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COMMUNITY EMPOWERMENT BASED ON WASTE MANAGEMENT (CASE STUDY IN BOGOR REGENCY)

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Abstract

Based on a study conducted in 2012, the prevailing waste management pattern consists of 69% being disposed of in landfills, 10% being buried, 7% being recycled, 5% being incinerated, and the remainder categorized as residual waste (menlh.go.id, 2015). To reduce landfill waste, one effort that can be made is community empowerment through waste utilization. Therefore, a program that involves the community—commonly referred to as community empowerment—is needed to provide benefits for both the community and the environment.

The purpose of this research is to identify the benefits, opportunities, costs, and risks (BOCR) within this empowerment model and to determine strategic priorities to reduce costs and risks while increasing benefits and opportunities as carried out by waste bank managers. The research method used is the Analytic Network Process (ANP) for Benefit-Opportunity-Cost-Risk (BOCR) analysis.

The results of this study show that the greatest impact of implementing this empowerment model is the emergence of an alternative with the highest priority: increasing public knowledge about waste and generating healthier environmental conditions as the main opportunity. In terms of cost, the highest priority is the marketing cost of recycled products, while the main risk is the inability to absorb products in the market.

Among the benefit, opportunity, cost, and risk criteria, the highest priority—agreed upon by 65%—is the alternative and opportunity aspects. The short-term alternative is the formation of a waste bank association, while the long-term alternative is centralized marketing coordination. Therefore, this community empowerment initiative can serve as a model for other waste banks.

Keywords: ***benefit, opportunity, cost, risk, Analytic Network Process (ANP), Benefit-Opportunity-Cost-Risk (BOCR)***

Abstrak

Berdasarkan penelitian yang dilakukan pada tahun 2012, pola pengelolaan sampah yang berlaku terdiri dari 69% dibuang ke tempat pembuangan akhir (TPA), 10% ditimbun, 7% didaur ulang, 5% dibakar, dan sisanya dikategorikan sebagai sampah residu (menlh.go.id, 2015). Untuk mengurangi sampah yang masuk ke TPA, salah satu upaya yang dapat dilakukan adalah pemberdayaan masyarakat melalui pemanfaatan sampah. Oleh karena itu, diperlukan

program yang melibatkan masyarakat – yang umum disebut sebagai pemberdayaan masyarakat – agar memberikan manfaat bagi masyarakat sekaligus lingkungan.

Tujuan penelitian ini adalah untuk mengidentifikasi manfaat, peluang, biaya, dan risiko (BOCR) dalam model pemberdayaan ini serta menentukan prioritas strategis untuk mengurangi biaya dan risiko sekaligus meningkatkan manfaat dan peluang sebagaimana dilakukan oleh pengelola bank sampah. Metode penelitian yang digunakan adalah Analytic Network Process (ANP) untuk analisis Benefit-Opportunity-Cost-Risk (BOCR).

Hasil penelitian ini menunjukkan bahwa dampak terbesar dari penerapan model pemberdayaan ini adalah munculnya alternatif dengan prioritas tertinggi yaitu meningkatkan pengetahuan masyarakat tentang sampah dan menciptakan kondisi lingkungan yang lebih sehat sebagai peluang utama. Dari segi biaya, prioritas tertinggi adalah biaya pemasaran produk daur ulang, sedangkan risiko utama adalah ketidakmampuan menyerap produk di pasar. Di antara kriteria manfaat, peluang, biaya, dan risiko, prioritas tertinggi – yang disepakati sebesar 65% – adalah aspek alternatif dan peluang. Alternatif jangka pendeknya adalah pembentukan asosiasi bank sampah, sedangkan alternatif jangka panjangnya adalah koordinasi pemasaran secara terpusat. Dengan demikian, inisiatif pemberdayaan masyarakat ini dapat menjadi model bagi bank sampah lainnya.

Kata kunci: manfaat, peluang, biaya, risiko, Analytic Network Process (ANP), Benefit-Opportunity-Cost-Risk (BOCR)

Introduction

The growing waste problem in Indonesia is inseparable from the annual increase in population, which is the main contributing factor to this issue. Every individual inevitably generates waste from daily activities and consumption. The waste problem cannot be resolved simply by disposing of trash into bins, having it collected by garbage trucks, and dumping it in a designated area. Instead, a professional approach to waste handling and management is required. This professional approach must move beyond end-of-pipe solutions and embrace a paradigm of sustainable materials management, which views waste not as a useless byproduct to be discarded, but as a potential resource that can be reintegrated into the economic cycle. The linear economic model of "take-make-dispose" that has long dominated global consumption patterns is fundamentally unsustainable, especially for a developing nation with a population exceeding 270 million. This model places an immense and growing burden on limited land resources, creates significant environmental externalities such as soil and water contamination, and represents a substantial

economic loss in the form of valuable materials that are buried and forgotten. The challenge, therefore, is not merely to build more landfills or purchase more collection trucks, but to orchestrate a systemic shift towards a circular economy that prioritizes waste reduction at the source, encourages product redesign for longevity and reparability, and maximizes recovery through reuse, recycling, and composting. This transition demands a multi-stakeholder framework involving stringent government policy, innovative corporate responsibility, and, most critically, active and empowered community participation. It is at this community level that the most immediate and tangible changes can occur, transforming abstract national policies into concrete local action. Community-based waste management initiatives represent a critical nexus where environmental goals converge with social empowerment and economic opportunity, creating a powerful catalyst for sustainable development.

It is estimated that waste in Indonesia would reach 68 million tons by 2019, according to the Director General of Waste, Hazardous Waste, and B3 Management of the Ministry of Environment and Forestry, Tuti Hendrawati Mintarsih (CNN Indonesia, 2015). Therefore, the waste management system in urban areas requires special attention, including the availability of land and tools capable of recycling waste into usable products. **This staggering figure,** which has likely grown significantly in the subsequent years, underscores a national crisis that manifests most visibly in urban centers. Cities, as hubs of commerce and consumption, generate waste at a density and volume that often overwhelms municipal capacity. The challenges are multifaceted: logistical nightmares in collection and transportation through congested streets, the social and political difficulties in siting new landfills or waste processing facilities (a phenomenon known as "Not In My Backyard" or NIMBYism), and the financial strain of maintaining and expanding waste services on already tight public budgets. The traditional government-centric approach, where municipalities bear sole responsibility for waste from collection to final disposal, is proving to be financially and operationally untenable. This has created a pressing need for decentralized, cost-effective, and innovative solutions that can operate at a community or district level. These solutions must leverage appropriate technology—not necessarily the most advanced, but the most suitable for the local context—to sort, process, and add value to waste streams. This includes simple composting units for organic waste, which constitutes the majority of Indonesia's waste stream, as well as more organized systems for collecting and aggregating recyclables like plastics, paper, glass, and metals to achieve economies of scale that make recycling financially viable. By creating a distributed network of small-scale processing points, the pressure on central landfills is alleviated, transportation costs and emissions are reduced, and materials are recovered much more efficiently.

Based on a study conducted in 2012, the existing waste management pattern consisted of 69% being dumped in landfills, 10% being buried, 7% composted and recycled, 5% incinerated, and the remaining 5%—which could

not be recycled—classified as residual waste (menlh.go.id, 2015). This distribution reveals a critical imbalance and a significant opportunity. The heavy reliance on landfilling (69%) is the least desirable option from an environmental and resource perspective. It generates methane, a potent greenhouse gas, from decomposing organic matter; it risks leaching toxic substances into groundwater; and it perpetuates the linear "take-make-dispose" model. The mere 7% that is composted and recycled represents a vast untapped potential. This low figure is not due to a lack of recyclable material but rather to the absence of efficient, structured, and incentivized collection systems. The informal sector, comprising waste pickers (*pemulung*), has long been the de facto recycling workforce, performing a valuable yet often dangerous and unrecognized service. However, their efforts are fragmented, unregulated, and lack the integration needed to maximize recovery rates and ensure decent working conditions. Formalizing and empowering this sector through community-based organizations can dramatically increase recycling rates. Furthermore, the 5% incineration, while reducing volume, poses its own risks if not managed with advanced emissions control technology to prevent the release of dioxins and other harmful pollutants. The data from 2012 serves as a stark baseline, highlighting an urgent need for interventions that can drastically shift this pattern towards a much higher percentage for composting and recycling, thereby reducing the landfill burden to an absolute minimum reserved only for true residuals.

According to Nurhayanti, the Regent of Bogor Regency, the garbage trucks in the regency are unable to transport the total waste volume, which reaches 120 tons per day. Of the household waste produced, around 60%-70% is organic waste, while 30%-40% is inorganic. Among the inorganic waste, approximately 20%-30% can be recycled (Damanhuri, 2017). Nurhayanti also stated that flooding is partly caused by waste, and because Bogor Regency lies along the Cisadane and Ciliwung rivers, development and environmental control must be regulated to avoid being blamed when floods occur in Jakarta (Himi Abdul Halim, 2017). The case of Bogor Regency is a microcosm of Indonesia's broader waste challenges and exemplifies the direct link between poor waste management and other environmental disasters. The statistic that 60-70% of waste is organic is both a challenge and an enormous opportunity. Organic waste, when landfilled, is a major problem, but when managed properly through composting or anaerobic digestion, it becomes a valuable resource—producing nutrient-rich soil amendment for agriculture and gardens, reducing the need for chemical fertilizers, and closing the nutrient loop. The inability of garbage trucks to collect all waste leads to illegal dumping and the clogging of drainage systems and rivers. This is a primary cause of the frequent and devastating floods that affect not only Bogor but also downstream areas like Jakarta. Plastic bags and packaging are particularly pernicious, creating blockages that exacerbate flooding during heavy rains. Therefore, improving waste management in Bogor is not just a local sanitation issue; it is a critical piece of regional water management and flood mitigation strategy. This creates

a powerful imperative for local government to invest in and promote community-level solutions that reduce the amount of waste requiring collection in the first place. By empowering communities to manage their organic waste through home composting or community-scale composting facilities, the volume of waste that the municipal trucks must collect is immediately reduced by over half. This freed-up capacity can then be better focused on collecting residual and recyclable waste, making the entire system more efficient and resilient.

According to MUI Fatwa No. 47 of 2014 concerning Waste Management to Prevent Environmental Damage, every Muslim is obliged to maintain environmental cleanliness, utilize leftover items, and avoid wastefulness and extravagance. The fatwa also states that recycling waste into useful products that contribute to the welfare of the community is considered a communal obligation (*fardhu kifayah*). This religious ruling provides a profound and culturally resonant ethical foundation for waste management efforts in Indonesia, the world's largest Muslim-majority nation. It elevates the act of waste reduction and recycling from a mere secular environmental concern to a religious duty and an act of worship (*ibadah*). The concepts of avoiding wastefulness (*israf*) and extravagance (*tabdzir*) are central to Islamic teachings on consumption, encouraging a lifestyle of moderation and mindfulness. The fatwa explicitly frames the mismanagement of waste as a form of environmental damage (*ifsad al-bi'ah*), which is religiously prohibited. Most significantly, by classifying recycling for community welfare as a *fardhu kifayah*, it places a collective responsibility on the Muslim community. This means that if a sufficient number of people within a community engage in these practices, the obligation is lifted from others; however, if no one does, then the entire community is considered sinful. This creates a powerful social and religious impetus for collective action. It encourages mosque congregations, Islamic boarding schools (*pesantren*), and Muslim communities to establish and participate in waste management initiatives, such as waste banks (*bank sampah*), not just for economic or environmental reasons, but to fulfill a shared religious obligation. This integration of faith-based values with modern environmentalism offers a uniquely powerful motivator for behavioral change, fostering a sense of moral purpose and community solidarity that can be far more effective than top-down regulations or economic incentives alone. It provides a compelling "why" that can drive deep and lasting engagement in community empowerment programs centered on waste.

Literature Review

Empowerment

Community empowerment is a concept aimed at granting authority and trust to every individual within an organization, and

encouraging those individuals to be creative in carrying out their tasks to the best of their abilities (Ife, 1995).

Empowerment is an economic development concept that encompasses social values. This concept tends to be *people-centered, participatory, empowering, and sustainable*, in which the participation of the community itself is required, as well as strengthening the potential that exists within the community (Chambers, 1985). This concept not only aims to meet the basic needs of the community and prevent the continuation of poverty, but also addresses the root of the problem—namely, by improving the capabilities of the community.

Empowerment is about giving full authority to the community with the goal of enabling them to grow and understand themselves in all aspects (Taufik, 2016).

Waste Management

Waste management is a systematically conducted activity in terms of waste reduction and handling, aimed at improving public health, environmental quality, and utilizing waste as a resource (LH, 2008).

An integrated waste management system is defined as the application and selection of technologies and management strategies to achieve the highest level of efficiency, through the following processes (Syafrudin, 2004):

1. **Source Reduction**: The process of minimizing waste generation by reducing the volume and hazard level of waste that spreads in the environment.
2. **Recycling**: The process of reusing waste to reduce the need for raw materials and decrease the volume of waste at landfills.
3. **Waste Transformation**: Changes that occur in waste, including physical, chemical, and biological transformations. These three components determine the level of efficiency required in the waste management system. This process can produce other useful products such as compost.
4. **Landfilling**: The final stage of managing residual waste that can no longer be utilized, by disposing it at a landfill.

Waste

Household waste, as defined in Article 1 letter (a) of Law of the Republic of Indonesia Number 18 of 2008, originates from the daily consumption activities of households.

According to Gelbert M. (1996), the sources of waste are as follows:

a. **Waste from residential areas**
A residential area consists of several families living in the same location. Each family undoubtedly produces waste, which is generally organic in nature, such as food scraps or wet waste.
b. **Waste from public and commercial places**
Public and commercial places such as markets are often crowded with people engaging in various activities. These locations have significant potential to generate waste. The types of waste produced typically include food scraps, dry waste, ash, plastic, paper, cans, and other types of refuse.
c. **Waste from public service facilities owned by the government**
Public service facilities owned by the government refer to public entertainment areas such as beaches, recreational parks, mosques, offices, hospitals, and other government-owned infrastructures that generate both dry and wet waste.
d. **Industrial waste**
This type of waste is produced from industrial activities, including distribution and raw material processes. The waste generated typically includes wet and dry waste as well as leftover construction materials. Industrial waste tends to be more voluminous compared to other sources of waste.
e. **Agricultural waste**
This type of waste comes from plants or animals in agricultural areas, such as from gardens, animal pens, or rice fields. It usually consists of food materials, fertilizers, or pesticides specifically used for crops.

Waste Bank

Waste Bank is an institution that buys and accepts organic or inorganic waste from the community. The business process carried out by the managers of the waste bank is regulated by a system similar to a conventional bank, where there are customers, passbooks, and buying and selling transactions. The waste buyers act as the waste bank, and the waste sellers are called customers. (Liguna, 2015)

The working mechanism of a waste bank includes waste sorting, depositing, weighing, recording, and transportation. After the waste is

collected and deposited at the waste bank, customers have the right to receive the proceeds from the waste they have collected, which is recorded in their passbooks. (Liguna, 2015)

A waste bank is a place used by the community as a savings facility and can also serve as a bank to empower the community to care about cleanliness. (Rachma Triwardani, 2013)

The waste bank serves as a place for residents to gather and strengthen the bonds of friendship among the local community. (Atis, 2017)

Research Methodology

Sources and Methods of Data Collection

This study uses both secondary and primary data. Secondary data come from various literatures related to the research theme. Primary data are obtained through:

1. **In-depth interviews**, which are conducted to gather detailed and comprehensive information related to the problem object discussed in this research. From the interview results, the author obtains several data about empowerment as well as alternatives, opportunities, costs, and risks.
2. The respondents in this study are individuals directly involved in the field of community empowerment based on waste management.

General Overview of the Analytic Network Process Method

ANP (Analytic Network Process) is a general theory of relative measurement used to derive composite priority ratios from individual ratio scales that reflect the relative measurement of influences among interacting elements with control criteria. This method was first developed by Thomas L. Saaty as an advancement of the Analytic Hierarchy Process (AHP). ANP represents a new approach to decision-making processes without making assumptions (Thomas L. Saaty, 2006).

The main functions of AHP/ANP are to structure complexity, measure on a ratio scale, and synthesize. Structuring complexity hierarchically involves grouping factors into homogeneous clusters to model the problem within the AHP/ANP framework. Measurement on a ratio scale is believed to be the most accurate for evaluating factors

forming the hierarchy; ratio measurement is necessary to reflect proportions. To keep it simple, pairwise ratio judgments of factors within the hierarchy are used to obtain ratio scale measurements. Synthesis is the process of combining all summarized and measured parts into a unified whole.

Analysis of Alternatives, Opportunities, Costs, and Risks

The relationship between Benefit, Opportunity, Cost, and Risk is influenced by common factors. The Benefit, Opportunity, Cost, and Risk (BOCR) analysis is a priority determination method based on the calculation of desired criteria as benefits (Benefit) and undesired criteria as burdens (Cost). Meanwhile, there are criteria based on future events that may occur as positive factors (Opportunity) and factors that may cause negative risks (Risk) (Thomas L. Saaty, 2006).

The results of several prioritized alternatives include three outcomes: the general condition (standard condition) obtained from the B/C calculation, the pessimistic condition B/(C×R), and the realistic condition (B×O)/(C×R). Alternatives with a high realistic value become the best alternatives and are considered decisions determined over other alternatives (Thomas L. Saaty, 2006).

There are two types of calculations produced by BOCR for the realistic value, namely:

a. Additive negative formula: this formula is usually used to determine long-term priorities, with the formula bB + oO + cC + rR.
b. Multiplicative formula: equivalent to marginal cost/alternative analysis and generally used to determine short-term priorities, with the formula BO / CR.

In this research, the calculation used to determine long-term priorities is the additive negative formula, with the formula bB + oO + c(1 - C) + r(1 - R).

Data Collection

At this stage, the first step is model construction by conducting a literature review to gather various issues related to the research object. Then, these problems are structured into the ANP framework.

Understanding the research problem can be done through theoretical foundations, literature review, questionnaires, focus group

discussions (FGD), and in-depth interviews. After that, the model is constructed and validated by experts and practitioners who serve as respondents.

In conducting this research, the initial step is to develop a conceptual framework. The technique used to develop this framework involves collecting data and information from interviews and several literature studies. Interviews were conducted with several respondents knowledgeable about empowerment; most of them were housewives who serve as heads of the community empowerment division. These interviewees are called respondents and will later be given questionnaires consisting of several questions related to empowerment. This is necessary to perform measurements using a ratio scale. Data collection was carried out separately for each respondent.

Data Processing

After obtaining interview results from the respondents, the data are then compiled into a framework model and processed using Microsoft Excel and the software "Super Decision." The questionnaire is processed into pairwise comparisons, both among elements within clusters and between clusters, to determine which has a greater influence when viewed from one side. Meanwhile, respondents are asked to perform pairwise comparisons on the prepared questionnaire by filling in a numerical rating scale from 1 to 9, with the following explanations for these numbers:

Table 1 Numerical Scale

1	2	3	4	5	6	7	8	9
Equal Important The Influence	Slightly More The Influence		More The Influence		Much More The Influence		Absolutely More The Influence	

The BOCR network results from several respondents will be consolidated and then processed using Microsoft Excel. To obtain quantification results, the next step is to calculate the Rater Agreement and the Geometric Mean.

The first step is to calculate the Rater Agreement, which is a measure that indicates the level of agreement among respondents (R1–Rn) on an issue within a single cluster. The tool used to calculate Rater Agreement is Kendall's Coefficient of Concordance (W; 0 < W < 1). W = 1 indicates perfect agreement (Ascarya, 2012).

The formula to obtain the W value is as follows:

$U = (T1 + T2 + \ldots + Tp)/p$

$S = (T1 - U)2 + (T2 - U)2 + \ldots + Tp - U)^2$

$MaxS = (n-U)2 + (2n-U)2 + \ldots + (pn-U)^2$

$W = S / MaxS$

Where: U = the average value of the total ranking
S = the sum of squared deviations
p = the number of nodes
n = the number of respondents

If the obtained agreement value is 1 (W=1), it indicates perfect agreement among respondents. If the value of W is 0 or close to 0, it indicates disagreement among respondents. Secondly, calculate the Geometric Mean. This measure is used to determine the individual assessments of respondents and to obtain a collective opinion from a group of respondents. The Geometric Mean is a type of average calculation that indicates a tendency or specific value. The formula is as follows (Ascarya, 2012):

$GMk = (R1*R2*\ldots* n)1/n$

Where: GM = Geometric Mean
R = Respondent
n = Number of respondents

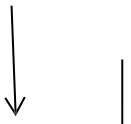
The final stage is to determine the priorities and the main alternative to be used. This calculation uses the Multiplicative Formula, which is equivalent to marginal cost/alternative analysis and is generally used to determine short-term priorities. Meanwhile, the

Additive Negative Formula is typically used to determine long-term priorities, using the formula bB + oO - cC - rR (Thomas L. Saaty, 2006).

Results and Discussion

Table 2 Conceptual Framework of BOCR

BENEFIT	*COST*
1. Helping to increase income (Muntazah, 2015) 2. Increasing public knowledge about waste (Muntazah, 2015) 3. Improving skills (Muntazah, 2015) 4. Reducing waste accumulation (Dwi Pratiwi Kurniawati, 2012)	1. Infrastructure and facilities costs (Viradin Yogiesti, 2010) 2. Educational costs (Muntazah, 2015) 3. Recycled product marketing costs (Librianti) 4. Training costs (Dhaka Ahsania Mission, 2006)



OPPORTUNITY	*RISK*
1. Reducing the potential for natural disasters (Librianti) 2. Poverty alleviation (Librianti) 3. Creating job opportunities (Halimah, 2017) 4. A healthier environment (Wardi)	1. Lack of commitment from management (Muntazah, 2015) 2. Products not absorbed in the market (Librianti) 3. Damage to facilities and infrastructure (Halimah, 2017) 4. Lack of community commitment (Muntazah, 2015)

ALTERNATIVE

1. Synergize with the government for a system of rewards and punishments (Halimah, 2017) 2. Collaborate with local government for facilities and infrastructure 3. Centralize marketing coordination (Halimah, 2017) 4. Optimize the role of the Waste Bank Association (Atis, 2017)

Source: Data processed by the author, 2017

BOCR analysis is an approach used to determine priorities based on the calculation of various criteria, where the desired criteria are considered as benefits (alternatives), and the undesired criteria are treated as burdens (costs). Additionally, criteria that may occur in the future as positive outcomes are referred to as opportunities, while those that could lead to risks or threats are referred to as risks. The calculations are based on interview results using the pairwise comparison method and processed using a second-level BOCR network. Based on data processing with the Super Decisions software, the results show that the priority levels of benefits and opportunities are higher compared to costs and risks.

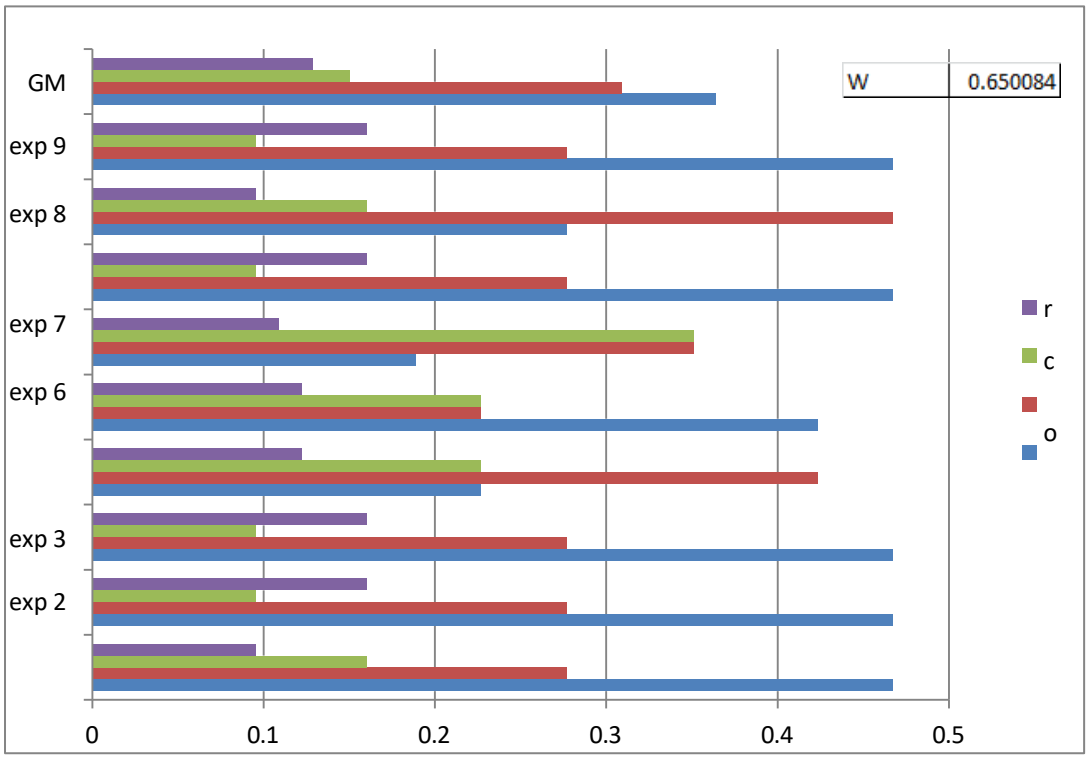


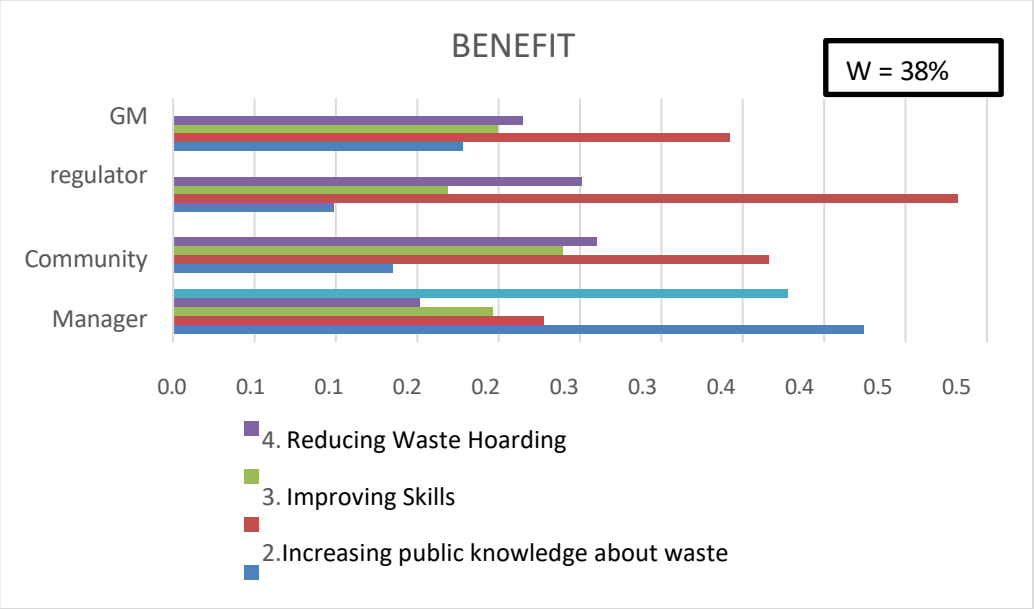
Figure 1. BOCR Level 2 Rater Agreement Model
Source: Data processed by the author, 2017

The image above illustrates the priority sequence of the BOCR model based on respondent agreement regarding the importance of the benefit and opportunity aspects in community empowerment through waste management. The priority order based on the geometric mean places **benefit** in the first rank, followed by **opportunity**, and then **cost** and **risk** clusters.

The purpose of this prioritization is to evaluate the outcomes of the implemented empowerment program. Based on the results shown in the image, it can be concluded that implementing this empowerment program will have a positive impact on both the waste bank managers and the community, as all respondents indicated a 65% agreement level on the significance of **benefit** and **opportunity** in this empowerment initiative.

Comparison Results of Priorities Between Groups

Figure 2 Overall Results of the Benefit Cluster Group



Source: Data processed by the author, 2017

Based on the calculation results in Figure 30, it can be seen that the comparison of benefits prioritized by each respondent group is as follows: regulators and the community prioritize increasing public knowledge about waste, while managers prioritize the benefit of helping to increase income — with an agreement value of 38%.

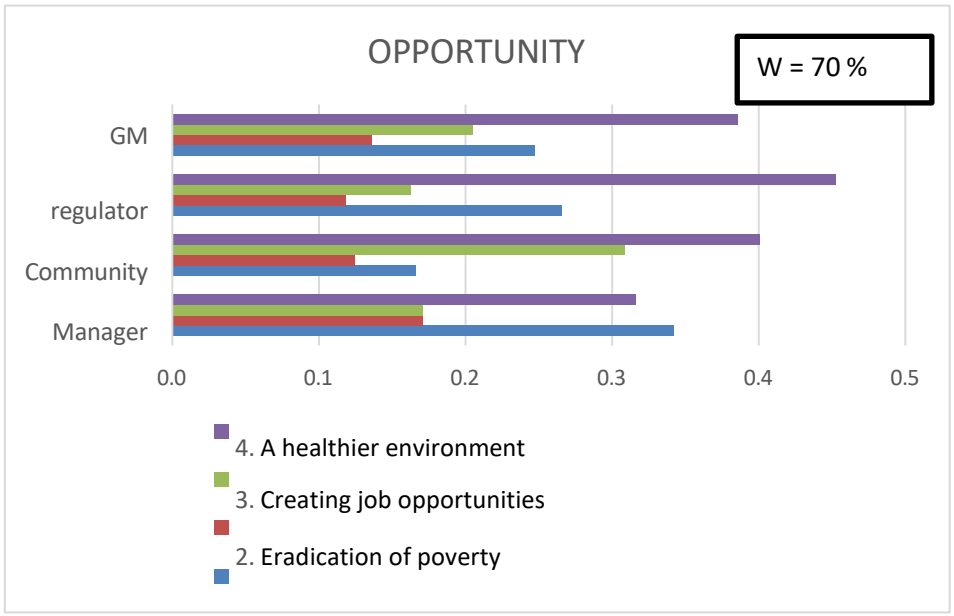


Figure 3 Results of All Groups in the Opportunity Cluster

Source: Data processed by the author, 2017

Based on the calculation results in Figure 31, it can be seen that the opportunity comparison prioritized by each group of respondents is as follows: the regulator and the community prioritize a healthier environment, while the managers prioritize reducing the potential for natural disasters. The agreement level is 70%.

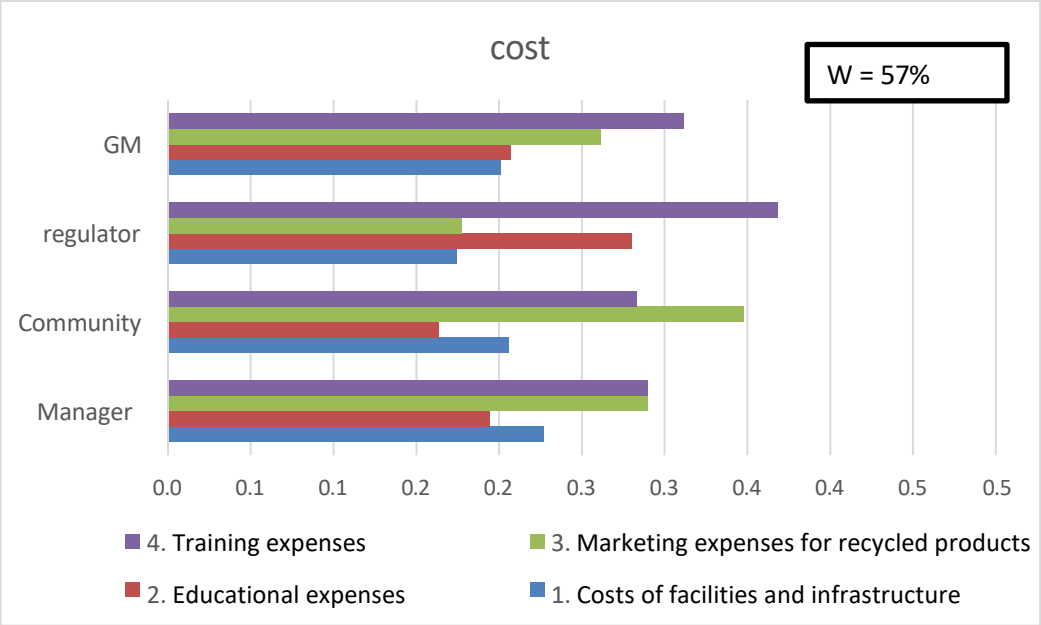


Figure 4. Results of All Groups in the Cost Cluster
Source: Data processed by the author, 2017

Based on the calculation results in Figure 32, it can be seen that the cost comparisons prioritized by each respondent group are as follows: the regulator prioritizes training costs, the community prioritizes recycling product marketing costs, and the managers prioritize both training costs and recycling product marketing costs.

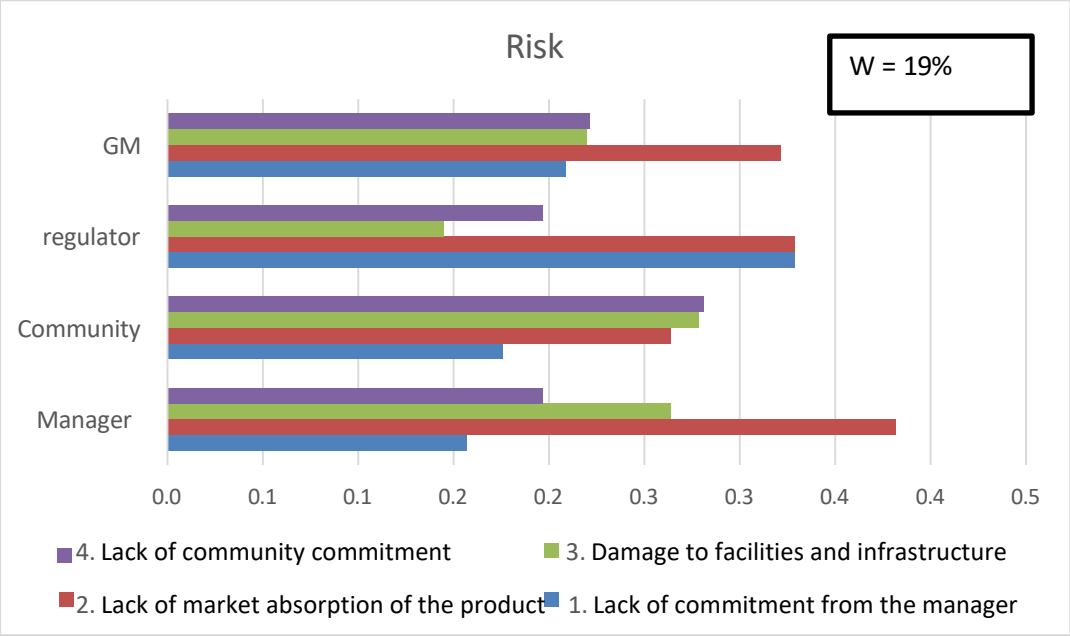


Figure 5 Results of All Groups in the Risk Cluster
Source: Data processed by the author, 2017

Based on the calculations shown in Figure 33, it can be seen that the primary risk priorities for each respondent group are as follows: the regulator prioritizes the risk of products not being absorbed in the market and damage to facilities and infrastructure; the community prioritizes the lack of community commitment; and the managers prioritize the risk of products not being absorbed in the market. The agreement value among them is 19%.

Closing

Conclusion

The data processing results using the pairwise comparison method in Super Decisions show that the conclusion of this study is that community empowerment based on waste management in Bogor Regency is very important for improving the quality of life, as well as for the benefits and opportunities received by both the community and the waste bank managers. Based on the research objectives, the conclusions are as follows:

1. The most apparent benefit of implementing this community empowerment is increasing public knowledge about waste, including the community's understanding of the dangers of waste and their behavior in sorting waste. Once the community begins to sort waste, a comfortable and clean environment will be created. The

most dominant burden felt by both parties, the community and the waste bank managers, is the marketing cost of recycled goods. This is due to the lack of regular buyers for recycled products. Currently, sales only occur during certain events such as bazaars or exhibitions held by the Environmental Agency of Bogor Regency. A possible risk for this empowerment is the failure to absorb the products in the market. Finding regular consumers for recycled products is very difficult; if these products are not purchased, it may lead to decreased income for both the community and waste bank managers, which in turn will cause the accumulation of organic waste again.

2. The aspect with the greatest impact in the benefit cluster is increasing public knowledge, with a respondent agreement level of 12%. The aspect with the greatest impact in the opportunity cluster is a healthier environment, with an agreement level of 52%. The aspect with the greatest impact in the cost cluster is the marketing cost of recycled goods, with an agreement level of 17%. The aspect with the greatest impact in the risk cluster is the failure to absorb products in the market, with an agreement level of 0.4%.

3. In the short term, the alternatives needed to reduce costs and risks while increasing benefits and opportunities include cooperation with the government for facilities and infrastructure. This is because most waste banks do not have adequate places to collect recyclable waste, and organic waste requires large plastic bins in residential areas or at each household. The waste bank association is also currently a necessary alternative, as government involvement in monitoring and supervising waste banks, as well as financial support for community empowerment programs, is crucial. In the long term, the needed alternative for this empowerment is centralized marketing coordination. When the waste bank association operates according to its vision and mission, all waste banks in Bogor Regency will be registered and it will be easier to collect recycled products from each waste bank. Consequently, the government can help promote recycled products more broadly, for example by ensuring that souvenirs at every event held by the Bogor Regency Office are recycled products.

Recommendations

Based on the research results described by the author, suggestions are given to the waste bank managers, the community, and the local government. Community empowerment based on

waste management through waste banks is a very effective way to minimize the increasing volume of waste at the Galuga landfill. It can also improve community behavior in sorting waste and create a healthy and clean environment. Moreover, income can increase if recycled product production expands throughout Indonesia or even worldwide. To achieve this, government involvement is needed to support the requirements and costs for the sustainability of this empowerment program. Likewise, strong participation and consistency from both the waste bank managers and the community are essential for the continuity of this program.

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