LivaS
International Journal on
Livable Space

Volume 06, Number 2
August 2021

e-ISSN : 2548-7515
p-ISSN : 2580-7552

CARBON AND SPACE UTILIZATION

Carbon Footprint Identification Of Ready Mix Concrete In Building Project 45-52
Daniswara Putra Satya, Ryan Faza

Student's Perception On The Activities Space During Covid-19 Pandemic 53-60
Marselinus Nirwan Luru, Rahel Situmorang, Dewi Setiani, Farah Fauziah Andini

The Identification Of Vitality Factors For Public Open Space At The Cisadane River Area, Tangerang City 61-68
Yos Freddy, A. Hadi Prabowo

Utilization Of Pedestrian Ways In The Aspect Of Safety And Attractiveness On Road Ir. H Juanda Raya Depok 69-74
Sutrysno Airlambang, Popi Puspitasari

Value Based Decision On Technology Criteria That Are Resilent Against Global Economic Uncertainty 75-81
Genta Bintang Al Akbar, Raflis, Giraldi Fardiaz Kuswanda

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Int.J.Livable.Sp.	Vol. 6	No. 2	pp. 45-85	Jakarta August 2021	p-ISSN 2580-7552

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Articles

CARBON FOOTPRINT IDENTIFICATION OF READY MIX CONCRETE IN BUILDING PROJECT

Daniswara Putra Satya, Ryan Faza

45-52

PDF

Abstract: 200 | PDF downloads:317

STUDENT'S PERCEPTION ON THE ACTIVITIES PLACES DURING COVID-19 PANDEMIC

Marselinus Nirwan Luru, Rahel Situmorang, Dewi Setiani, Farah Fauziah Andini

53-60

PDF

Abstract: 169 | PDF downloads:94

THE IDENTIFICATION OF VITALITY FACTORS FOR PUBLIC OPEN SPACE AT THE CISADANE RIVER AREA, TANGERANG CITY

Yos Freddy, A. Hadi Prabowo

61-68

PDF

Abstract: 131 | PDF downloads:105

PEDESTRIAN PATHS UTILIZATION: SAFETY AND ATTRACTIVENESS ASPECTS (Case Study: Ir. H Juanda Raya Sidewalk, Depok, Indonesia)

Sutrysno Airlambang, Popi Puspitasari

69-74

PDF

Abstract: 198 | PDF downloads:127

VALUE BASED DECISION ON TECHNOLOGY CRITERIA THAT ARE RESILENT AGAINST GLOBAL ECONOMIC UNCERTAINTY

Genta Bintang Al Akbar, Raflis, Giraldi Fardiaz Kuswanda

75-81

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LivaS: International Journal on Livable Space
Vol. 06, No. 2, August 2021: 75-81
Doi: 10.25105/livas.v6i2.16802

ISSN : 2548-7515 (online)
ISSN : 2580-7552 (print)

VALUE BASED DECISION ON TECHNOLOGY CRITERIA THAT ARE RESILENT AGAINST GLOBAL ECONOMIC UNCERTAINTY

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ABSTRACT

Infrastructure development is important in today's society. This has become an obstacle due to the increasing number of residents reside in DKI Jakarta. The limited land creates the imbalance toward the growth of population. The COVID-19 pandemic has gradually paralyzed the world economic system. The IMF estimates that the global economy will experience a decline in growth rates of up to -3%. Currently, Indonesia is on the brink of recession. To determine the impact of global economic uncertainty in construction projects, the appropriate alternative standards and strategies are needed from the criteria for technologies that are resilient to global economic uncertainty. In this research, there are five criteria and three alternatives that underlie the goal of the best strategy in the aspect of technology for Value Based Decision Making against global economic uncertainty. AHP is used to examine the importance level data by asking for opinions from 10 experts for criteria and alternatives. Based on the results of distributing questionnaires to experts, it is identified that Office Building Construction is an alternative and Building Materials criteria are the most suitable criteria against economic uncertainty.

Keywords: Value Based Decision Making, Technology Aspect, Commercial Building, Global Economic Uncertainty

INTRODUCTION

Infrastructure development carries a significant meaning towards the modern society. This development affects the expansion of other parts in the society, i.e., the population. The increasing number of DKI Jakarta population requires adequate situation to carry out its activities, one of which is related to housing construction. As the population increases, the needs for sufficient land also increases. However, the availability of land does not necessarily directly proportional toward the increase of population. This situation is exacerbated by the Covid-19 pandemic which is slowly crippling the global economic situation, including Indonesia.

Currently, Indonesia is on the verge of recession. According to the IMF, the growth in global economic conditions will slow down towards -3%. On the other hand, Indonesia's economic growth rate has been relentless within the range of 4-5% in the last few years. This situation will affect the construction industry in terms of decision-making policy. Value based decision-making is one way of making important organizational decisions in an informed and timely method. This method is used to identify the most significant decisions that will be faced, determine when decisions are made, and find the needed information to make these decisions. In the construction field, the choice of construction method is also essential. The appropriate choice of construction method will instigate

maximum results in terms of cost, performance, and time.

LITERATURE REVIEW

Commercial buildings are buildings that accommodate various commercial functions, such as villas, hotels, resorts, trade, rental office space, and others. Based on the type, commercial buildings associate to a designed and planned building to provide benefits to users as well as owners. The design of commercial buildings has to reflect several aspects, among others (Wungow, 2011):

1. Character/image
2. Building economic value
3. Strategic location
4. Principles of safety construction
5. Principles of building comfort
6. Long-term needs
7. Conditions, potential, and characteristics of the area
8. Socio-cultural conditions of the community
9. Development of technology

A recession is the stagnation and significant reduction in economic activity over a long period of time, ranging from months to years. Recession also implies a sharp contraction in economic activity (Ahmad, 2021). Experts articulate that recession occurs when a country's economy experiences rising unemployment, declining retail sale, undergoing negative Gross Domestic Product (GDP), experiencing prolonged contraction in income and manufacturing, or having negative real economic growth for two consecutive quarters. The impact itself begins with an economic slowdown which will cause the real sector to curb its capacity and lead to work termination (layoffs).

The value based decision-making model is a method in making important organizational decisions in an informed and timely manner. This method can be used to identify the most critical decision, determine the most appropriate time, and find out the most needed information to make those decisions (Kent McDonald, 2017). Technology criteria in Value Based Decisions according to Raflis (2021), namely: building materials, building location, type of land use, usage period of a building, and duration of construction work

The Analytical Hierarchy Process (AHP) is a decision model that describes multi-criteria problems into a hierarchical form (Kurniawan dan Hasibuan, 2017). The hierarchical form is interpreted as a fairly complex form of problem where in a multilevel sequence, the main level is the goal, and the factor level appears as criteria, sub-criteria, then up to the final level. To get the right strategy to assist the decision-making process, the contractors can conduct several kinds of construction, namely: construction of office buildings, construction of shopping centers, or construction of apartments.

RESEARCH METHODOLOGY

Yulianto (2014) suggests that there are several steps in general that must be taken into consideration if AHP will be used to problem solving are as follows:

1. Define the problem and choose a solution.
   In this step, problem to be solved is chosen in detail and clearly. If a problem is found, solution to the problem is needed by doing an experiment. This also can continue to the later stage
2. Design a hierarchical structure with main objectives.
   When main level has been determined, the second or lower hierarchical level need to be arranged, namely the criteria that are in accordance with the alternative assessment that has been provided and determined. Each criterion has a different wight. If necessary, proceed to the sub-criteria.
3. Interpret the pairwise comparison matrix.

The results of the comparative questionnaire will show the level of importance of each criterion in the form of umbers 1, 3, 5, 7, 9. This comparison scale was introduced by Thomas Saaty which is shown below.

Description on importance score:

Tabel 1 AHP standard Value

Interest Intensity	explanation
1	The criteria are the same, and the two elements have the same effect.
3	One criterion is slightly more important than the other.
5	One criterion is more important than the other.
7	One criterion is absolutely more important than the other.
9	One criterion is absolutely more important than any other criterion.
2, 4, 6, 8	This value is among the values above that are close together.

4. Calculating eigen values and consistent tests.
   1) It is calculated as follows:
   2) Normalize the matrix criteria column by dividing each matrix column value by the number in the appropriate column.
   3) Compute the average of all matrix rows.
   4) Next, calculate the eigen vector values with:

$$\lambda \max = \frac{\Sigma \frac{(\mathrm{Wij})}{\Sigma \mathrm{Wj}}}{\mathrm{n}}$$

Description:
λ max : Nilai Eigen
WiJ : Column value cell *Vector Eigen*
ΣWj : Column total value
Wj : The average sum of each matrix row
N : The number of matrices being compared.

After having the λ max, next finding consistency (CI), as follows:

$$\mathrm{CI} = \frac{\lambda \max - \mathrm{n}}{\mathrm{n} - 1}$$

Description:
CI : Consistency Index
λ max : Eigen value
n : Total number of pairwise matrix

The value of *Consistency Ratio* is acquired by dividing *Consistency Index* (CI) with that of *Random Index* (RI), with the result is as follows:

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}}$$

Description:
CI : *Consistency Index*
RI : *Random Index*

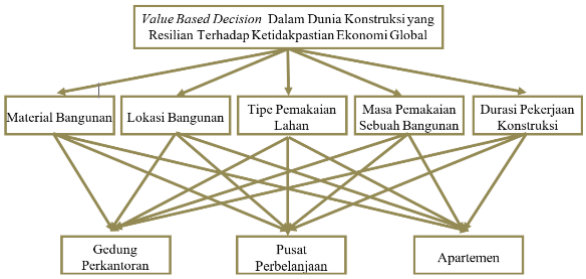
Tabel 2 Random Index
(Source : Hafiyusholeh and Hanif Asyhar, 2016)

N	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51

HASIL DAN PEMBAHASAN

Gathering data was conducted by using direct and indirect surveys, using questionnaires through google forms, and interviewing respondents as the target of this study. The respondents are those who related to value-based decision-making and those who are the decision-maker in the developer company. There are ten respondents who agree to be involved as samples in this study.

Image 1 Respondent background



Gambar 2 Hierarki AHP Pengambilan Keputusan yang Resilian Terhadap Ketidakpastian Ekonomi Global

This study covers three criteria, namely: Building materials (A1), Building location (A2), Land use type (A3), Building usage period (A4), Duration of construction work (A5) with three alternatives, namely: Building offices (C1), Shopping centers (C2), Apartments (C3).

1. Calculation of the average weighting for each element and components. Criteria of data are processed by using the Analytical Hierarchy Process by creating a comparison matrix which is then be averaged by using the following formula:

$$GM = \sqrt[n]{X1 \,.\, X2 \,\ldots\, Xn}$$

Desciption:
X1,X2,…,Xn :Respondents assessment data
n :Number of orders

Tabel 3 Average Weighting and Elements of Each Criterion

Kriteria	A1	A2	A3	A4	A5
A1	1	1,4532	1,6311	1,1413	1,0636
A2	0,6881	1	1,4409	1,0069	0,9669
A3	0,6131	0,6940	1	0,7665	0,5008
A4	0,8762	0,9931	1,3046	1	0,7892
A5	0,9402	1,0342	1,9969	1,2671	1
	4,1176	5,1746	7,3735	5,1818	4,3205

2. Calculation of the weight elements of the component criteria.

Tabel 4 Calculation of Criteria Elements Weight Elements

Kriteria	A1	A2	A3	A4	A5	Jumlah	Rata-rata
A1	0,2429	0,2808	0,2212	0,2203	0,2462	1,2113	0,2423
A2	0,1671	0,1933	0,1954	0,1943	0,2238	0,9739	0,1948
A3	0,1489	0,1341	0,1356	0,1479	0,1159	0,6825	0,1365
A4	0,2128	0,1919	0,1769	0,1930	0,1827	0,9573	0,1915
A5	0,2283	0,1999	0,2708	0,2445	0,2315	1,1750	0,2350
	1	1	1	1	1	5	1

The results of the assessment of each criterion obtained the order of importance, as follows:

Tabel 5 Assessment Results From Each Criterion

		Rata-rata	Rank
Material Bangunan	A1	0,2423	1
Durasi Pekerjaan Konstruksi	A5	0,2350	2
Lokasi Bangunan	A2	0,1948	3
Masa Pemakaian Bangunan	A4	0,1915	4
Tipe Pemakaian Lahan	A3	0,1365	5

3. Consistency measurement
   1. $\lambda \max = (4.1176 \times 0.2423) + (5.1746 \times 0.1915) + (7.3735 \times 0.1365) + (5.181 \times 0.1915) + (4.3205 \times 0.2350)$
      $\lambda \max = 5.0193$
   2. *Consistency Index*
      $CI = \dfrac{5.0193 - 5}{5 - 1}$
      $CI = 0.0048$
   3. *Consistency Ratio*

Tabel 6 IR = Indeks Random Consistency

n	IR	n	IR
1	0,00	7	1.32
2	0,00	8	1.41
3	0.58	9	1.45
4	0.90	10	1.49
5	1.12	11	1.51
6	1.24	12	1.48

$$CR = \frac{0.0048}{1.12}$$
$$CR = 0.0043 < 0.1 \text{ (Consistent)}$$

Alternative toward building material criteria

Tabel 7 Calculation of the Weight Elements of Alternative Building Material Strategies

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,5271	0,6015	0,4431	1,5717	0,5239
Pusat Perbelanjaan (C2)	0,2113	0,2411	0,3370	0,7894	0,2631
Apartemen (C3)	0,2616	0,1573	0,2199	0,6389	0,2130
					1

1. Consistency measurement
    1. $\lambda \max = (2.2591 \times 0.4426) + (3.9277 \times 0.2535) + (3.5643 \times 0.3039)$
    $\lambda \max = 3.0787$
    2. *Consistency Index*
    $$CI = \frac{3.0787 - 3}{3 - 1}$$
    $$CI = 0.0393$$
    3. *Consistency Ratio*
    $$CR = \frac{0.0393}{0.58}$$
    $CR = 0.0678 < 0.1$ **(Consistent)**

Alternative toward building location criteria

Tabel 8 Calculation of Weight Elements for Alternative Building Location Strategies

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4003	0,4934	0,3367	1,2304	0,4101
Pusat Perbelanjaan (C2)	0,2056	0,2534	0,3317	0,7906	0,2635
Apartemen (C3)	0,3942	0,2533	0,3316	0,9790	0,3263
					1

1. $\lambda \max = (2.4982 \times 0.4101) + (3.9468 \times 0.2635) + (3.0160 \times 0.3263)$
$\lambda \max = 3.0490$
2. *Consistency Index*
$$CI = \frac{3.0490 - 3}{3 - 1}$$
$$CI = 0.0245$$
3. *Consistency Ratio*
$$CR = \frac{0.0245}{0.58}$$
$CR = 0.0422 < 0.1$ **(Consistent)**

Alternative toward land use type criteria

Tabel 9 Calculation of Land Use Type Strategy Weight Elements

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4192	0,5019	0,3291	1,2502	0,4167
Pusat Perbelanjaan (C2)	0,2597	0,3109	0,4188	0,9894	0,3298
Apartemen (C3)	0,3211	0,1872	0,2521	0,7603	0,2534
					1

1. $\lambda \max = (2.3854 \times 0.4167) + (3.2160 \times 0,3289) + (3.9668 \times 0.2534)$
$\lambda \max = 3.0602$
2. *Consistency Index*
$$CI = \frac{3.0602 - 3}{3 - 1}$$
$$CI = 0.0301$$
3. *Consistency Ratio*
$$CR = \frac{0.0301}{0.58}$$
$CR = 0.0519 < 0.1$ **(Consistent)**

Alternative toward building usage period criteria

Tabel 10 Calculation of the Weight Element of the Building Use Period Strategy

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,5281	0,4481	0,5988	1,5749	0,5250
Pusat Perbelanjaan (C2)	0,2588	0,2196	0,1596	0,6381	0,2127
Apartemen (C3)	0,2131	0,3323	0,2416	0,7870	0,2623
					1

1. $\lambda \max = (1.8936 \times 0.5250) + (4,5536 \times 0,2127) + (4.1394 \times 0,2623)$
$\lambda \max = 3.0485$
2. *Consistency Index*
$$CI = \frac{3.0485 - 3}{3 - 1}$$
$$CI = 0.0242$$

3. *Consistency Ratio*

$$CR = \frac{0.0242}{0.58}$$

$$CR = 0.0418 < 0.1 \text{ (Consistent)}$$

Alternative toward duration of construction work criteria

Tabel 11 Calculation of the Elements of strategy weight for the duration of construction work

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4427	0,3435	0,5417	1,3279	0,4426
Pusat Perbelanjaan (C2)	0,3281	0,2546	0,1777	0,7604	0,2535
Apartemen (C3)	0,2293	0,4019	0,2806	0,9117	0,3039
					1

1. $\lambda \max = (2.2591 \times 0.4426) + (3.9277 \times 0.2535) + (3.5643 \times 0.3039)$
   $\lambda \max = 3.0787$
2. *Consistency Index*

$$CI = \frac{3.0787 - 3}{3 - 1}$$

$$CI = 0.0393$$

3. *Consistency Ratio*

$$CR = \frac{0.0393}{0.58}$$

$$CR = 0.0678 < 0.1 \text{ (Consistent)}$$

Alternative processing based on all criteria

1. Tabulate the average on each criterion element

Tabel 12 Assessment Results of All Criteria

		Rata-rata	Rank
Material Bangunan	**A1**	0,2423	1
Durasi Pekerjaan Konstruksi	**A5**	0,2350	2
Lokasi Bangunan	**A2**	0,1948	3
Masa Pemakaian Bangunan	**A4**	0,1915	4
Tipe Pemakaian Lahan	**A3**	0,1365	5
		1	

2. Tabulate the average that has been obtained from each alternative

Tabel 13 Assessment Results of Each Alternative

		Material Bangunan	Lokasi Bangunan	Tipe Pemakaian Lahan	Masa Pemakaian Bangunan	Durasi Pekerjaan Konstruksi
		A1	A2	A3	A4	A5
Gedung Perkantoran	C1	0,5239	0,4101	0,4167	0,5250	0,4426
Pusat Perbelanjaan	C2	0,2631	0,2635	0,3298	0,2127	0,2535
Apartemen	C3	0,2130	0,3263	0,2534	0,2623	0,3039

3. AHP results based on all criteria rating

Tabel 14 AHP Results Based on All Criteria Ratings

Alternatif	Hasil	Ranking
Gedung Perkantoran	0,4682	**1**
Apartemen	0,2714	**2**
Pusat Perbelanjaan	0,2604	**3**
	1	

The results of the implementation of the AHP by analyzing the assessment of all experts demonstrate that constructing an office building becomes the best alternative with a total value is of **0.4682**.

CONCLUSION

1. The determining criteria on the aspect of technology in order to be resilient to global economy uncertainty, namely the criteria for **building materials**.
2. The determinant alternative strategy in the aspect of technology in order to be resilient to global economy uncertainty, namely an alternative strategy for the construction of office building.
3. Based on the result of data analysis, the advantages of constructing office building compared to others are:
   a. The demand level toward CBD (Central Business District) is high, with activities related to 'FIRE' (Finance & Banking, Insurance, dan Real Estate). As long as the economy is growing, the demand for office space will remain high.
   b. The capital gain for office buildings is higher than rental land and vacant houses, which is around 7-12%.

c. The rental period for office buildings is 1-3 years, while the rental period for houses is only 1-2 years.

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VALUE BASED DECISION ON TECHNOLOGY CRITERIA THAT ARE RESILENT AGAINST GLOBAL ECONOMIC UNCERTAINTY

by Magister Teknik Sipil 1

Submission date: 19-Mar-2025 09:12AM (UTC+0700)
Submission ID: 2568051471
File name: ITERIA_THAT_ARE_RESILENT_AGAINST_GLOBAL_ECONOMIC_UNCERTAINTY.pdf (687.44K)
Word count: 2348
Character count: 12740

LivaS: International Journal on Livable Space
Vol. 06, No. 2, August 2021 : 75-81
Doi: 10.25105/livas.v6i2.16802
ISSN : 2548-7515 (online)
ISSN : 2580-7552 (print)

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Keywords: Value Based Decision Making, Technology Aspect, Commercial Building, Global Economic Uncertainty

INTRODUCTION

Infrastructure development carries a significant meaning towards the modern society. This development affects the expansion of other parts in the society, i.e., the population. The increasing number of DKI Jakarta population requires adequate situation to carry out its activities, one of which is related to housing construction. As the population increases, the needs for sufficient land also increases. However, the availability of land does not necessarily directly proportional toward the increase of population. This situation is exacerbated by the Covid-19 pandemic which is slowly crippling the global economic situation, including Indonesia.

Currently, Indonesia is on the verge of recession. According to the IMF, the growth in global economic conditions will slow down towards -3%. On the other hand, Indonesia's economic growth rate has been relentless within the range of 4-5% in the last few years. This situation will affect the construction industry in terms of decision-making policy. Value based decision-making is one way of making important organizational decisions in an informed and timely method. This method is used to identify the most significant decisions that will be faced, determine when decisions are made, and find the needed information to make these decisions. In the construction field, the choice of construction method is also essential. The appropriate choice of construction method will instigate

maximum results in terms of cost, performance, and time.

LITERATURE REVIEW

Commercial buildings are buildings that accommodate various commercial functions, such as villas, hotels, resorts, trade, rental office space, and others. Based on the type, commercial buildings associate to a designed and planned building to provide benefits to users as well as owners. The design of commercial buildings has to reflect several aspects, among others (Wungow, 2011):

1. Character/image
2. Building economic value
3. Strategic location
4. Principles of safety construction
5. Principles of building comfort
6. Long-term needs
7. Conditions, potential, and characteristics of the area
8. Socio-cultural conditions of the community
9. Development of technology

A recession is the stagnation and significant reduction in economic activity over a long period of time, ranging from months to years. Recession also implies a sharp contraction in economic activity (Ahmad, 2021). Experts articulate that recession occurs when a country's economy experiences rising unemployment, declining retail sale, undergoing negative Gross Domestic Product (GDP), experiencing prolonged contraction in income and manufacturing, or having negative real economic growth for two consecutive quarters. The impact itself begins with an economic slowdown which will cause the real sector to curb its capacity and lead to work termination (layoffs).

The value based decision-making model is a method in making important organizational decisions in an informed and timely manner. This method can be used to identify the most critical decision, determine the most appropriate time, and find out the most needed information to make those decisions (Kent McDonald, 2017). Technology criteria in Value Based Decisions according to Raflis (2021), namely: building materials, building location, type of land use, usage period of a building, and duration of construction work

The Analytical Hierarchy Process (AHP) is a decision model that describes multi-criteria problems into a hierarchical form (Kurniawan dan Hasibuan, 2017). The hierarchical form is interpreted as a fairly complex form of problem where in a multilevel sequence, the main level is the goal, and the factor level appears as criteria, sub-criteria, then up to the final level. To get the right strategy to assist the decision-making process, the contractors can conduct several kinds of construction, namely: construction of office buildings, construction of shopping centers, or construction of apartments.

RESEARCH METHODOLOGY

Yulianto (2014) suggests that there are several steps in general that must be taken into consideration if AHP will be used to problem solving are as follows:

1. Define the problem and choose a solution.
   In this step, problem to be solved is chosen in detail and clearly. If a problem is found, solution to the problem is needed by doing an experiment. This also can continue to the later stage
2. Design a hierarchical structure with main objectives.
   When main level has been determined, the second or lower hierarchical level need to be arranged, namely the criteria that are in accordance with the alternative assessment that has been provided and determined. Each criterion has a different wight. If necessary, proceed to the sub-criteria.
3. Interpret the pairwise comparison matrix.

The results of the comparative questionnaire will show the level of importance of each criterion in the form of umbers 1, 3, 5, 7, 9. This comparison scale was introduced by Thomas Saaty which is shown below.

Description on importance score:

Tabel 1 AHP standard Value

Interest Intensity	explanation
1	The criteria are the same, and the two elements have the same effect.
3	One criterion is slightly more important than the other.
5	One criterion is more important than the other.
7	One criterion is absolutely more important than the other.
9	One criterion is absolutely more important than any other criterion.
2, 4, 6, 8	This value is among the values above that are close together.

4. Calculating eigen values and consistent tests.
   1) It is calculated as follows:
   2) Normalize the matrix criteria column by dividing each matrix column value by the number in the appropriate column.
   3) Compute the average of all matrix rows.
   4) Next, calculate the eigen vector values with:

$$\lambda \max = \frac{\Sigma \frac{(Wij)}{\Sigma Wj}}{n}$$

Description:
λ max : Nilai Eigen
WiJ : Column value cell *Vector Eigen*
ΣWj : Column total value
Wj : The average sum of each matrix row
N : The number of matrices being compared.

After having the λ max, next finding consistency (CI), as follows:

$$CI = \frac{\lambda \max - n}{n - 1}$$

Description:
CI : Consistency Index
λ max : Eigen value
n : Total number of pairwise matrix
The value of *Consistency Ratio* is acquired by dividing *Consistency Index* (CI) with that of *Random Index* (RI), with the result is as follows:

$$CR = \frac{CI}{RI}$$

Description:
CI : *Consistency Index*
RI : *Random Index*

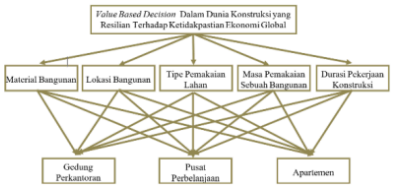
Tabel 2 Random Index
(Source : Hafiyusholeh and Hanif Asyhar, 2016)

N	1	2	3	4	5	6	7	8	9	10	11
RI	0	0	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51

HASIL DAN PEMBAHASAN

Gathering data was conducted by using direct and indirect surveys, using questionnaires through google forms, and interviewing respondents as the target of this study. The respondents are those who related to value-based decision-making and those who are the decision-maker in the developer company. There are ten respondents who agree to be involved as samples in this study.

Image 1 Respondent background



Gambar 2 Hierarki AHP Pengambilan Keputusan yang Resilian Terhadap Ketidakpastian Ekonomi Global

This study covers three criteria, namely: Building materials (A1), Building location (A2), Land use type (A3), Building usage period (A4), Duration of construction work (A5) with three alternatives, namely: Building offices (C1), Shopping centers (C2), Apartments (C3).

1. Calculation of the average weighting for each element and components. Criteria of data are processed by using the Analytical Hierarchy Process by creating a comparison matrix which is then be averaged by using the following formula:

$$GM = \sqrt[n]{X1 \,.\, X2 \,\ldots\, Xn}$$

Desciption:
X1,X2,…,Xn :Respondents assessment data
n :Number of orders

Tabel 3 Average Weighting and Elements of Each Criterion

Kriteria	A1	A2	A3	A4	A5
A1	1	1,4532	1,6311	1,1413	1,0636
A2	0,6881	1	1,4409	1,0069	0,9669
A3	0,6131	0,6940	1	0,7665	0,5008
A4	0,8762	0,9931	1,3046	1	0,7892
A5	0,9402	1,0342	1,9969	1,2671	1
	4,1176	5,1746	7,3735	5,1818	4,3205

2. Calculation of the weight elements of the component criteria.

Tabel 4 Calculation of Criteria Elements Weight Elements

Kriteria	A1	A2	A3	A4	A5	Jumlah	Rata-rata
A1	0,2429	0,2808	0,2212	0,2203	0,2462	1,2113	0,2423
A2	0,1671	0,1933	0,1954	0,1943	0,2238	0,9739	0,1948
A3	0,1489	0,1341	0,1356	0,1479	0,1159	0,6825	0,1365
A4	0,2128	0,1919	0,1769	0,1930	0,1827	0,9573	0,1915
A5	0,2283	0,1999	0,2708	0,2445	0,2315	1,1750	0,2350
	1	1	1	1	1	5	1

The results of the assessment of each criterion obtained the order of importance, as follows:

Tabel 5 Assessment Results From Each Criterion

		Rata-rata	Rank
Material Bangunan	A1	0,2423	1
Durasi Pekerjaan Konstruksi	A5	0,2350	2
Lokasi Bangunan	A2	0,1948	3
Masa Pemakaian Bangunan	A4	0,1915	4
Tipe Pemakaian Lahan	A3	0,1365	5

3. Consistency measurement
   1. $\lambda \max = (4.1176 \times 0.2423) + (5.1746 \times 0.1915) + (7.3735 \times 0.1365) + (5.181 \times 0.1915) + (4.3205 \times 0.2350)$
      $\lambda \max = 5.0193$
   2. *Consistency Index*
      $CI = \frac{5.0193 - 5}{5 - 1}$
      $CI = 0.0048$
   3. *Consistency Ratio*

Tabel 6 IR = Indeks Random Consistency

n	IR	n	IR
1	0,00	7	1.32
2	0,00	8	1.41
3	0.58	9	1.45
4	0.90	10	1.49
5	1.12	11	1.51
6	1.24	12	1.48

$$CR = \frac{0.0048}{1.12}$$
$$CR = 0.0043 < 0.1 \text{ (Consistent)}$$

Alternative toward building material criteria

Tabel 7 Calculation of the Weight Elements of Alternative Building Material Strategies

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,5271	0,6015	0,4431	1,5717	0,5239
Pusat Perbelanjaan (C2)	0,2113	0,2411	0,3370	0,7894	0,2631
Apartemen (C3)	0,2616	0,1573	0,2199	0,6389	0,2130
					1

1. Consistency measurement
   1. $\lambda \max = (2.2591 \times 0.4426) + (3.9277 \times 0.2535) + (3.5643 \times 0.3039)$
      $\lambda \max = 3.0787$
   2. *Consistency Index*
      $CI = \frac{3.0787 - 3}{3 - 1}$
      $CI = 0.0393$
   3. *Consistency Ratio*
      $CR = \frac{0.0393}{0.58}$
      $CR = 0.0678 < 0.1$ (**Consistent**)

Alternative toward building location criteria

Tabel 8 Calculation of Weight Elements for Alternative Building Location Strategies

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4003	0,4934	0,3367	1,2304	0,4101
Pusat Perbelanjaan (C2)	0,2056	0,2534	0,3317	0,7906	0,2635
Apartemen (C3)	0,3942	0,2533	0,3316	0,9790	0,3263
					1

1. $\lambda \max = (2.4982 \times 0.4101) + (3.9468 \times 0.2635) + (3.0160 \times 0.3263)$
   $\lambda \max = 3.0490$
2. *Consistency Index*
   $CI = \frac{3.0490 - 3}{3 - 1}$
   $CI = 0.0245$
3. *Consistency Ratio*
   $CR = \frac{0.0245}{0.58}$
   $CR = 0.0422 < 0.1$ (**Consistent**)

Alternative toward land use type criteria

Tabel 9 Calculation of Land Use Type Strategy Weight Elements

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4192	0,5019	0,3291	1,2502	0,4167
Pusat Perbelanjaan (C2)	0,2597	0,3109	0,4188	0,9894	0,3298
Apartemen (C3)	0,3211	0,1872	0,2521	0,7603	0,2534
					1

1. $\lambda \max = (2.3854 \times 0.4167) + (3.2160 \times 0,3289) + (3.9668 \times 0.2534)$
   $\lambda \max = 3.0602$
2. *Consistency Index*
   $CI = \frac{3.0602 - 3}{3 - 1}$
   $CI = 0.0301$
3. *Consistency Ratio*
   $CR = \frac{0.0301}{0.58}$
   $CR = 0.0519 < 0.1$ (**Consistent**)

Alternative toward building usage period criteria

Tabel 10 Calculation of the Weight Element of the Building Use Period Strategy

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,5281	0,4481	0,5988	1,5749	0,5250
Pusat Perbelanjaan (C2)	0,2588	0,2196	0,1596	0,6381	0,2127
Apartemen (C3)	0,2131	0,3323	0,2416	0,7870	0,2623
					1

1. $\lambda \max = (1.8936 \times 0.5250) + (4,5536 \times 0,2127) + (4.1394 \times 0,2623)$
   $\lambda \max = 3.0485$
2. *Consistency Index*
   $CI = \frac{3.0485 - 3}{3 - 1}$
   $CI = 0.0242$

3. *Consistency Ratio*

$$CR = \frac{0.0242}{0.58}$$

$$CR = 0.0418 < 0.1 \text{ (Consistent)}$$

Alternative toward duration of construction work criteria

Tabel 11 Calculation of the Elements of strategy weight for the duration of construction work

Alternatif	C1	C2	C3	Jumlah	Rata-rata
Gedung Perkantoran (C1)	0,4427	0,3435	0,5417	1,3279	0,4426
Pusat Perbelanjaan (C2)	0,3281	0,2546	0,1777	0,7604	0,2535
Apartemen (C3)	0,2293	0,4019	0,2806	0,9117	0,3039
					1

1. $\lambda \max = (2.2591 \times 0.4426) + (3.9277 \times 0.2535) + (3.5643 \times 0.3039)$
   $\lambda \max = 3.0787$
2. *Consistency Index*

$$CI = \frac{3.0787 - 3}{3 - 1}$$

$$CI = 0.0393$$

3. *Consistency Ratio*

$$CR = \frac{0.0393}{0.58}$$

$$CR = 0.0678 < 0.1 \text{ (Consistent)}$$

Alternative processing based on all criteria

1. Tabulate the average on each criterion element

Tabel 12 Assessment Results of All Criteria

		Rata-rata	Rank
Material Bangunan	**A1**	0,2423	1
Durasi Pekerjaan Konstruksi	**A5**	0,2350	2
Lokasi Bangunan	**A2**	0,1948	3
Masa Pemakaian Bangunan	**A4**	0,1915	4
Tipe Pemakaian Lahan	**A3**	0,1365	5
		1	

2. Tabulate the average that has been obtained from each alternative

Tabel 13 Assessment Results of Each Alternative

		Material Bangunan	Lokasi Bangunan	Tipe Pemakaian Lahan	Masa Pemakaian Bangunan	Durasi Pekerjaan Konstruksi
		A1	A2	A3	A4	A5
Gedung Perkantoran	C1	0,5239	0,4101	0,4167	0,5250	0,4426
Pusat Perbelanjaan	C2	0,2631	0,2635	0,3298	0,2127	0,2535
Apartemen	C3	0,2130	0,3263	0,2534	0,2623	0,3039

3. AHP results based on all criteria rating

Tabel 14 AHP Results Based on All Criteria Ratings

Alternatif	Hasil	Ranking
Gedung Perkantoran	0,4682	**1**
Apartemen	0,2714	**2**
Pusat Perbelanjaan	0,2604	**3**
	1	

The results of the implementation of the AHP by analyzing the assessment of all experts demonstrate that constructing an office building becomes the best alternative with a total value is of **0.4682**.

CONCLUSION

1. The determining criteria on the aspect of technology in order to be resilient to global economy uncertainty, namely the criteria for **building materials**.
2. The determinant alternative strategy in the aspect of technology in order to be resilient to global economy uncertainty, namely an alternative strategy for the construction of office building.
3. Based on the result of data analysis, the advantages of constructing office building compared to others are:
   a. The demand level toward CBD (Central Business District) is high, with activities related to 'FIRE' (Finance & Banking, Insurance, dan Real Estate). As long as the economy is growing, the demand for office space will remain high.
   b. The capital gain for office buildings is higher than rental land and vacant houses, which is around 7-12%.

c. The rental period for office buildings is 1-3 years, while the rental period for houses is only 1-2 years.

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7