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# A SMART-BASED DECISION-MAKING FRAMEWORK FOR PRIORITIZING ENERGY EFFICIENCY INITIATIVES: A CASE STUDY OF AN INDONESIAN RETAIL COMPANY

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**Abstract**

This study develops a SMART-based decision-making framework to prioritize Energy Efficiency initiatives in an Indonesian retail company. PT Prima Retail Lestari (PT PRL) is a retailer which faces budget and operational constraints, while several Energy Efficiency initiatives are available and have different financial, ESG, feasibility, and risk implications. An applied case study method will be used. The data will be gathered through semi-structured interviews, questionnaires, and document analysis. Situational Appraisal and Kepner-Tregoe Problem Analysis will be used to clarify the decision making gap, while the SMART method will be used to compare five initiatives: Refrigerant Transition, Rooftop Solar Panel Implementation, LED Lighting Transition, Water Loop Refrigeration System, and HVAC Efficiency Improvement. The result shows that ESG contribution and financial impact are the most important criteria with normalized weights of 0.30 and 0.28, respectively. Rooftop Solar Panel Implementation gets the highest weighted score of 4.00, followed by LED Lighting Transition with 3.92 and Water Loop Refrigeration System with 3.86. The study recommends prioritizing rooftop solar, implementing LED transition in parallel, and preparing water loop refrigeration as a long term initiative.

**Keywords:** Energy Efficiency, SMART Method, Decision Making, Retail, ESG

## INTRODUCTION

Environmental, Social, and Governance (ESG) has became a part of the business strategy for many companies due to regulations and consumer expectations, especially for industries that influence the environment and communities. In retail industry, ESG issues cover a range of environmental and social issues including energy consumption, carbon emissions, food waste, packaging, employee welfare, occupational health and safety, and healthier product choices. This range of issues continues to develop due to changes in regulations and business priorities.

Energy and emissions are two major ESG issues for retail companies. Deloitte (2023) citing data from the World Business Council for Sustainable Development notes that the retail supply chain produces around 25% of the world's greenhouse gas emissions. The details of the retail supply chain breakdown show that emissions come from purchased products and services, store operations and company vehicles, store electricity and heating, product shipping, and end-of-life disposal (Novotny, 2025). This means that despite the fact that the majority of retail emissions are produced in the supply chain process, store operations and electricity use are still important issues that retailers can manage.

PT Prima Retail Lestari (PT PRL) is a modern retail company in Indonesia with supermarkets as the primary business format. The company sells daily consumer products including fresh products, dry groceries, and household items. PT PRL has over 250 stores throughout Indonesia with the support of distribution centers and head office functions. PT PRL is a joint venture between the Global Retail Group and a local partner. Due to the structure of ownership, PT PRL must translate the global ESG directions into local business situation. In 2025, weak economic conditions had an impact on profitability and forced the company to make more selective investment decisions. PT PRL can no longer implement all ESG initiatives simultaneously. The company needs to prioritize initiatives that will provide some value for the company under budget and operational constraints. Since around 30% of retail emissions are related to the store operation and electricity use, PT PRL decided to prioritize Energy Efficiency initiatives. Such initiatives are important as they might generate electricity cost savings, carbon emissions reductions,

and operational efficiency. At the same time, Energy Efficiency initiatives have different costs, benefits, technical implications, implementation risks, and long term value. PT PRL considered several Energy Efficiency initiatives including Refrigerant Transition, Rooftop Solar Panel Implementation, LED Lighting Transition, Water Loop Refrigeration System, and HVAC Efficiency Improvement. At the same time, the existing decision making process in the company depends mostly on discussions, technical readiness, budget availability, and management judgment. The company does not have any structured framework to compare the alternatives using consistent criteria.

Based on this issue, this study aims to develop a structured decision making framework which will help PT PRL to prioritize Energy Efficiency initiatives. The study will have three objectives. First, it will identify the criteria used to evaluate Energy Efficiency initiatives. Second, it will develop a SMART-based decision making framework for prioritization. Third, it will identify the Energy Efficiency initiative that should be prioritized under budget and operational constraints.

## LITERATURE REVIEW

Decision making process for sustainability and energy management usually includes many criteria and interests of different stakeholders. Sousa, Almeida, and Calili (2021) state that decision making process for sustainable development requires structured assessment as it is usually related to many objectives. D'Adamo and Gastaldi (2022) also note that sustainability assessment can be related to different dimensions and multi-criteria decision analysis becomes useful in this case. In the context of energy, Sahoo and Choudhury (2025) point out that energy management problem usually includes competing criteria, uncertainty, and dynamic decision environment.

Situational Appraisal is useful at the initial phase of problem solving as decision makers must understand the current situation before finding a solution. Kepner and Tregoe (2013) define Situational Appraisal as a rational process that allows recognizing concerns, separating issues, setting priorities, and determining the next type of analysis needed. It is important for PT PRL as the problem of Energy Efficiency initiation prioritization might be just the symptoms of the bigger problem related to unclear evaluation criteria, fragmented information, different stakeholder priorities, and lack of structured decision making process.

Kepner-Tregoe Problem Analysis helps to define the problem analyzing what the problem is, where it occurs, when it occurs, and how far the impact extends. It is useful as it helps to separate the actual problem from irrelevant issues. Markopoulos et al. (2022) note that the Kepner-Tregoe method helps to enhance situational understanding and critical thinking in organizations. For this study, the Kepner-Tregoe Problem Analysis will help to reveal that the problem in PT PRL is not in the absence of ESG initiatives but in the absence of the structured way to evaluate and prioritize them.

Simple Multi-Attribute Rating Technique (SMART) is the multi-criteria decision making method used for the evaluation of alternatives based on several criteria. SMART is related to decision analysis and multi-attribute decision making logic as the alternatives are evaluated according to their performance regarding the different attributes, while each attribute has its own weight according to its importance. Keeney and Raiffa (1976) note that many decision problems are associated with multiple objectives, while Belton and Stewart (2002) emphasize the importance of multi-criteria decision analysis in making objectives, alternatives, criteria, and trade-offs more explicit.

SMART is important for the Energy Efficiency prioritization as the company cannot base its decision on one factor. The Energy Efficiency initiative with the lowest cost will not necessarily provide the highest ESG contribution, while the one with the highest ESG impact can be complicated to implement or require high investments. Taherdoost and Mohebi (2024) emphasize that SMART is useful as it is simple, transparent, and easy to use in multi-attribute decision making. At the same time, it depends on the judgment of the stakeholder in terms of assignment of weights and scores. Therefore, SMART can be used as the decision support tool and not the automatic final decision.

Several studies also support the use of SMART in business, sustainability, and energy decisions. Lipka and Szwed (2021) used SMART to select the clean coal energy generation technology using environmental, technological, and economic criteria. Wulf, Haase, Baumann, and Zapp (2023) used SMART to count weighting factors for the sustainability assessment of energy technologies. Gultom and Siallagan (2025) used both Kepner-Tregoe and SMART for clarifying the business problem and evaluating alternative solutions. These studies confirm that Kepner-Tregoe and SMART methods can be used in the applied business research as Kepner-Tregoe helps to clarify the problem, while SMART evaluates alternatives.

## METHOD

The applied case study approach will be used in one company, PT PRL. The unit of analysis will be the internal decision making process for the purpose of proposal, evaluation, and prioritization of Energy Efficiency initiatives. The study will focus on how different divisions cooperate in the evaluation process and how their views can be translated into the structured prioritization framework. Primary data will be collected through semi-structured interviews and questionnaires. The respondents will be selected according to their involvement in ESG decision making and implementation. It includes Steering Committee, Strategy & Sustainability, Business Planning, Project Investment, Maintenance, Property, and Store Operations. These functions are selected due to their involvement in approval, ESG alignment practicality.

Semi-structured interviews will be used to analyze the current prioritization process, reveal the decision making gap, and explore the criteria. The questionnaire will be used to gather the quantitative inputs for the SMART analysis. The respondents will be asked to rate the importance of four criteria: financial impact, ESG contribution, feasibility, and risk. They will be asked also to score five Energy Efficiency alternatives using the same criteria. The scale is from 1 to 5, with a higher number indicating a stronger condition. The secondary data will be collected from the internal company documents and relevant public references. Internal documents will be used to understand the list of initiatives, planning process, cost assumptions, and implementation considerations. The public references will be used for the background, literature review, and discussion on ESG, energy efficiency, and decision making methods.

Data analysis will be performed in three steps. At first, the Situational Appraisal will be used to identify current concerns, priority issues, and the type of analysis needed. Secondly, the Kepner-Tregoe Problem Analysis will be used to reveal the actual problem by using the dimensions of what, where, when, and extent. Thirdly, the SMART method will be used to evaluate and prioritize the alternatives. SMART is used as the primary decision making tool to evaluate and prioritize Energy Efficiency initiatives since it provides flexibility in case of changes in available initiatives and assumptions. In case of changes, the framework can be adjusted by including a new alternative in the scoring model and adjusting the criteria weights or scores without changing the overall decision making structure. The data needed for criteria weights and alternative scores will be collected via questionnaires of the relevant stakeholders. Table below shows energy efficiency alternatives and cost assumptions collected from internal documents.

**Table 1.** Energy Efficiency alternatives and cost assumptions

| Initiative | CAPEX (IDR mio) | OPEX (IDR mio) | Total Cost (IDR mio) |
|---|---|---|---|
| Refrigerant Transition | 420 | 40 | 460 |
| Rooftop Solar Panel Implementation | 500 | 25 | 525 |
| LED Lighting Transition | 150 | 10 | 160 |
| Water Loop Refrigeration System | 750 | 60 | 810 |
| HVAC Efficiency Improvement | 300 | 30 | 330 |

## RESULTS AND DISCUSSION

### Current Decision-Making Gap

The results of the Situational Appraisal show four main concerns in PT PRL's current Energy Efficiency decision making process. First, Energy Efficiency initiatives are driven by the company's direction but the direction has not been translated into structured evaluation criteria. Second, the company does not have a structured framework to compare and prioritize initiatives. Third, the prioritization process still depends on the discussion based judgment, budget availability, and ease of implementation. Fourth, the initiatives have different characteristics and uncertainty, especially as each of them has different technical requirements, cost implications, and implementation risks.

It can be seen that the core of the issue is not in the lack of Energy Efficiency initiatives. The initiatives already exist and some of them are implemented or considered. The main problem is in the way how they are evaluated and prioritized. The Kepner-Tregoe Problem Analysis proves that the issue occurs during the process of evaluation and prioritization, not during the execution of the initiatives. It happens across several divisions because the ESG initiative selection depends on sustainability alignment, financial review, investment feasibility, technical readiness, store infrastructure, and operational practicality. Such situation can make decision making inconsistent. For example, one initiative can seem attractive from the ESG perspective but it can require high investments or complex technical preparation. Another initiative can be easier to implement but it will not have the strongest ESG contribution. Without

a standardized framework, each division will emphasize different factors. Therefore, PT PRL needs a decision making framework which will capture the expected impact and implementation considerations.

**SMART Criteria and Weights**

Based on the interviews and questionnaires, four criteria were selected for the SMART framework: financial impact, ESG contribution, feasibility, and risk. Financial impact reflects the expected economic benefit of an initiative, including cost savings and the required investment. ESG contribution reflects the degree to which an initiative supports the sustainability targets. Feasibility reflects the practicality of implementation in the store and operational conditions. Risk reflects the manageability of the uncertainty and possible disruptions related to implementation.

The criteria weights were calculated by averaging the importance scores received from the seven respondents and normalization. ESG contribution received the highest normalized weight of 0.30 followed by the financial impact (0.28), feasibility (0.24), and risk (0.18). It means that the stakeholders still see the sustainability impact as the most important consideration but they also consider the financial benefits because the company has budget constraints. Feasibility and risk are also important since the selected initiative should be practical and manageable.

**Table 2.** Criteria weights for SMART analysis

| Criteria | Average Score | Normalized Weight |
|---|---|---|
| Financial Impact | 4.3 | 0.28 |
| ESG Contribution | 4.6 | 0.30 |
| Feasibility | 3.7 | 0.24 |
| Risk | 2.7 | 0.18 |
| **Total** | **15.2** | **1.00** |

**SMART Evaluation Results**

SMART analysis evaluates five alternatives: Refrigerant Transition, Rooftop Solar Panel Implementation, LED Lighting Transition, Water Loop Refrigeration System, and HVAC Efficiency Improvement. Each alternative was rated from 1 to 5 based on the four criteria. Then the score of each alternative was multiplied by the normalized weight of each criterion to produce the final weighted score.

The result shows that Rooftop Solar Panel Implementation received the highest total weighted score of 4.00. It has strong financial and ESG scores since it helps to reduce the long term electricity costs and generate the renewable electricity. At the same time, its feasibility and risk scores are moderate as its implementation depends on rooftop size, building structure, lease status, shading condition, and electricity load profile.

LED Lighting Transition received the second position with the weighted score of 3.92. Its main strength is feasibility and risk manageability. The LED technology is widely available, easy to install, can be implemented gradually, and it causes limited disruptions to the store operations. Even though the ESG contribution of LED lighting is not as high as in rooftop solar, it is still a good quick-win initiative since it requires lower investments and electricity savings. Water Loop Refrigeration System received the third position with the weighted score of 3.86. This initiative has a strong long term potential since refrigeration is one of the biggest energy consuming areas in supermarket operations. At the same time, it receives lower feasibility and risk scores because it requires more technical preparation, infrastructure readiness, and maintenance capabilities. HVAC Efficiency Improvement and Refrigerant Transition are still relevant but have lower weighted scores in comparison with the three strongest alternatives.

**Table 3.** Weighted score and priority ranking

| Rank | Initiative | Financial | ESG | Feasibility | Risk | Total |
|---|---|---|---|---|---|---|
| 1 | Rooftop Solar Panel Implementation | 1.24 | 1.50 | 0.73 | 0.53 | 4.00 |
| 2 | LED Lighting Transition | 0.92 | 0.90 | 1.21 | 0.89 | 3.92 |
| 3 | Water Loop Refrigeration System | 1.24 | 1.41 | 0.73 | 0.48 | 3.86 |
| 4 | Refrigerant Transition | 0.84 | 1.20 | 0.73 | 0.53 | 3.30 |
| 5 | HVAC Efficiency Improvement | 0.84 | 0.90 | 0.73 | 0.71 | 3.18 |

**Cost Benefit and Sensitivity Analysis**

The cost benefit analysis strengthens the interpretation of the SMART result. LED Lighting Transition, Rooftop Solar Panel Implementation, and Water Loop Refrigeration System are the most relevant alternatives in the efficient frontier discussion. LED Lighting Transition is the low-cost and high feasibility option. Rooftop Solar Panel Implementation provides the highest benefit score with a moderate investment level. Water Loop Refrigeration System requires the highest investment but remains strategically important since it is targeted at the refrigeration efficiency which is material for supermarket operations.

The sensitivity analysis shows that the ranking of alternatives changes when the evaluation is made only according to the implementation considerations or only according to the expected impact. When financial impact and ESG contribution are equal to zero, LED Lighting Transition becomes the strongest alternative with the score of 5.00 because it is the easiest and least risky initiative to implement. HVAC Efficiency Improvement becomes the second in this scenario because it is also relatively manageable. This means that LED Lighting Transition is the strongest initiative when PT PRL prioritizes practicality and low operational risk.

When feasibility and risk are equal to zero, Rooftop Solar Panel Implementation becomes the strongest alternative with the score of 4.72. Water Loop Refrigeration System becomes the second alternative with the score of 4.58. This means that, if the company focuses only on the potential benefits, Water Loop Refrigeration System becomes more attractive than LED Lighting Transition due to its long term impact. However, its implementation complexity reduces the normal score. Overall, the sensitivity analysis reveals that each initiative has its strengths. The Rooftop Solar Panel Implementation is the best balanced option, LED Lighting Transition is the best quick-win option, and Water Loop Refrigeration System is a strong long-term option.

**Table 4.** Sensitivity analysis summary

| Initiative | Implementation Only | Normal Score | Expected Impact Only |
|---|---|---|---|
| Refrigerant Transition | 3.00 | 3.30 | 3.52 |
| Rooftop Solar Panel Implementation | 3.00 | 4.00 | 4.72 |
| LED Lighting Transition | 5.00 | 3.92 | 3.14 |
| Water Loop Refrigeration System | 2.88 | 3.86 | 4.58 |
| HVAC Efficiency Improvement | 3.42 | 3.18 | 3.00 |

**Proposed Business Solution**

Based on the analysis, this study offers two business solutions for PT PRL. First, it suggests adopting the SMART-based decision making framework as a part of the ESG planning, budgeting, and investment review process. In practice, SMART method does not have to be repeated through formal interviews and questionnaires each time the initiative is proposed. The logic of the framework can be translated into a standardized business case template. Initiative owner explains the financial impact, ESG contribution, feasibility, and risk of the initiative and the score can be discussed and validated in a cross-divisional meeting.

Second, PT PRL should develop a phased Energy Efficiency roadmap. PT PRL should prioritize Rooftop Solar Panel Implementation as the main initiative because it has the highest weight score and ESG contribution. PT PRL should start with selected stores or facilities with the highest electricity consumption and suitable rooftop conditions. Before the full roll-out, PT PRL should conduct feasibility studies and pilot implementation.

The LED Lighting Transition should be implemented in parallel. It has lower investment requirements, high feasibility, and low implementation risk. It can provide short term electricity savings while the company is preparing the large initiatives. The Water Loop Refrigeration System should be prepared as a long term strategic initiative. In the first 12 months, the company should conduct technical feasibility studies, find pilot stores, and develop a roadmap rather than implement it. Refrigerant Transition can be included into the broader refrigeration improvement roadmap and HVAC Efficiency Improvement can be considered depending on the store condition and operational needs.

Table 5. Proposed implementation roadmap

| Period | Main Activity | Expected Output |
|---|---|---|
| Q1 | Develop SMART based business case template and evaluation guideline | Standard framework and scoring guideline |
| Q2 | Conduct feasibility study and prepare business case for solar and LED | Validated assumptions and management proposal |
| Q3 | Run pilot implementation for rooftop solar and LED transition | Pilot result, initial savings, and implementation report |
| Q4 | Monitor pilot result and prepare water loop refrigeration roadmap | Evaluation report and long term refrigeration plan |

## CONCLUSION

The study develops a decision making framework for the prioritization of Energy Efficiency initiatives at PT PRL under budget and operational constraints. The study reveals that the main problem is not in the absence of ESG or Energy Efficiency initiatives, but in the absence of the structured way to evaluate and prioritize them consistently. The current process depends on discussion-based judgment and can produce inconsistent decisions across the different divisions. The study reveals four criteria important for the prioritization of Energy Efficiency initiatives: financial impact, ESG contribution, feasibility, and risk. According to the results, ESG contribution has the highest weight, followed by financial impact, feasibility, and risk. This shows that stakeholders would like the selected initiative to have a positive impact on sustainability targets and financial and operational perspectives.

According to the SMART analysis, the Rooftop Solar Panel Implementation initiative should be prioritized since it has the highest weighted score and provides strong ESG contribution. LED Lighting Transition should be implemented in parallel because it has high feasibility, low risk, and is relatively low cost. The Water Loop Refrigeration System should be prepared as a long-term initiative as it has high potential impact but it requires more detailed technical and financial assessment. For future research, the framework can be improved by adding more detailed financial analysis including payback period, net present value, internal rate of return, and actual energy savings. Future studies can also test the framework using the post-implementation data or apply it in other retail companies to compare how ESG initiatives are prioritized in different business contexts.

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