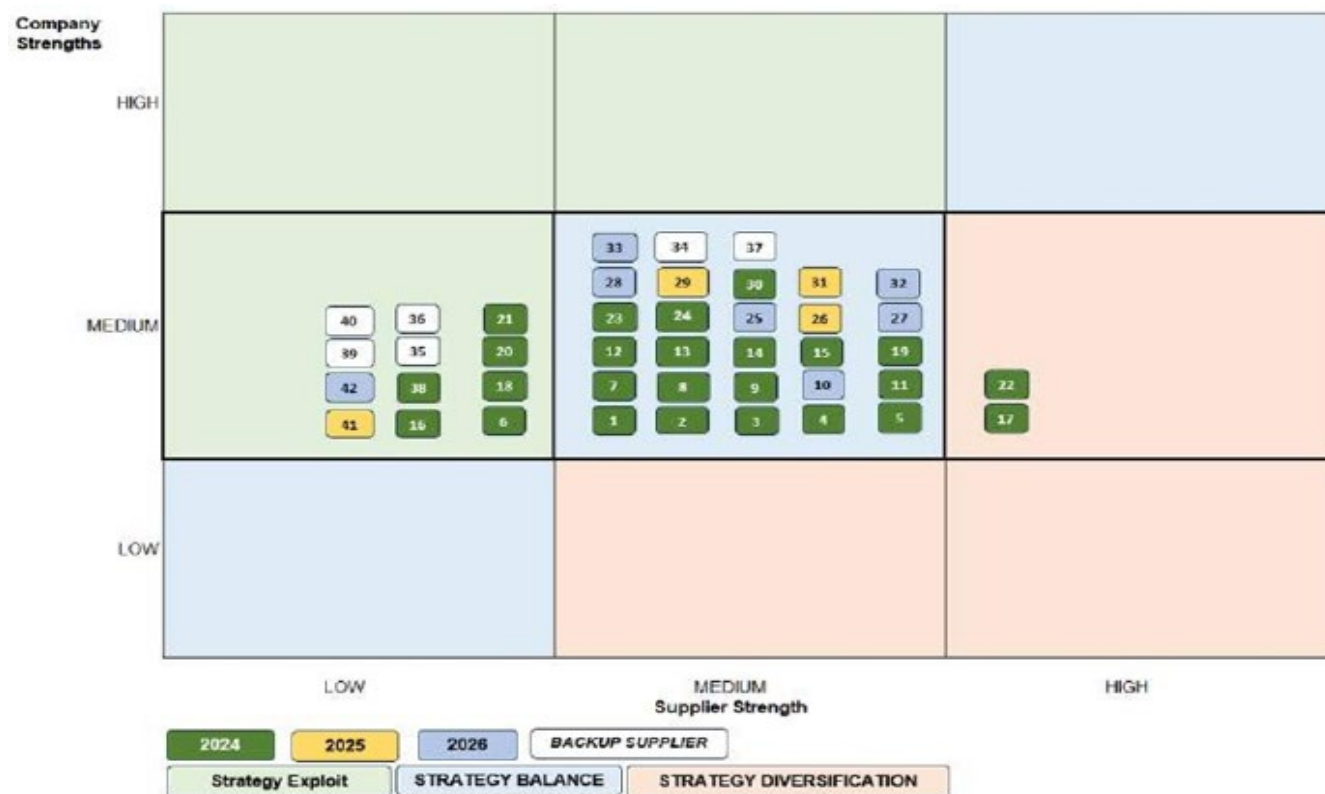

Figure 5. RCP Purchasing Portfolio Matrix – PT KMA

Table 10. Procurement Strategy

Policy	Exploit Strategy	Balance Strategy	Diversification Strategy
Price	Additional price with agreed quality of goods	Providing transportation subsidies for certain locations, for example outside the island.	Purchases at the same price from multiple branches, without eliminating transportation subsidies for closer branches
Volume	In certain periods such as peak season, purchases and bonuses are made	In certain periods such as peak season, purchases are made with volume contracts and bonuses	Purchase at the location of the collector's warehouse, with the agreement that if there is no significant change in quality, then there will be no volume cut due to quality deterioration
Contract	Not Applicable	Not Applicable	May use volume-binding contracts with bonuses if volume can be met by collectors
Make Policy	Not Applicable	Provision of work facilities to increase production capacity with specified delivery targets.	Establish production cooperation with suppliers in accordance with the concept of vendor managed inventory where company representatives are assigned to manage inventory at the gathering location.
Value Engineer	Not Applicable	Incentive program for quality improvement with predetermined standards.	Incentive program for quality improvement.
Logistic	Not Applicable	Material pick-up program at the collecting location.	Not Applicable

Table 11. Implementation Plan (Exploit Strategy)

Program	2024				2025				2026			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Exploit Strategy												
1 Additional price with agreed quality of goods												
- Creation, evaluation and revision of additional price proposal	■				■				■			
- Socialization of prices and expected quality standards	■				■				■			
- implementation of additional price		■	■	■	■	■	■	■	■	■	■	■
2 In certain periods, such as peak season, purchases and bonuses are made	■				■				■			

The results of this study show the importance of designing appropriate procurement strategies for companies for the sake of a sustainable supply of raw materials. The global world has experienced disruption in the supply of raw materials during the pandemic (Dube et al. 2022; van Hoek and Dobrzykowski, 2021), and these risks need to be anticipated and mitigated properly (Can Saglam et al. 2022). In addition, companies need to implement sustainable supply chain practices to be more aligned with the global Sustainable Development Goals (Zimon et al. 2020). One global initiative that can be implemented is sustainable procurement, as is also implemented by PT KMA. This is in line with a recent study from Hald et al. (2021) as well as the global trend toward circular economy practices (Hazen et al. 2021).

Managerial Implications

This study aims to provide a purchasing strategy design for PT KMA, but the strategy design process applies to various companies in different industrial sectors. From the results of this study, we recommend that operations managers implement suitable strategies that are adjusted to the characteristics of the company's raw materials. If planned long-term and analyzed

carefully, a procurement strategy can be a mainstay for a company to increase its superiority compared to competitors, especially in supply sustainability and potential savings in the long term.

Managers can also use the Kraljic Matrix framework to help group suppliers into more customized strategies according to the suppliers' and the company's strengths and bargaining power. The framework offers four strategies based on the extent of supply risk and profit impact, where a high supply risk with a high profit impact leads to a Partnership Strategy. Based on this suggestion, managers might develop more appropriate implementation plans for their suppliers so that the supply of strategic raw materials will continue to be maintained.

CONCLUSION AND RECOMMENDATIONS

Conclusions

To ensure the sustainable source of RCP as a strategic item for PT KMA in 2024- 2026, a long-term partnership program with its suppliers is needed. The long-term partnership program is grouped into three main programs, namely the exploit program, balanced program, and diversification program. The partnership program is then translated into activities in the implementation program that will be carried out during 2024-2026.

Recommendation

The scope of this research is limited to domestic RCP procurement strategies to ensure the sustainable source of RCP at PT KMA, and it is also necessary to conduct research to obtain a draft strategy for procuring imported RCP. Imported recycled paper can increase PT KMA's strength in the RCP market, which is expected to increase the company's profitability.

Conflicts of Interest: The authors declare no conflict of interest.

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