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ENVIRONMENTAL SUSTAINABILITY IMPROVEMENT OF MALANG CITY BASED ON LOCAL SUSTAINABILITY

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Abstract

Background: *Malang City is a city that has a function as an area of education, industry, trade, and services so that it is experiencing fairly rapid development. These developments often only pursue economic and social aspects, causing problems in environmental aspects.*
Research purposes: *Assessing the environmental sustainability index in all urban villages in Malang City, analyze the indicators that affect the environmental sustainability index in all urban villages in Malang City and prepare recommendations for improving environmental sustainability in Malang City.*
Research methods: *The method used is Multi-Dimensional Scaling (MDS) through the Rapid Appraisal for Sustainable Development (RAP-SUSDEV) ordination technique approach modified from RAPFISH, which is a sustainability analysis used to determine status and identify sensitive indicators in the process of knowing sustainability. The MDS method can provide stable results compared to multivariate analysis methods such as factor analysis.*
Research results: *The results of the index display indicators that are sensitive or have an effect on sustainability, which are useful as reference materials in compiling recommendations for improving environmental sustainability in Malang City.*
Conclusion: *The urban areas that have the highest environmental sustainability index values are Tasikmadu and Tunggulwulung Urban Villages with very sustainable status. Meanwhile, the kelurahan that has the smallest environmental sustainability index value is Kotalama Urban Village with unsustainable status. The results of the leverage analysis show that the factors that have a significant effect on environmental sustainability are anticipation and mitigation efforts, namely as many as 23 urban villages. Based on the analysis that has been done, the recommendations for improving environmental sustainability in Malang City are prioritized to build anticipation and mitigation efforts such as early warning systems, safety equipment, and signs, and disaster evacuation routes. The prioritized recommendations were taken based on the most recommendations given to 57 urban villages in Malang City.*
Keywords: ***Environmental Sustainability, Sustainable Development, Local Sustainability, Multi-Dimensional Scaling***

Abstrak

Latar belakang: Kota Malang merupakan kota yang memiliki fungsi sebagai kawasan pendidikan, industri, perdagangan, dan jasa sehingga mengalami perkembangan yang cukup pesat. Perkembangan tersebut seringkali hanya mengejar aspek ekonomi dan sosial sehingga menimbulkan permasalahan pada aspek lingkungan.
Tujuan penelitian: Mengkaji indeks kelestarian lingkungan di seluruh kelurahan di Kota Malang, menganalisis indikator-indikator yang mempengaruhi indeks kelestarian lingkungan di seluruh kelurahan di Kota Malang dan menyusun rekomendasi peningkatan kelestarian lingkungan di Kota Malang.
Metode penelitian: Metode yang digunakan adalah Multi-Dimensional Scaling (MDS) melalui pendekatan teknik ordinasi Rapid Appraisal for Sustainable Development (RAP-SUSDEV) yang dimodifikasi dari RAPFISH, yaitu analisis keberlanjutan yang digunakan untuk menentukan status dan mengidentifikasi indikator sensitif dalam proses mengetahui keberlanjutan. Metode MDS dapat memberikan hasil yang stabil dibandingkan dengan metode analisis multivariat seperti analisis faktor.
Hasil penelitian: Hasil indeks menampilkan indikator-indikator yang sensitif atau berpengaruh terhadap kelestarian, yang berguna sebagai bahan acuan dalam menyusun rekomendasi perbaikan kelestarian lingkungan di Kota Malang.
Kesimpulan: Wilayah perkotaan yang memiliki nilai indeks kelestarian lingkungan tertinggi

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adalah Kelurahan Tasikmadu dan Kelurahan Tunggulwulung dengan status sangat lestari. Sedangkan kelurahan yang memiliki nilai indeks kelestarian lingkungan terkecil adalah Kelurahan Kotalama dengan status tidak lestari. Hasil analisis leverage menunjukkan bahwa faktor yang berpengaruh signifikan terhadap kelestarian lingkungan adalah upaya antisipasi dan mitigasi yaitu sebanyak 23 kelurahan. Berdasarkan analisis yang telah dilakukan, rekomendasi untuk peningkatan kelestarian lingkungan di Kota Malang diprioritaskan untuk membangun upaya antisipasi dan mitigasi seperti sistem peringatan dini, peralatan keselamatan, dan rambu-rambu, serta jalur evakuasi bencana. Rekomendasi yang diprioritaskan diambil berdasarkan rekomendasi yang paling banyak diberikan kepada 57 kelurahan di Kota Malang.

Kata kunci: **Kelestarian Lingkungan, Pembangunan Berkelanjutan, Keberlanjutan Lokal, Penskalaan Multi-Dimensi**

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INTRODUCTION

The process to achieve sustainable development is currently trying to be achieved by cities in Indonesia, including Malang City, in the Malang City Medium Term Development Plan (RPJMD) report for 2019-2023 is to create a productive and competitive city based on a creative economy, sustainability and integration (Pemerintah Kota Malang, 2018). Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Rustiadi et al., 2011). Sustainable development is an important effort to achieve so that the development carried out does not only pursue economic and social aspects but also must pay attention to the environment. One aspect of sustainable development is the environment furthermore, the notion of a sustainable environment is a condition of balance, resilience, and interconnectedness so that humans are enabled to meet their needs without exceeding the capacity of the supporting ecosystem, and can regenerate to continue to meet future needs (Effendi et al., 2018). To find out the achievements of environmentally-based sustainable development in Malang City, useful indicators are needed to help achieve sustainability targets, inform about the weaknesses and strengths of indicators, inform policymakers and the public about the condition of their area, and are useful for determining priorities (Pupphachai & Zuidema, 2017).

Malang City is a city that has a function as an area of education, industry, trade, and services so that it is experiencing fairly rapid development. The development often only pursues the economic aspect, causing problems in the environmental aspect. Problems in the environmental aspect are natural disasters. Malang City is an area that has the potential to be prone to natural disasters. However, Malang City's resilience to disasters is still not maximized (Rusli & Ulya, 2018). Natural disasters have a major impact on humans and the environment, so it is necessary to anticipate and mitigate early warning systems and safety equipment (BPS, 2013). The next problem is land, the area of residential land increased by 54.99% in 2016, and the area of rice fields decreased by 84.10% in the same year. The change in land use resulted in the critical land area in Malang City being 52.72% of the total area (Santoso & Nurumudin, 2020). The land is part of the three main factors of production and is something that is needed in the housing and agriculture sectors, to accommodate policymaking materials and sustainable land use planning, information on land areas such as rice fields, non-rice fields agricultural lands such as dry land /gardens, fields/ huma, and land that is temporarily not cultivated (BPS, 2013).

Another problem faced by Malang City is the measurement of sustainable environmental development which is currently only carried out at the city scale, there is no measurement at the scale of the local or urban village. Measurement of local

sustainability is useful to assist the government in making a policy or program so that it can prioritize and optimize in zones or areas that have a low sustainability index (Pravitasari et al., 2016). The selection of sub-districts as an effort to create a sustainable environment is supported in the Village Sustainable Development Goals (SDGs) document which was later issued by the Minister of Villages for Development of Disadvantaged Regions and Transmigration Regulation Number 13 of 2020 which regulates the use of village funds and efforts to achieve the SDGs. The Village SDGs document is a derivative of Presidential Regulation Number 59 of 2017 concerning the implementation of achieving sustainable national development goals.

Based on this urgency, this research is expected to contribute to improving the sustainable environment of Malang City based on the local sustainability index, while the objectives to be achieved are assessing the environmental sustainability index in all urban villages in Malang City; analyze the indicators that affect the environmental sustainability index in all urban villages in Malang City and prepare recommendations for improving environmental sustainability in Malang City.

RESEARCH METHOD

The method used is Multi-Dimensional Scaling (MDS) through the Rapid Appraisal for Sustainable Development (RAP-SUSDEV) ordination technique approach modified from RAPFISH, which is a sustainability analysis used to determine status and identify sensitive indicators in the process of knowing sustainability. The MDS method can provide stable results compared to multivariate analysis methods such as factor analysis (Pitcher et al., 2013).

The data to be used in this study is secondary data, which in its meaning is a source of data sourced from written data such as literature, scientific studies, and so on (Sugiyono, 2017). The data covers all sub-districts in Malang City, totaling 57 sub-districts see Table 3. The data in question consists of variables and indicators that are sourced based on considerations from previous research and are associated with problems in Malang City, see Table 1.

Table 1. Variables, Indicators, and Relationships with Problems in Malang City.

Variable	Indicator	Code	Relationship with Problems in Malang City
Environment (Apriyanto et al., 2015)	Natural disaster incident (BPS, 2013)	X1	The Malang City area is an area that is vulnerable to natural disasters (Rusli & Ulya, 2018).
	Victims of natural disasters (BPS, 2013)	X2	
	Anticipation and mitigation efforts (BPS, 2013)	X3	
	Rice field area (BPS, 2013)	X4	The increase in residential land area is accompanied by an increase in critical land (Santoso & Nurumudin, 2020)
	Area of dry land/gardens and fields/huma (BPS, 2013)	X5	
	Area of land that is temporarily	X6	

Variable	Indicator	Code	Relationship with Problems in Malang City
	uncultivated (BPS, 2013)		

Source: BPS (2013); Apriyanto et al (2015); Rusli & Ulya (2018); Santoso & Nurumudin (2020).

The Multi-Dimensional Scaling (MDS) method is used to describe geometric spaces through the similarity and inequality of variables (Borg & Patrick J.F., 2005), the approach used is the Rapid Appraisal for Sustainable Development (RAP-SUSDEV) ordinance technique modified from RAPFISH.

The RAP-SUSDEV analysis is used to assess the environmental sustainability index in all urban villages in Malang City. The analysis process goes through several stages, the first of which is to assess each indicator on an ordinal scale based on sustainability criteria. The scoring is based on facts in the field according to predetermined criteria by giving a score of 0 to 3, which means bad (0), moderate (1), good (2), and very good (3) (Suwarno et al., 2011). Number 3 is the maximum number of good numbers, while 0 is the minimum number or bad number.

The second is the ordination stage for each indicator that has been previously assessed. The ordination technique in MDS is based on the Euclidean distance, which is manifested in dimensional space and can be written as the configuration or ordination of a point or object, resulting in the position of the sustainability status of the object being observed and then projected on a horizontal line with different levels of coordination between bad points. and the good point (good) which the index value is between 0 to 100% (Fauzi & Anna, 2005) see table 2.

Table 2. Sustainability Status Index Value.

Index Value	Category
0,00 – 25,00	Bad (unsustainable)
25,01 – 50,00	Less (less sustainable)
50,01 – 75,00	Enough (sustainable enough)
75,01 – 100,00	Good (very sustainable)

Source: Fauzi & Anna (2005).

The accuracy of the results of the sustainability index analysis can be verified using R^2 (coefficient of determination) and stress values, low-stress values indicate good fit, and high-stress values indicate bad fit, the tolerance limit for random values is 0.25 (Fauzi & Anna, 2005). The value of R2 is also used to verify whether or not additional indicators are needed. It should be noted that if the R^2 value is close to 1 (100%) then the results of the analysis are said to be quite good (Kavanagh & Pitcher, 2004).

The third is leverage analysis which is used to analyze indicators that affect the environmental sustainability index in all urban villages in Malang City. The results of the analysis are used as a reference in formulating recommendations for improving environmental sustainability in the city of Malang. Determination of sensitive attributes/indicators based on the order of priority on the results of the leverage analysis, by looking at the shape of the change in Root Mean Square (RMS) on the X-axis. The greater the RMS value on the attributes/indicators, the greater the sensitivity or influence on the sustainability status (Kavanagh & Pitcher, 2004).

Fourth is the Monte Carlo analysis which is used to estimate the impact of the error at the 95% confidence level (Fauzi & Anna, 2005), which is then compared with the

value of the Multi-Dimensional Scaling index. The analysis serves to verify the indicators used in measuring the sustainability index, which can be done by looking at the difference between the Monte Carlo index and the sustainability index in findin
g the smallest difference (Hidayanto et al., 2009), thus ensuring that there are no errors in the measurement of the sustainability index value.

RESULT AND DISCUSSION

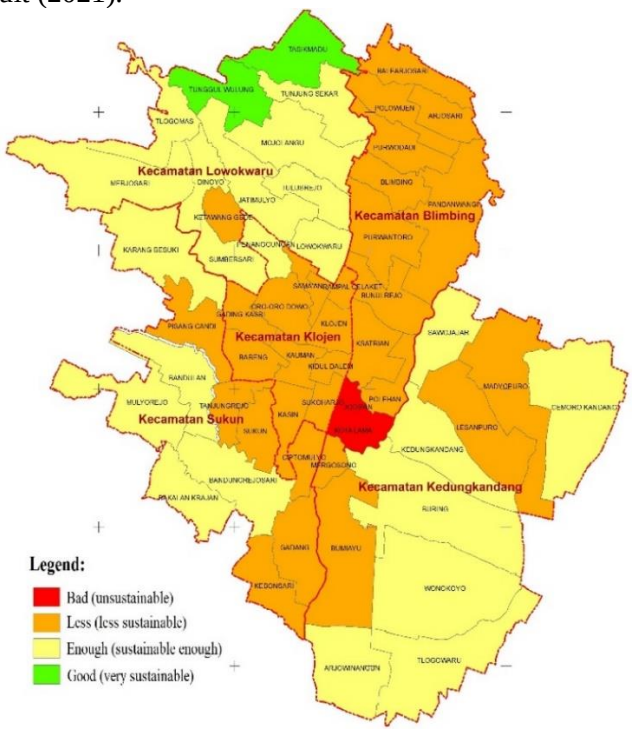
Based on the results of the RAP-SUSDEV analysis to answer goal 1, the environmental sustainability index value is obtained. These index values produce stress values that are all still below the random value limit of 0.25 and R^2 (coefficient of determination) is close to 1, meaning that the results of the RAP-SUSDEV analysis are accurate. Likewise, the Monte Carlo analysis is used to see the impact of random errors from each indicator. The results of the Monte Carlo analysis carried out with 25 iterations show that the sustainability index is at a 95% confidence interval or has a difference of less than 5% from the results of the RAP-SUSDEV analysis, then these results qualify as an estimator of the sustainability index value.

Table 3. Environmental Sustainability Index (ESI), Monte Carlo Index (MCI), Sustainability Sensitive Indicators (SSI).

Urban Villages	ESI	*Stress*	R^2	MCI	SSI (Code)	RMS value
Arjowina-ngun	53,54	0,15	0,92	53,00	X3	14,65
Tlogowaru	53,54	0,15	0,92	53,07	X3	14,65
Wonokoyo	53,54	0,15	0,92	52,91	X3	14,65
Bumiayu	49,23	0,15	0,94	49,00	X3	9,66
Buring	53,54	0,15	0,92	53,34	X3	14,65
Mergosono	33,79	0,15	0,94	33,02	X3	7,68
Kotalama	16,08	0,14	0,94	15,55	X2	5,47
Kedung-kandang	53,44	0,15	0,94	53,05	X4	8,91
Sawojajar	62,28	0,15	0,94	61,66	X5	11,27
Madyopuro	47,40	0,14	0,93	47,32	X3	12,25
Lesanpuro	42,43	0,15	0,94	42,06	X3	8,80
Cemoro-kandang	53,71	0,14	0,93	53,60	X4	14,16
Kebonsari	41,88	0,14	0,94	41,69	X1	10,63
Gadang	48,71	0,14	0,94	48,45	X3	11,33
Ciptomulyo	35,53	0,14	0,94	35,17	X1	13,64
Sukun	45,36	0,15	0,94	44,75	X3	9,02
Bandung-rejosari	54,26	0,15	0,94	53,52	X3	9,59
Bakalan Krajan	69,74	0,15	0,92	67,20	X3	13,33
Mulyorejo	62,42	0,14	0,93	61,00	X3	11,79
Bandulan	54,26	0,15	0,94	53,52	X3	9,59
Tanjungrejo	44,04	0,15	0,92	43,13	X3	15,66
Pisang Candi	44,82	0,15	0,94	44,40	X3	7,07
Karang-besuki	53,13	0,15	0,93	52,59	X3	9,68
Kasin	49,99	0,14	0,94	49,51	X4	14,18
Sukoharjo	49,99	0,14	0,94	49,99	X4	14,18
Kidul Dalem	49,99	0,14	0,94	49,52	X4	14,18
Kauman	49,99	0,14	0,94	49,24	X4	14,18
Bareng	49,99	0,14	0,94	49,00	X4	14,18
Gadingkasri	49,99	0,14	0,94	49,98	X4	14,18
Oro Oro Dowo	44,44	0,14	0,94	44,17	X3	13,93
Klojen	49,99	0,14	0,94	49,99	X4	14,18

Urban Villages	ESI	*Stress*	R^2	MCI	SSI (Code)	RMS value
Rampal Celaket	49,99	0,14	0,94	49,09	X4	14,18
Samaan	44,44	0,14	0,94	44,25	X3	13,93
Penanggungan	53,10	0,14	0,94	52,75	X4	14,15
Jodipan	23,74	0,14	0,95	22,77	X1	13,74
Polehan	35,19	0,15	0,94	35,02	X5	7,14
Kesatrian	35,53	0,14	0,94	35,03	X1	13,64
Bunulrejo	39,54	0,14	0,94	39,34	X1	11,06
Purwantoro	39,54	0,14	0,94	39,16	X1	11,06
Pandan-wangi	39,54	0,14	0,94	39,28	X1	11,06
Blimbing	39,54	0,14	0,94	39,12	X1	11,06
Purwodadi	39,54	0,14	0,94	39,11	X1	11,06
Polowijen	39,54	0,14	0,94	39,45	X1	11,06
Arjosari	42,40	0,14	0,94	42,26	X3	11,07
Balearjosari	46,42	0,14	0,94	46,02	X3	11,12
Merjosari	66,52	0,15	0,94	65,10	X4	10,54
Dinoyo	62,28	0,15	0,94	61,32	X5	11,27
Sumbersari	53,10	0,14	0,94	52,61	X4	14,15
Ketawanggede	49,99	0,14	0,94	49,24	X4	14,18
Jatimulyo	56,23	0,15	0,94	56,03	X3	8,64
Lowokwaru	53,10	0,14	0,94	52,94	X4	14,15
Tulusrejo	55,02	0,15	0,92	54,55	X4	16,84
Mojolangu	56,41	0,15	0,94	56,01	X3	6,96
Tunjung-sekar	67,46	0,15	0,94	66,38	X5	9,76
Tasikmadu	76,07	0,15	0,94	74,23	X5	12,81
Tunggulwulung	76,07	0,15	0,94	73,57	X5	12,81
Tlogomas	61,83	0,15	0,94	60,05	X4	9,00

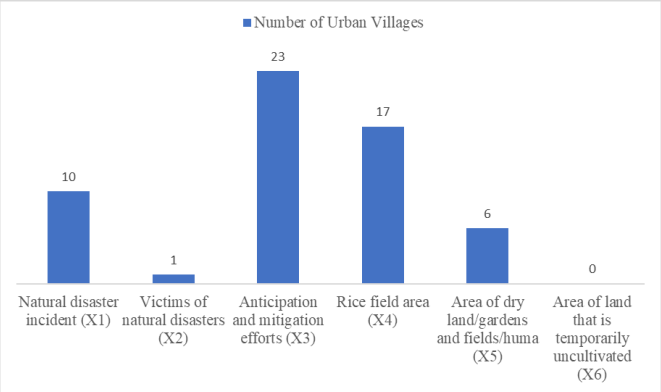
Source: Analysis Result (2021).



Picture 1. Environmental Sustainability Index in 57 Urban Villages in Malang City.
Source: Analysis Result (2021).

Referring to table 3 and picture 1 regarding the environmental sustainability index, it is known that the Tunggulwulung and Tasikmadu Urban Villages have the highest environmental sustainability status with an index value of 76,07 meaning very sustainable status, while the index value of Jodipan Urban Village is 23.74 and Kotalama Urban Village is 16.08, having the lowest environmental sustainability index which means unsustainable status.

The next process is leverage analysis which is carried out to answer objective 2, which is to analyze indicators that affect the environmental sustainability index in all urban villages in Malang City. Influential indicators need to be improved to support environmental sustainability in all urban villages. The results of the analysis can be seen in Table 3, the RMS value displayed is the highest value on the indicator.



Picture 2. Number of Indicators Sensitive to Environmental Sustainability Index in Each Urban Villages. Source: Analysis Result (2021).

The results of the leverage analysis in table 3 are then summarized in picture 2, showing that the natural disaster incident indicator is sensitive to the environmental sustainability index in 10 urban villages, the victims of natural disasters indicator is sensitive to the environmental sustainability index in 1 urban village, the anticipation and mitigation efforts indicator is sensitive to the index. environmental sustainability in 23 urban villages, rice field area indicator is sensitive to environmental sustainability index in 17 urban villages, area of dry land/gardens and fields/huma indicator is sensitive to environmental sustainability index in 6 urban villages, and area of land that is temporarily uncultivated indicator is not sensitive to the environmental sustainability index in all urban villages.

The results of the leverage analysis are used to answer objective 3, namely as a reference for compiling recommendations for improving environmental sustainability in Malang City, see table 4.

Table 4. Recommendations for Improvement of Environmental Sustainability in Malang City

Urban Villages	Recommendations
Arjowinangun	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Tlogowaru	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Wonokoyo	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Bumiayu	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Buring	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Mergosono	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Kotalama	Maintaining the number of survivors from natural disasters.
Kedungkandang	Maintain the number of existing paddy fields.
Sawojajar	Increase the area of dry land/garden/ and fields/huma and the like.
Madyopuro	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Lesanpuro	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Cemorokandang	Maintain the number of existing paddy fields.
Kebonsari	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Gadang	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Ciptomulyo	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Sukun	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Bandungrejosari	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Bakalan Krajan	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Mulyorejo	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.

Urban Villages	Recommendations
Bandulan	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Tanjungrejo	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Pisang Candi	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Karangbesuki	Build anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Kasin	Increase the area of rice fields and the like.
Sukoharjo	Increase the area of rice fields and the like.
Kidul Dalem	Increase the area of rice fields and the like.
Kauman	Increase the area of rice fields and the like.
Bareng	Increase the area of rice fields and the like.
Gadingkasri	Increase the area of rice fields and the like.
Oro Oro Dowo	Maintain and improve anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Klojen	Increase the area of rice fields and the like.
Rampal Celaket	Increase the area of rice fields and the like.
Samaan	Increase anticipation and mitigation efforts, such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Penanggungan	Increase the area of rice fields and the like.
Jodipan	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Polehan	Increase the area of dry land/garden/ and fields/huma and the like.
Kesatrian	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Bunulrejo	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Purwantoro	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Pandanwangi	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Blimbing	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Purwodadi	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Polowijen	Be aware of natural disasters, and protect the environment to minimize the occurrence of natural disasters.
Arjosari	Increase anticipation and mitigation efforts, such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Balearjosari	Increase anticipation and mitigation efforts, such as early warning

Urban Villages	Recommendations
	systems, safety equipment, and disaster evacuation signs and routes.
Merjosari	Increase the area of rice fields and the like.
Dinoyo	Increase the area of dry land/garden/ and fields/huma and the like.
Sumbersari	Increase the area of rice fields and the like.
Ketawanggede	Increase the area of rice fields and the like.
Jatimulyo	Maintain and improve anticipatory and mitigation efforts such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Lowokwaru	Increase the area of rice fields and the like.
Tulusrejo	Increase the area of rice fields and the like.
Mojolangu	Increase anticipation and mitigation efforts, such as early warning systems, safety equipment, and disaster evacuation signs and routes.
Tunjungsekar	Increase the area of dry land/garden/ and fields/huma and the like.
Tasikmadu	Increase the area of dry land/garden/ and fields/huma and the like.
Tunggulwulung	Increase the area of dry land/garden/ and fields/huma and the like.
Tlogomas	Increase the area of rice fields and the like.

Source: Analysis Result (2021).

The recommendations that have been made are expected to contribute to the improvement of environmental sustainability in Malang City. Although these recommendations are made for each urban village, if each urban village can improve environmental sustainability in its area, it will support sustainability in the upper area because every urban villages area in Malang City has spatial relationships and relationships.

This research is a development of a previous study entitled Development of a Local Sustainability Index in Pagar Alam City, South Sumatra (Nurahmatulah, 2019). The study used factor analysis to calculate the value of the local sustainability index in each dimension in each urban village, then to determine the factors that influence the local sustainability index in Pagar Alam City, Geographically Weighted Regression (GWR) analysis was used. Finally, to develop directions and recommendations for development areas based on the local sustainability index in Pagar Alam City used descriptive analysis.

The difference with previous research is that this study uses RAP-SUSDEV analysis modified from RAPFISH to measure the environmental sustainability index, then to analyze the indicators that affect the environmental sustainability index in all urban villages in Malang City, leverage analysis is used. The results of the analysis are used as a reference for compiling recommendations for improving environmental sustainability in the city of Malang.

CONCLUSION

The urban areas that have the highest environmental sustainability index values are Tasikmadu and Tunggulwulung Urban Villages with very sustainable status. Meanwhile, the kelurahan that has the smallest environmental sustainability index value is Kotalama Urban Village with unsustainable status. The results of the leverage analysis show that the factors that have a significant effect on environmental sustainability are anticipation and mitigation efforts, namely as many as 23 urban villages. Based on the analysis that has been done, the recommendations for improving environmental sustainability in

Malang City are prioritized to build anticipation and mitigation efforts such as early warning systems, safety equipment, and signs, and disaster evacuation routes. The prioritized recommendations were taken based on the most recommendations given to 57 urban villages in Malang City.

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