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Designing School Building Maintenance Priorities Using the Cost-User Effectiveness Ratio

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Abstract **-** Prioritizing school building maintenance solely based on structural damage often leads to inefficient budget allocation and fewer beneficiaries. The research introduced an integrated Cost-User Effectiveness Ratio (CUER) to establish maintenance priorities by combining three critical factors: damage severity, maintenance costs, and the number of affected students. The CUER formulation employed the Geometric Mean or the root mean multiplication of the cost effectiveness and user effectiveness ratio to balance these factors systematically. The methodology encompassed several steps, including damage assessment and calculation of component importance weights using the Analytical Hierarchy Process (AHP), to determine integrated damage levels, costs, and student weights. These inputs were subsequently used to generate priority rankings of schools requiring maintenance. As a result, the case study in Wonogiri Regency illustrates the superiority of the proposed method over the conventional method. While the conventional approach prioritizes 27 schools benefiting 2,442 students, the CUER approach prioritizes 33 schools benefiting 2,957 students, demonstrating increased efficiency and broader impact. The CUER-based model presents a systematic and equitable solution to prioritize school building maintenance, ensuring the optimal allocation of resources and maximizing benefits within existing budgetary constraints. This innovative approach addresses current challenges in maintenance planning and offers significant implications for improving the management of educational infrastructure.

Keywords**:** school building maintenance, Cost-User Effectiveness Ratio (CUER), analytical hierarchy process, prioritization, decision-making

I. INTRODUCTION

Educational infrastructure serves as a cornerstone of education, playing a fundamental role in fostering an effective learning environment while ensuring students' safety and comfort (Le et al., 2021). In Indonesia, this infrastructure faces significant challenges, with structural deterioration affecting critical elements like foundations, columns, beams, and roofs (Fernandez et al., 2024). Recent data from the Statistics Indonesia reveals that 41% of school buildings exhibit varying levels of damage, highlighting the urgency for strategic maintenance efforts (Badan Pusat Statistik, 2023). The damage rate has worsened compared to previous decades, signaling the pressing need for sustainable and effective maintenance prioritization frameworks.

The current method for prioritizing school building maintenance in Indonesia primarily evaluates the severity of damage. However, this approach is flawed. It neglects other crucial factors, such as maintenance costs and the number of students impacted. Moreover, it is prone to manipulation, where damage reports may be exaggerated to secure priority. These issues exacerbate inefficiencies in budget allocation and leave many schools without essential repairs.

Incorporating multi-criteria decision-making frameworks, such as the Analytical Hierarchy Process (AHP), offers a more structured alternative. AHP has been applied successfully in diverse contexts, including groundwater potential zoning in Turkey (Aykut, 2021), prioritization of soil erosion protection strategies in Oman (Al-Rahbi et al., 2020), ranking of environmentally friendly public facilities in Ethiopia (Gashaw et al., 2023), and ranking of delay risks in the Malaysian East Coast Road project (Razi et al., 2019). In India, AHP has prioritized road paving projects in Odisha (Chundi et al., 2022) and road maintenance in Himachal Pradesh (Nautiyal & Sharma, 2022). AHP has also played a role in evaluating energy-efficient building designs and renewable energy systems in developed countries (Alharasees et al., 2024), sustainability in historic and modern buildings in the UAE (Mushtaha et al., 2020), contractors in Saudi Arabia (Almohassen et al., 2023), historic buildings in Hangzhou, China (Yang et al., 2022), and life-cycle costs in industrial buildings in Egypt (El Hadidi et al., 2022). In Indonesia, AHP facilitates selecting formwork systems in construction due to its simplicity (Hansen et al., 2020) and prioritizing road maintenance in Banten (Warnars et al., 2021).

Additional applications include fund allocation for road and water pipe maintenance in Sri Lanka (Jayakody et al., 2024), decarbonization in residential buildings in Zhejiang, China (Wang et al., 2023), highway project sustainability in Egypt (Ibrahim & Shaker, 2019), and sustainable material risks in condominiums (Andal & Juanzon, 2020). These applications highlight AHP's ability to evaluate complex scenarios involving multiple stakeholders and criteria. Despite its strengths, AHP relies heavily on expert judgments, introducing subjectivity and potential biases that can undermine decision reliability.

To address these challenges, the researchers integrate AHP with the Cost-User Effectiveness Ratio (CUER), a novel metric that incorporates three critical factors, namely damage severity, repair costs, and the number of students affected. The CUER framework, guided by principles outlined in the Ministry of Public Work and Public Housing Regulation N0. 24 of 2008 (Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 24 Tahun 2008), ensures resource allocation prioritizes cost-efficiency and user benefits (Menteri Pekerjaan Umum dan Perumahan Rakyat, 2028). For example, schools with relatively low repair costs and high student impact rank higher than schools with similar damage levels but fewer beneficiaries. This integration offers an innovative solution that not only reduces the subjectivity of the AHP method but also overcomes the limitations of conventional methods in determining priorities. The research demonstrates how the CUER approach optimizes school maintenance priorities more holistically by combining quantitative data with expert assessments. The CUER model is applied to a case study in Wonogiri Regency, where maintenance budgets are constrained despite significant infrastructure needs, to demonstrate the efficacy of this framework. The research contributes to sustainable infrastructure management by demonstrating how integrating cost and user considerations can enhance equity and efficiency in resource allocation.

II. METHODS

The research consists of several interconnected stages, depicted in Figure 1 (see Appendices). The initial step is to develop the CUER model to prioritize school building maintenance. This model integrates damage severity, maintenance costs, and the number of beneficiary students. The factors considered align with Ministry of Public Work and Public Housing Regulation N0. 24 of 2008 (Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Nomor 24 Tahun 2008). According to the regulations, the damage aspect serves as the primary indicator for determining maintenance priorities, the cost aspect mandates that maintenance expenses be aligned with the severity of building damage, and the user aspect emphasizes the need to consider the benefits and impacts of maintenance for building users. Data normalization is performed using Equations (1)−(3) to ensure consistency in scale across all parameters.

$$Damage\ Weight = \frac{Integrated\ Damage\ Level}{Total\ Integrated\ Damage\ Level}, \quad (1)$$

$$Cost\ Weight = \frac{Maintenance\ Cost}{Total\ Maintenance\ Cost} \quad (2)$$

$$User\ Weight = \left(1 - \left(\frac{User}{Total\ Users}\right)\right) \times \left(\frac{1}{Total\ Buildings\ - 1}\right). \quad (3)$$

The CUER model combines the cost and user effectiveness ratios through the Geometric Mean, as detailed in Equation (4). The Geometric Mean is chosen because it provides a representative average for ratio-based data, ensuring proportional prioritization. This approach evaluates the ratio of the cost of required maintenance and the number of beneficiary students to the number of damages that can be handled.

$$CUER = \sqrt[2]{\frac{Damage\ Weight}{Cost\ Weight} \times \frac{Damage\ Weight}{User\ Weight}} \quad (4)$$

Subsequently, a damage assessment survey is conducted by consultants who are experienced in building evaluation. Visual inspections identify structural damage such as cracks, deformations, corrosion, moisture, and other types of damage. The results are recorded using standard forms and guidelines from Ministry of Education, Culture, Research, and Technology (Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, 2023).

Following that, the importance weights of building components are calculated using the AHP. This step involves structuring criteria hierarchically, distributing questionnaires to six expert respondents from the public works office, the education office, and building engineering experts who are relevant to the research, and utilizing a pairwise comparison matrix with a rating scale of 1 to 9 to assess the relative importance of elements. Afterward, the priority vector x_i, representing the weight of each element, is calculated using Equation (5). The w_i is the square root of the row elements.

$$x_i = \frac{w_i}{\sum w_i} \quad (5)$$

The maximum eigen value (λ_{maks}) is derived using Equation (6). The maximum eigenvalue (λ_{maks}) is calculated by multiplying the pairwise comparison matrix (α_{ij}) by the eigenvector or weight (x_i). The pairwise comparison α_{ij} contains the values representing the relative comparison between the i^{th} and j^{th} elements based on certain criteria. The eigenvector x_i is a vector of relative weights that reflects the importance level of each element derived from these comparisons. The maximum eigenvalue is used to test the consistency of judgments in the AHP method. The closer the value of λ_{maks} is to the number of elements in the matrix, the better the consistency of the matrix.

$$\lambda_{maks} = \sum a_{ij} \cdot x_i \quad (6)$$

The Consistency Index (CI) to assess consistency of responses is calculated with Equation (7). In this equation, CI indicates the logical consistency of the judgments made in the comparison process. The λ_{maks} denotes the maximum eigenvalue derived from the pairwise comparison matrix, while n represents the total number of criteria or elements being compared.

$$CI = \frac{\lambda_{maks} - n}{n - 1} \quad (7)$$

Finally, the Consistency Ratio (CR) is computed using Equation (8). The Consistency Ratio is a parameter used to assess whether the pairwise comparison judgments are consistent. In this equation, CI stands for Consistency Index, which measures the degree of inconsistency in the comparison matrix, while RI is the Random Index, a benchmark value derived by Saaty (1980) cited in Ismanto (2017) based on 500 randomly generated samples. By comparing the CI value to the RI, it can be determined whether the level of consistency in the judgments is acceptable.

$$CR = \frac{CI}{RI} \quad (8)$$

The comparison matrix is acceptable if it is CR ≤ 0.1. Otherwise, adjustments are necessary (Ismanto et al., 2017). The survey data collected provide the damage value (DL_n) of each building component. It is multiplied by the AHP-derived weight (WC_n) to calculate the Integrated Damage Level (IDL) for each school using Equation (9).

$$IDL = (WC_1 \times DL_1) + \ldots + (WC_n \times DL_n) \quad (9)$$

The damage weight is calculated using Equation (1) based on the integrated damage levels. Then, the priority order is subsequently determined. The damage weight represents the relative significance of each damage level in proportion to the overall damage observed. The damage weight provides a standardized measure that facilitates comparison by normalizing the integrated damage level with respect to the total integrated damage across all components. This weighted value is then used to prioritize maintenance or repair efforts, ensuring that components with higher damage impact receive attention first.

Next, the research estimates the maintenance cost (MC) by multiplying the Standard Highest Unit Price (SHUP) per m^2, the area of damaged buildings (ADB), the level of building damage (BDL), and the building level coefficient (LC) as described by Ismanto et al. (2017), using Equation (10). The maintenance cost calculation integrates several factors to provide a comprehensive estimate of the repair expenses. The formula accounts for both the physical extent and complexity of the damage by incorporating the damaged area, damage severity, building level, and standard unit price. This approach ensures that cost estimations are tailored to the specific characteristics of each building, enabling more accurate budgeting and resource allocation.

$$MC = ADB \times BDL \times LC \times SHUP \quad (10)$$

The cost weight is then calculated using Equation (2). The priority order is determined based on the cost weight. Similarly, student population data for each school are normalized to calculate user weights using Equation (3).

The CUER model synthesized the normalized damage, cost, and user weights into a priority value for each school, as shown in Equation (4). The data sample includes 52 elementary schools with moderate damage levels, obtained from school damage assessment forms officially approved by the relevant government agency. Schools are ranked from highest to lowest priority based on these values to determine maintenance priorities. The prioritization results are further validated through a case study focused on moderately damaged elementary school classrooms in Wonogiri Regency. By employing the CUER model, maintenance decisions prioritize schools that balance high damage levels with low costs and high student impact, ensuring optimal resource allocation within budgetary constraints.

III. RESULTS AND DISCUSSIONS

This case study aims to determine the priority for elementary school classroom maintenance in

Wonogiri Regency by employing the CUER method. The research analyzes 52 elementary schools, focusing on classrooms categorized as moderately damaged, which necessitate targeted maintenance interventions. The analysis begins with the formulation of a hierarchical framework comprising criteria and sub-criteria. The determination of criteria and sub-criteria is based on the building structure, which comprises various systems and their respective components. These building systems are categorized into three main groups: structural systems, architectural systems, and utility systems. Each system consists of several building components. The structural system includes foundations, sloofs, columns, beams, and roofs. The architectural system comprises walls, floor finishes, ceilings, doors, windows, and other finishing works. Meanwhile, the utility system has electrical installations, water supply systems, and wastewater drainage systems. This structured approach facilitates a systematic evaluation of factors influencing the prioritization of maintenance efforts, as depicted in Figure 2 (see Appendices).

The weights of building components are determined using the AHP, as presented in Table 1 (see Appendices). Six experts, comprising representatives from the public works office, the education and culture office, and building engineering expert, are selected based on their expertise and relevance to the research. Each respondent evaluates the criteria and sub-criteria using a standardized scale from 1 to 9.

Then, the evaluations for structural, architectural, and utility criteria are processed using the Geometric Mean and compiled into a 3×3 pairwise comparison matrix. The eigenvector (x_i), representing the relative weights of the criteria, is calculated using Equation (5), resulting in the following weights structure of 0.6112, architecture of 0.3018, and utility of 0.0870.

The CI and CR are calculated using Equations (7) and (8) to validate the reliability of the pairwise comparison matrix. For a 3×3 matrix, with a Random Index (RI) value of 0.58, the resulting CR is 0.0145, which is well below the acceptable threshold of 0.1, confirming the consistency of the matrix.

A similar procedure is applied to calculate the weights of sub-criteria. For instance, the structural criterion weight is multiplied by the weights of the foundation and sloof sub-criteria, resulting in a final weight of 0.1925 for these components. The weights of building components are integrated to determine the damage weights, with the results presented in Table 2 (see Appendices).

The data presented in Table 2 (see Appendices) describes the calculation process used to determine the IDL for each school. The integrated damaged level is calculated by applying Equation (9), which involves multiplying the damage value of each building component (DL_n) by its corresponding importance weight (WC_n). The weighted values for all components are then summed to obtain the total integrated damage level for each school. Equation (1) is used to divide the integrated damage level of each school by the total integrated damage level across all schools, yielding a normalized damage weight to normalize these values. Schools are subsequently ranked based on their damage weight, with higher damage weights indicating higher priority for repair. For instance, at Public Elementary School (Sekolah Dasar Negeri (SDN)) 3 Minggarharjo, the damage value of the foundation and sloof, calculated as 4.20%, is multiplied by an importance weight of 0.1925. It results in an integrated damage level of 0.0442. Then, when normalized by dividing it by the total integrated damage level of all schools of 1.6620, a damage weight of 0.0266 is obtained. Following the ranking process, SDN 3 Kepyar is identified as the highest priority for repair based on its damage weight.

This method provides a comprehensive evaluation by integrating both the extent of physical damage and the structural significance of each building component. The subsequent stage involves determining the cost weights, as detailed in Table 3 (see Appendices). The calculation of maintenance costs for school buildings employs Equation (10), wherein the raw highest unit price (SHUP) per m² is multiplied by the damaged area (ADB), damage value (BDL), and building level coefficient (LC). Normalization is performed using Equation (2) by dividing the maintenance cost of each school by the total maintenance costs, producing cost weights that are subsequently ranked in descending order. For example, SDN 3 Kepyar, with a total damaged area of 410 m², a damage value of 36.91%, and a building level coefficient of 1.00, incurs a maintenance cost of IDR 636,882,050. Following normalization against total maintenance costs of IDR 17,733,605,148, its cost weight is calculated as 0.0359, making it the highest priority.

Maintenance cost estimation is influenced by the extent and severity of damage, with larger areas and higher severity increasing costs. Further prioritization is facilitated through the calculation of user weights, as summarized in Table 4 (see Appendices). Based on Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi (2022), Dana Alokasi Khusus (DAK) funding for elementary schools prioritizes institutions with at least 60 students. Table 4 (see Appendices) shows normalized student data, calculated using Equation (3) by dividing each school's student count by the total number of students from schools requiring building maintenance. The resulting user weights are ranked in descending order. For example, SDN 1 Ngroto, with 210 students, obtains a user weight of 0.0187, calculated by dividing its student count by the total of 4,699 students. The result positions SDN 1 Ngroto as the highest-ranked school by user weight.

The prioritization of school building maintenance is conducted using CUER, which combines damage weight (Table 2), cost weight (Table 3), and user weight (Table 4). The CUER rankings are presented in Table 5 (see Appendices). It provides the priority values for school building maintenance determined through the CUER method, as defined by Equation (4). The calculation of damage, cost, and user weights is performed using the Geometric Mean, with the resulting priority values ranked in descending order. For example, SDN 3 Kerjo Lor, with a damage weight of 0.0218, a cost weight of 0.0062, and a user weight of 0.0191, achieves CUER by dividing the damage weight by the cost weight and the user effectiveness ratio by dividing the damage weight by the user weight. The CUER value is then computed by taking the square root of the product of these two ratios, resulting in a priority value of 2.0070. Consequently, SDN 3 Kerjo Lor is identified as the highest-priority school for maintenance.

According to the Wonogiri Regency's Office of Education and culture through a direct verbal interview, the maintenance budget for elementary school buildings in the 2025 fiscal year, sourced from the DAK, amounts to IDR 9,576,939,480. Due to budgetary constraints, not all schools that submitted damage assessments in 2024 will receive funding. Based on the CUER calculation in Table 5 (see Appendices), 33 primary schools are prioritized for maintenance in 2025.

The research successfully introduces a systematic approach to determining school building maintenance priorities through the CUER method, which integrates three critical factors: damage severity, repair costs, and the number of affected students. As demonstrated in Table 5 (see Appendices), the CUER method effectively prioritizes schools with severe damage that can be addressed at a relatively low cost while benefiting a significant number of students. This innovative approach simultaneously reduces the subjectivity inherent in the AHP method and overcomes the limitations of conventional prioritization techniques.

Lastly, the priority rankings generated using the CUER method are compared with those derived from the traditional building damage value method. This comparison, illustrated in Figures 3 (see Appendices) and 4 (see Appendices), underscores the enhanced accuracy and objectivity of the CUER approach in determining maintenance priorities. Figure 3 (see Appendices) shows the cumulative comparison chart of school maintenance costs using the DAK budget of IDR 9,576,939,480. The school damage value method can only prioritize maintenance in 27 elementary schools because it tends to prioritize schools with higher maintenance costs. It results in uneven resource allocation, so the number of schools receiving maintenance is limited. In contrast, the CUER method with the same budget is able to prioritize maintenance in 33 elementary schools. This method ensures a more balanced distribution of maintenance costs among schools with varying levels of need, whether low, medium, or high.

Then, Figure 4 (see Appendices) presents the cumulative comparison chart of the number of beneficiary students. The school damage value method only provides benefits to 2,447 students by prioritizing a small number of schools. In contrast, the CUER method provides benefits to a total of 2,957 students because it allows for more schools to be prioritized, so that the number of beneficiaries increases.

The case study in Wonogiri Regency highlights the advantages of the CUER method over the conventional school damage value method. With the same budget allocation, the CUER method successfully reprioritizes school building maintenance, achieving a more equitable distribution of resources. This approach increases the number of schools receiving maintenance and the number of students benefiting from the effort. Thus, the CUER-based model is proven to provide a systematic and equitable framework for prioritizing school building maintenance, optimizing resource allocation, and maximizing benefits within budget constraints.

IV. CONCLUSIONS

The research successfully introduces the CUER model as an innovative method for prioritizing school building maintenance. The model integrates factors, such as the level of building damage, maintenance costs, and the number of benefiting students, enabling priority to be given to schools with severe damage that can be repaired at low costs while maximizing benefits for a large number of students. A case study in Wonogiri Regency confirms the superiority of this approach over conventional methods, as it increases the number of schools receiving maintenance and the number of students benefiting from the effort. The CUER-based model provides a systematic and equitable framework for prioritizing school building maintenance, optimizing resource allocation, and maximizing benefits within budget constraints. This innovative approach addresses current challenges in maintenance planning and offers significant implications for improving the management of educational infrastructure.

However, the research has limitations in its application because it is specifically designed for building types such as schools, houses, hospitals, offices, and so on. The model cannot be applied to infrastructure other than buildings, such as roads, drainage, or irrigation systems. Future research can expand its scope by including different types of infrastructure, as well as adjusting the variables based on the type of building. In addition, an automated model or system can be developed to calculate maintenance priorities using the CUER method, allowing for a faster and more efficient process in determining maintenance priorities.

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AUTHOR CONTRIBUTIONS

Designed the Cost-User Effectiveness Ratio (CUER) formula to prioritize the maintenance of school buildings, V. P. P., H. P.; Collected data on school building damage and assessment data from expert respondents as a basis for maintenance priority analysis, V. P. P.; Developed calculation simulations using Microsoft Excel and prepared questionnaires for assessment by expert respondents, V. P. P.; Analyzed the data from the expert respondents' assessment using AHP and examined the calculation of CUER to determine the priority of schools that receive building maintenance, V. P. P.; Wrote the paper, V. P. P.; Analyzed and performed trial and error on the CUER formula to ensure its accuracy and applicability in determining maintenance priorities, H. P.; Provided input and assisted in the process of drafting and revising the manuscript, H. P., M. S., S. R. H., and S. S.; Analyzed the comparison results of priority calculations using the CUER formula with the results of conventional methods, M. S.

DATA AVAILABILITY

The data that support the findings of the research are available from the first author, Visaretri Pramuktia Purwosri, upon reasonable request. This dataset originates from official agencies and expert respondents from relevant institutions. It is not openly published to maintain a balance between scientific transparency and the protection of intellectual property rights. Its use is permitted only in accordance with applicable regulations and authorizations. So, the readers must request the data.

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APPENDICES

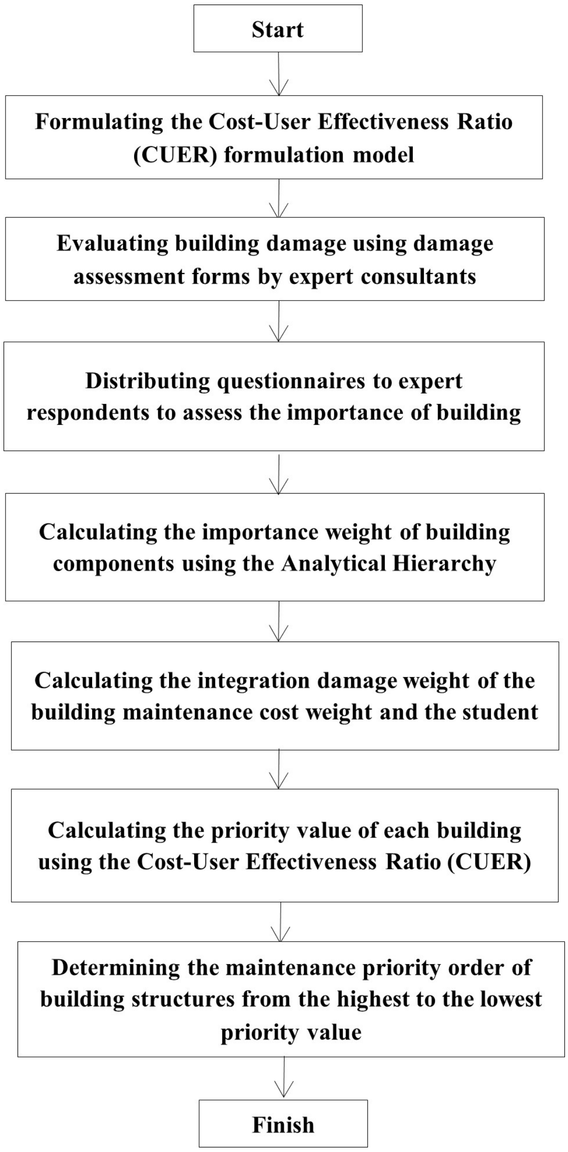

Figure 1 Research Flow Chart

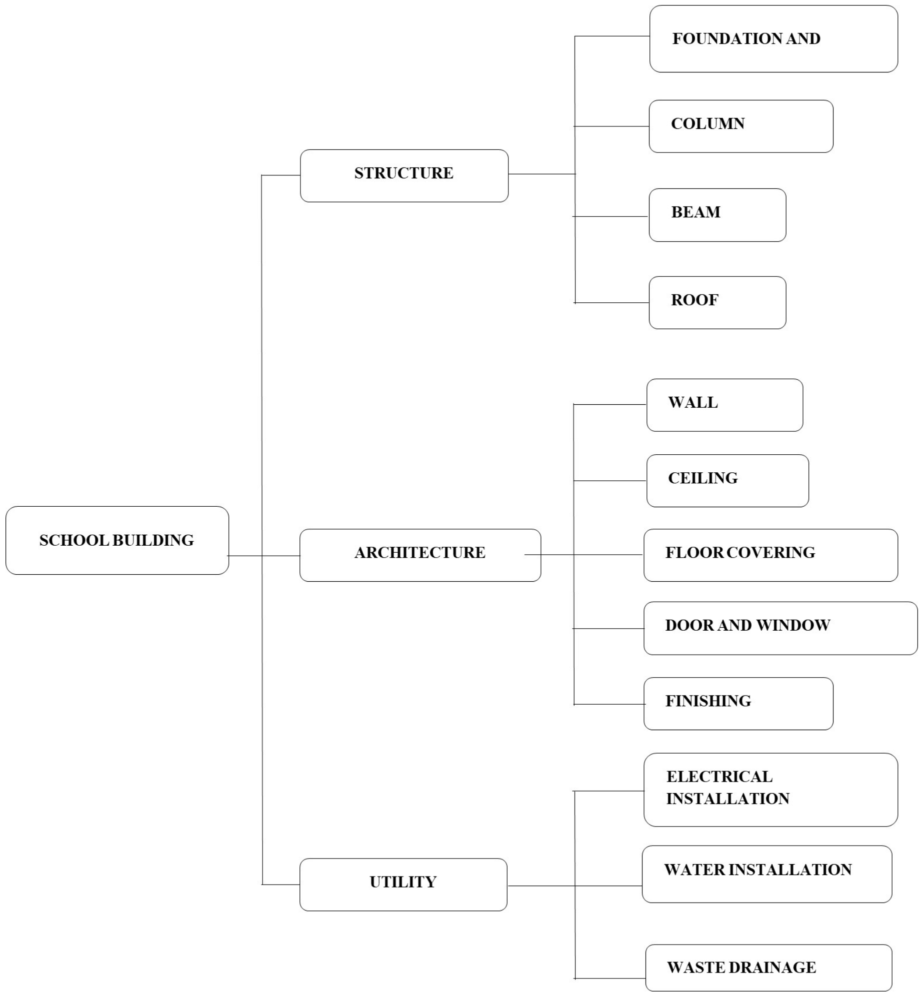

Figure 2 Building Hierarchy Diagram

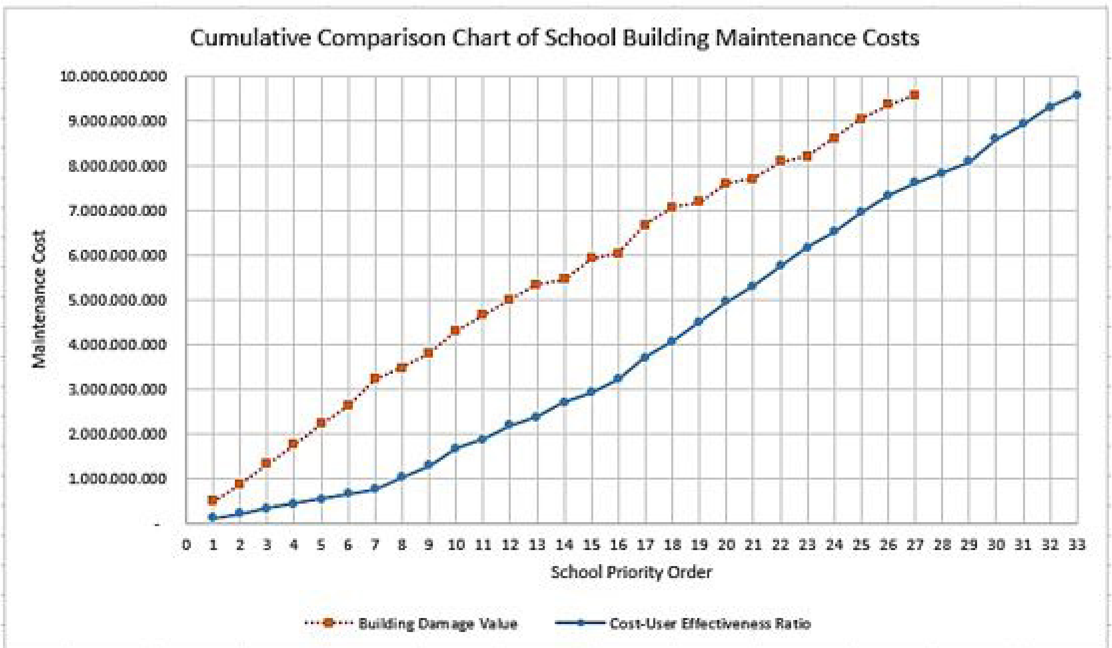

Figure 3 Cumulative Comparison Chart of Maintenance Costs Based on Damage Values and Cost-User Effectiveness Ratio (CUER)

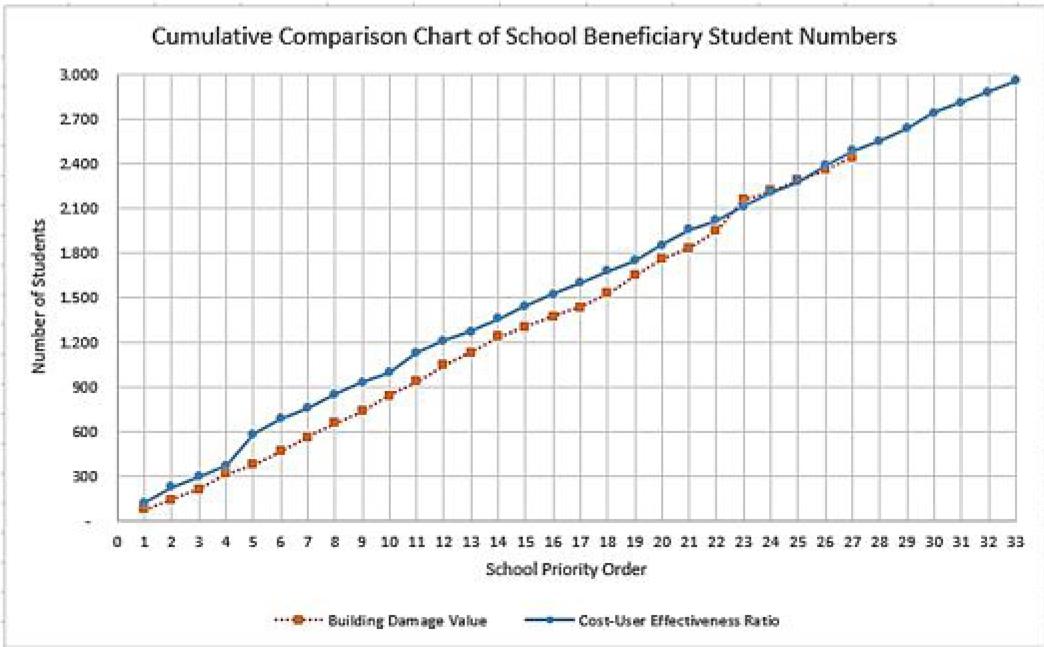

Figure 4 Cumulative Comparison Chart of Beneficiary Student Numbers
Based on Damage Values and Cost-User Effectiveness Ratio (CUER)

Table 1 Final Weights for Building Components

Criteria Weight			**Sub-criteria Weight**			**Final Weight**
	Eigen Vector (x_i)	**Consistency Ratio (CR)**		**Eigen Vector (x_i)**	**Consistency Ratio (CR)**	
Structure	0.6112	0.0145	Foundation and Sloof	0.3150	0.0032	0.1925
			Column	0.2938		0.1795
			Beam	0.1340		0.0819
			Roof	0.2573		0.1573
Architecture	0.3018		Wall	0.3926	0.0148	0.1185
			Ceiling	0.0537		0.0162
			Floor Covering	0.0920		0.0278
			Door and Window	0.3528		0.1065
			Finishing	0.1088		0.0328
Utility	0.0870		Electrical Installation	0.7120	0.0005	0.0620
			Water Installation	0.1084		0.0094
			Waste Drainage	0.1796		0.0156

Table 2 Priorities Based on Damage Weight

No	School Name	Foundation and Sloof (%)	Column (%)	Beam (%)	Roof (%)	Wall (%)	Ceiling (%)	Floor Covering (%)	Door and Window (%)	Finishing (%)	Electrical Installation (%)	Water Installation (%)	Waste Drainage (%)	Integration Damage Level	Damage Weight
1	SDN 3 Minggarharjo	4.20	4.50	3.08	7.00	7.53	4.55	3.99	2.15	3.83	0.00	0.00	1.50	0.0442	0.0266
2	SDN 1 Bulukerto	6.00	6.60	1.60	2.56	6.56	4.65	4.64	1.73	4.01	0.50	0.00	0.00	0.0420	0.0253
3	SDN 2 Trukan	4.20	4.17	2.38	3.08	8.98	4.48	7.83	3.20	3.95	0.20	0.00	1.50	0.0410	0.0247
4	SDN 2 Gemawang	4.20	4.00	3.40	3.03	8.98	4.40	4.42	2.31	3.82	0.20	0.00	0.00	0.0392	0.0236
5	SDN 2 Hargantoro	4.20	4.12	3.40	3.19	8.49	4.40	5.84	1.48	3.71	0.20	0.00	0.75	0.0387	0.0233
6	SDN 2 Ngrejo	4.20	4.12	2.80	2.77	7.85	3.88	5.40	3.13	3.60	0.50	0.20	0.75	0.0385	0.0232
7	SDN 2 Genukharjo	6.00	2.46	2.16	3.22	7.85	4.40	5.95	2.01	3.87	0.20	0.00	0.75	0.0381	0.0229
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
50	SDN 1 Sidokarto	0.00	3.67	2.32	2.35	6.88	3.50	4.64	1.90	2.99	0.50	0.00	1.50	0.0257	0.0155
51	SDN 1 Girimarto	0.00	3.00	1.60	2.98	7.20	2.75	4.86	2.04	3.83	0.50	0.00	1.50	0.0257	0.0155
52	SDN Selopukang	0.00	0.00	5.60	4.90	5.75	3.43	4.21	2.01	3.33	0.20	0.00	1.50	0.0244	0.0147
		Total Integration Damage Level												1.6620	

Table 3 Priorities Based on Cost Weights

No	School Name	Room Type	Area (m2)	Damage Rate (%)	Coeffficient Level	Unit Price (×1000)	Cost per Room	Maintenance Cost	Cost Weight
1	SDN 3 Kepyar	Class	315	36.91	1.00	4,760	553,428,540	636,882,050	0.0359
		Corridor	95			2,380	83,453,510		
2	SDN 2 Joho	Class	350	31.07	1.00	4,760	517,626,200	595,270,130	0.0336
		Corridor	105			2,380	77,643,930		
3	SDN 2 Kismantoro	Class	280	38.86	1.00	4,760	517,926,080	591,915,520	0.0334
		Corridor	80			2,380	73,989,440		
4	SDN 2 Jatirejo	Class	238	38.72	1.00	4,760	438,651,136	503,158,656	0.0284
		Corridor	70			2,380	64,507,520		
5	SDN 1 Sidokarto	Class	303	30.23	1.00	4,760	436,001,244	500,753,904	0.0282
		Corridor	90			2,380	64,752,660		
6	SDN 2 Trukan	Class	206	43.95	1.00	4,760	430,956,120	487,440,660	0.0275
		Corridor	54			2,380	56,484,540		
7	SDN 1 Panekan	Class	227	37.38	1.00	4,760	403,898,376	467,952,744	0.0264
		Corridor	72			2,380	64,054,368		
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
50	SDN 1 Ngaglik	Class	56	33.60	1.00	4,760	89,564,160	103,958,400	0.0059
		Corridor	18			2,380	14,394,240		
51	SDN 3 Tempursari	Class	52	36.17	1.00	4,760	89,527,984	103,301,520	0.0058
		Corridor	16			2,380	13,773,536		
52	SDN 1 Sembukan	Class	56	32.51	1.00	4,760	86,658,656	99,038,464	0.0056
		Corridor	16			2,380	12,379,808		
	Total Maintenance Costs for School Buildings							17,733,605,048	

Table 4 Priorities Based on User Weights

No	School Name	Number of Students	User Weights
1	SDN 1 Ngroto	210	0.0187
2	SDN 1 Girimarto	163	0.0189
3	SDN 3 Giriwono	134	0.0190
4	SDN 2 Domas	122	0.0191
5	SDN 1 Tempursari	119	0.0191
6	SDN 3 Kerjo Lor	118	0.0191
7	SDN 2 Joho	113	0.0191
⋮	⋮	⋮	⋮
50	SDN 3 Kepyar	61	0.0194
51	SDN 2 Genukharjo	61	0.0194
52	SDN 1 Genukharjo	61	0.0194
Total Number of Students		4699	

Table 5 Priority Order for School Building Maintenance with Cost-User Effectiveness Ratio (CUER)

No.	School Name	Integration Damage Level	Maintenance Cost	Number of Students	CUER Priority Value
1	SDN 3 Kerjo Lor	0.0362	109,546,164	118	2.0070
2	SDN 1 Ngaglik	0.0351	103,958,400	105	1.9929
3	SDN 2 Banaran	0.0349	116,836,104	73	1.8630
4	SDN 3 Tempursari	0.0323	103,301,520	76	1.8360
5	SDN 1 Ngroto	0.0298	107,117,136	210	1.6865
6	SDN 2 Sembukan	0.0310	116,667,600	105	1.6636
7	SDN 1 Sembukan	0.0265	99,038,464	70	1.5343
8	SDN 1 Bulukerto	0.0420	257,838,966	96	1.5129
9	SDN 1 Giriyoso	0.0380	266,899,864	77	1.3427
10	SDN 3 Minggarharjo	0.0442	381,644,662	67	1.3053
11	SDN 3 Giriwono	0.0319	201,837,804	134	1.3029
12	SDN 2 Gemawang	0.0392	327,314,260	79	1.2515
13	SDN 1 Genukharjo	0.0289	184,580,424	61	1.2252
14	SDN 3 Parangharjo	0.0370	326,697,840	87	1.1812
15	SDN 1 Jatirejo	0.0281	209,714,176	83	1.1195
16	SDN 2 Pondok	0.0324	300,261,276	83	1.0787
17	SDN 2 Trukan	0.0410	487,440,660	75	1.0704
18	SDN 5 Gunungan	0.0352	365,507,072	79	1.0630
19	SDN 2 Hargantoro	0.0387	441,192,024	69	1.0624
20	SDN 2 Ngrejo	0.0385	442,110,228	103	1.0600
21	SDN 2 Gesing	0.0335	350,579,712	107	1.0353
22	SDN 2 Genukharjo	0.0381	458,852,576	61	1.0249
23	SDN Plosorejo	0.0357	412,491,128	93	1.0157
24	SDN 2 Kerjo Lor	0.0327	349,666,744	98	1.0109
25	SDN 1 Gemawang	0.0362	433,748,336	68	1.0027
26	SDN 3 Mojopuro	0.0337	388,436,230	113	0.9908
27	SDN 2 Tanggulangin	0.0289	287,775,796	96	0.9857
28	SDN Selopukang	0.0244	203,843,192	65	0.9856
29	SDN 1 Banyakprodo	0.0273	258,892,830	86	0.9811
30	SDN 2 Jatirejo	0.0379	503,158,656	105	0.9770
31	SDN 1 Talesan	0.0300	327,134,808	73	0.9567
32	SDN 4 Eromoko	0.0325	385,778,960	66	0.9524
33	SDN 4 Wonoboyo	0.0265	266,777,770	76	0.9374
Total			9,576,939,480	2957	