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A REVIEW OF AGRICULTURAL AND COASTAL CITIES IN INDONESIA IN FINDING URBAN SPRAWL PRIORITY PARAMETERS

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Abstract

Urban sprawl has caused an impact on urban development, causing land use changes, loss of income and cultural values, environmental degradation, and high monetary costs. Urban sprawl needs to be carried out efficiently and inclusively to ensure sustainable land use and management including cities in Indonesia. Since 1980s, urban sprawl in Indonesia is high due to limited land which causes the expansion of development on the expanse of agricultural areas and coastal settlements. This paper presents a critical review of the parameters of urban sprawl in agricultural cities including Bandung, Batu, Pekanbaru and coastal cities including Surabaya, Gresik, and Madura using the Analytic Hierarchy Process (AHP). The parameters are gathered from a review of articles related to urban sprawl in agricultural and coastal cities in Indonesia. The result of this comparative studies showed two key important variables that caused urban sprawl in Indonesia: population growth, and land limitation to encompass agricultural and coastal cities. Furthermore, there are four priority parameters out of eight, namely immigrant population ratio-transnational, birth ratio, population growth rate, and land occupation ratio causing urban sprawl in agricultural and coastal cities. In sum, the findings of this study suggest the importance of applying urban sprawl parameters in analyzing urban development as it is useful for evaluating and monitoring the rapid urban development in Indonesia.

***Keywords**: urban sprawl; agricultural cities; coastal cities; parameters*

INTRODUCTION

Urban sprawl is suburban development that has lost its rural identity defined as an area between rural and urban (Karakayaci, 2016; Dridi, 2015). Urban sprawl resulting negative impacts such as unplanned development (Yiran, 2020), land use change (Karakayaci, 2016), food insecurity, loss of income and cultural values, pollution, health, slums, flood, and environmental degradation (Yiran, 2020; Karakayaci, 2016; Al Jarah, 2019; Mehriar et al., 2020) and large impact on high monetary costs (Correia and Silva, 2015). From the various negative impacts, urban sprawl needs to be carried out efficiently and inclusively to ensure sustainable land use and management. One of them is through the implementation of the SDGs (Sustainable Development Goals) program.

The SDGs have set an agenda for 2030 with 17 goals to ensure human welfare, economic prosperity, and environmental protection (Pradhan et al., 2017). One of the goals of the SDGs is to make cities and human settlements inclusive, safe, resilient, and sustainable (goals 11). Through SDGs goal 11, the negative impacts of urban sprawl can be resolved by producing suitable land uses for safe and affordable housing, sustainable transportation systems, controlled urbanization, protecting cultural and natural heritage, reduce environmental damage, the availability of green spaces, and sustainable public spaces.

Urban sprawl mechanically arises from unplanned and disorganized development (Yiran, 2020; Karakayaci, 2016; Kamran, 2020; Mehriar et al., 2020). For example, in Surakarta and Semarang Indonesia, unplanned and disorganized development forms slum settlements on the railways which engaged to poverty, pollution, and insecurity (Krisandriyana, 2019; Ridlo, 2020). The same is true in Malang city where slum settlements are formed along riverbanks (Mau, 2016).

In other words, urban sprawl is not the right development for the city from a monetary perspective because the costs incurred far exceed the revenue generated by the city. However, if the development or

expansion occurs between urban areas will be costless (Wu and Elena, 2003). In the other hand, urban sprawl gives a positive impact on suburban area development for having better facilities and a variety of jobs due to the flexibilities of managing and developing the suburban area (Saputra, 2012) and the improvement of road network construction (Yiran et al., 2020). Urban sprawl occurs due to several factors such as transportation development (Giyarsih, 2010), rapid population growth, uncontrolled and planned growth (Karakayaci, 2016), lack of well-defined land policies (Al Jarah et al., 2019), community desire of owned homes (Polidoro, 2012).

The development resulted in the link between residential area, industrial area, business area, and transportation. The cause of urban sprawl due to the construction of new transportation networks often allows the development of commercial and industrial fields as well as the development of new residential areas in their environment. The interactions between these sectors have led to an increase in urban sprawl, in this phenomenon urban policies could address negative aspects of sprawled by integrating residential areas, transportation, and other amenities (Mehriar et al., 2020; Giyarsih, 2010; Yiran, 2020). Conversely, if urban growth is coordinated by the right government policies, then the dense urban growth will be organized. In this case, ineffective development policies and inappropriate land use planning can be pointed out as the cause of urban sprawl.

Urban sprawl is a global problem as well as in Indonesia, which has experienced land use changes as a result of urban sprawl due to urban population growth which is in line with the increasing need for housing. However, limited urban land causes development to extend to suburban areas, namely agricultural and coastal areas (Hidayah and Suharyo, 2018). Some agricultural cities in Indonesia such as Bandung, Batu, and Pekanbaru changing agricultural land use to non-agriculture land use functions to provide the demand for housing and other urban facilities. Urban sprawl makes an impact on agriculture productivity and activities that cause food insecurity; indeed, the farmers are forced to change their occupation from agricultural to other activities (Widiawaty, 2018; Setyono, 2019; Firdaus, 2018).

As seen in Figure 1 below, Indonesia's rice production since April 2020 has continued to decline until December 2020 in line with that, the harvested area has also continued to decline to 0.44 million hectares in December 2020. Rice production in December 2020 was only 2.33 million tons where the rice needs of the Indonesian population every month is 2.47 million tons (Central Statistics Agency, 2020). For this reason, the land use change of agricultural land into housing due to urban sprawl needs to be addressed immediately so that agricultural production can meet the rice needs of the Indonesian population.

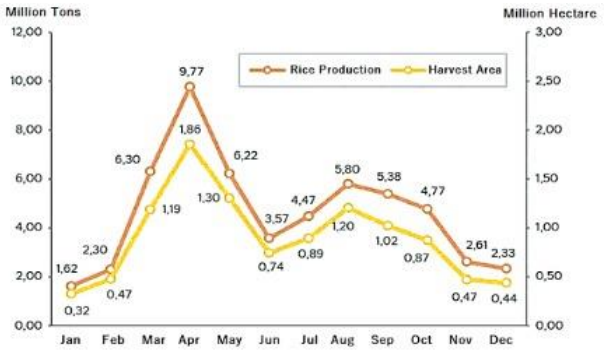

Figure 1. Indonesia Rice Production Rate and Harvest Area Growth in 2020 (Indonesian Central Statistics Agency, 2020)

Meanwhile, the change of coastal areas into housing has an impact on the ecosystem. The conversion of mangrove forest land results in the loss of ecosystem functions as various types of living things that lead to the loss of coastal biodiversity. Another environmental impact is increasing the potential for flooding due to sea level rise as a result of reclamation for housing development (Hidayah and Suharyo, 2018). The aim of this study is to compare urban sprawl in six developing cities in Indonesia which are divided into two types of cities, namely agricultural cities (Bandung, Batu, and Pekanbaru) and coastal cities (Surabaya, Gresik, and Madura) to investigate the parameters of urban sprawl in agricultural cities and coastal cities. The findings of this study suggest the importance of applying urban sprawl parameters in analyzing urban development as monitoring factors for the urban and policy making governmental agencies in evaluating the impact of urban sprawl in cities of Indonesia. Thus, the government can design the right strategy to overcome urban sprawl that causes land use changes in agricultural and coastal areas.

The reason for choosing Bandung, Batu, Pekanbaru, Surabaya, Gresik, and Madura to represent agricultural cities and coastal cities in Indonesia is that these six cities are developing cities in Indonesia that are experiencing land use change due to the impact of urban sprawl (Central Statistics Agency, 2020). Figure 2 below shows the map of urban sprawl as the data from Indonesia Central Statistics Agency for 2020 in six cities that urban sprawl has impacted most areas of the city.

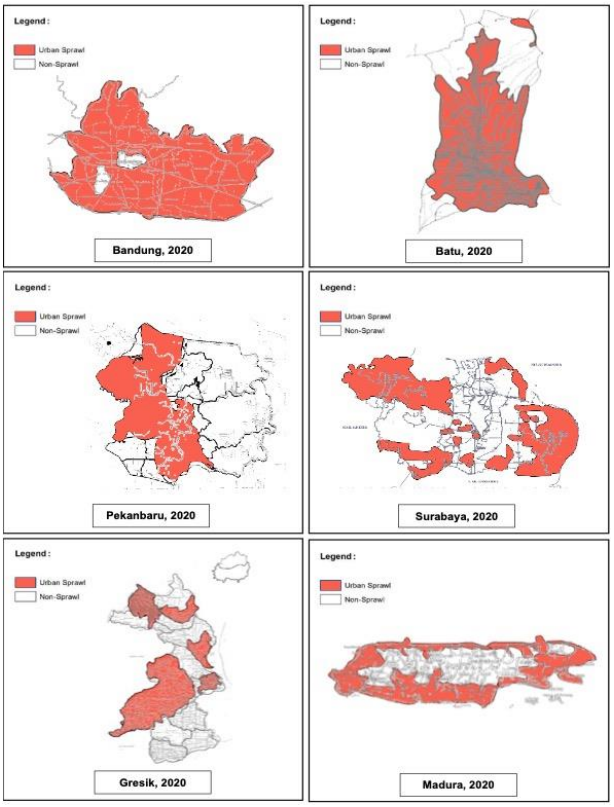

Figure 2. Urban Sprawl Map of Bandung, Batu, Pekanbaru, Surabaya, Gresik, and Madura Year 2020 (Author, 2021)

This research will examine several articles related to urban sprawl in Indonesia which represent agricultural cities and coastal cities, which produce factors (X_n) that influence the occurrence of urban sprawl. The results of this study are expected to be taken into consideration for the government in overcoming urban sprawl problems in Indonesia.

METHODOLOGY

In determining the parameters of urban sprawl, the first step of this research is to find articles in google scholar journals related to urban sprawl in agricultural and coastal cities in Indonesia through Publish or Perish (PoP) application to extract articles from google scholar journals which restricted publications from 2000 to 2021.

The keywords used in the search are 'sprawl' and 'Indonesia'. PoP provides several choices of journal article sources including Google Scholar, Scopus, and WoS. The author chose google scholar articles because the study was conducted in Indonesian cities so that PoP could collect more articles with cities in Indonesia, if Scopus or WoS were used, the results of articles collected by PoP would be very small due to not many urban sprawl studies with cities in Indonesia have been published in Scopus or WoS journals.

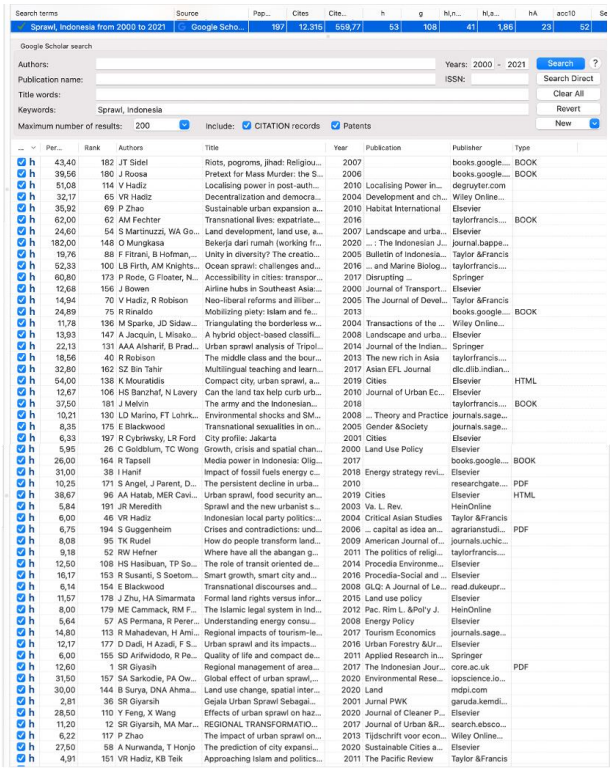

Figure 3. PoP Data Result (Author, 2021)

Figure 3 above is a display of the results of PoP screening of 200 articles on Google Scholar in year 2000-2021, resulting in 53 h-index google scholar articles according to two keywords: urban sprawl dan Indonesia. Of the 53 articles consisting of 29 articles on urban sprawl topics and 35 articles on Indonesian city locations . The articles used are excerpts from articles that have the topic of urban sprawl and the location of Indonesian cities. However, only nine articles filled the keywords with the topic 'urban sprawl in Indonesia' which had locations in Bandung, Batu, Pekanbaru, Surabaya, Gresik, and Madura as written in the introduction, these six cities represent types of agricultural and coastal cities in Indonesia.

This research conducted an analysis using the Analytic Hierarchy Process (AHP) to get the most appropriate parameters related to urban sprawl in Indonesia. Analytic Hierarchy Process (AHP) is a decision-making technique for regional development, basically designed to capture perceptions and rationale through procedures designed on a preferential scale among various sets of alternatives. The AHP method is carried out by pairwise comparisons of various sets of alternatives. In the AHP model, a limit scale of 1 to 9 is used which is considered sufficient to represent human

perception, scale 1,3,5,7,9 is covering the level of importance, moderate importance, a strong level of importance, a very strong level of importance, and the extreme importance level, while the scale 2,4,6,8 is the value in between (Falatehan, 2016).

The AHP method in this study involved interviewing ten experts with a background in urban planning lecturers to determine the scale, then the scales of the experts were collected and analyzed. The flow chart of the procedure of data collection and analysis is shown in Figure 3 below.

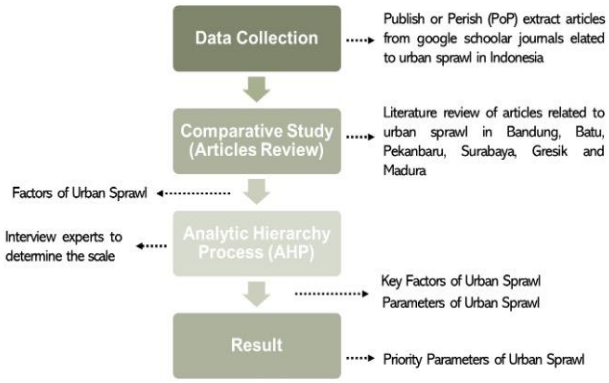

Figure 3. Flow Chart of Procedure of Data Collection and Analysis (Author, 2021)

RESULT AND DISCUSSION

The factors of urban sprawl in Indonesia among six cities is shown in Table 1 below, in term of land use change that is obtained from the results of a comparative study of article reviews. The results show that four factors affect the urban sprawl where each factor consists of two to four parameters. To get the most appropriate parameters related to urban sprawl in Indonesia, this research conducted an analysis using the Analytic Hierarchy Process (AHP) on these factors to find key factors so that the most appropriate parameters are obtained for urban sprawl in Indonesia.

The results showed that there are four factors (X) that affect urban sprawl where each factor consists of two to four parameters (P). To get the most appropriate parameters related to urban sprawl in Indonesia, this research conducted an analysis using the Analytic Hierarchy Process (AHP) on these factors to find the key factors so that the most appropriate parameters for urban sprawl in Indonesia were obtained. The four factors are: population growth (X1), land limitation (X2), mobility growth (X3), and community improvement (X4).

Table 1. Factors Affecting Urban Sprawl in Bandung, Batu, Pekanbaru as Agricultural cities and Surabaya, Gresik and Madura as Coastal Cities in Indonesia (Author, 2021)

No	Factor	Parameter	Source
1	Population Growth (X1)	Birth ratio	Hidayah & Suharyo (2018),
		Immigrant population ratio (Transnational)	Widiawaty et.al. (2018),
		Population growth rate	Setyono et al. (2019),
		Migration rate	Wagistina & Antariksa (2019), Firdaus et.al. (2018), Rohmadiani et.al. (2020), Mahriyar & Rho (2014), Siswanto et al. (2014), Nilayanti & Brotosunaryo (2012)
2	Land Limitation (X2)	Land occupation ratio	Widiawaty et al. (2018),
		Building density (built-up area growth)	Setyono et al. (2019),
		Variety of development	Wagistina & Antariksa (2019),
		Residential area growth	Firdaus et al. (2018), Rohmadiani et al. (2020), Mahriyar & Rho (2014), Siswanto et al. (2014), Nilayanti & Brotosunaryo (2012)
3	Mobility Growth (X3)	Road network density	Setyono et al. (2019),
		Car dependency ratio	Firdaus et al. (2018), Rohmadiani et al. (2020)
4	Community Improvement (X4)	Variety of activities	Hidayah & Suharyo (2018),
		Number of households	Widiawaty et al. (2018), Mahriyar & Rho (2014), Siswanto et al. (2014),

No	Factor	Parameter	Source
			Nilayanti & Brotosunaryo (2012)

The factors of urban sprawl in Indonesia among six cities through AHP analysis is shown in Table 2 below, with a percentage priority, namely population growth of 67.5%, limited land 17.4%, mobility growth of 5.9%, and community improvement of 9.2%, with principal eigenvalue (λ) = 4.042 and Consistency Ratio (CR) = 1.5% (0.015). The consistency ratio value is -0.005 ≤ 0.1, meaning that the matrix is consistent. Therefore, based on the results of the AHP analysis, there are two key factors of urban sprawl in Indonesia among six cities that represent agricultural and coastal cities, namely population growth and land limitation.

The rapid population growth causes the need for housing in urban areas to be very high so that a lot of lands have been converted as housing and makes the availability of land in urban areas is limited. This causes land prices to be very high so that residents eventually choose to live in suburban areas with lower housing prices, as well as developers and industries who choose to build in suburban areas because the available land is more extensive at low prices (Hidayah and Suharyo, 2018).

Table 2. Factors Decision Matrix and Percentage (Author, 2021)

No	Factor	X1	X2	X3	X4	%
1	Population Growth	1	4.00	9.00	9.00	67.5%
2	Land Limitation	0.25	1	3.00	2.00	17.4%
3	Mobility Growth	0.11	0.33	1	0.50	5.9%
4	Community Improvement	0.11	0.50	2.00	1	9.2%

Table 2 above shows that the focus for urban sprawl in Indonesia which includes agricultural cities and coastal cities is on the problem of population growth and limited land in urban areas. However, these two key factors have eight parameters based on the results of article reviews in Bandung, Batu, Pekanbaru, Surabaya, Gresik, and Madura which represent agricultural cities and coastal cities. Therefore, it is necessary to analyze the eight parameters to find the priority parameters for urban sprawl in Indonesia using the AHP method.

The eight parameters are owned by two key factors, namely population growth and land limitation, are immigrant population ratio (transnational) coded P1, land occupation ratio coded P2, birth ratio coded P3, population growth rate coded P4, migration rate coded P5, building density-built up area growth coded P6, variety of development coded P7, and residential area growth with coded P8. These parameters will then be re-analyzed using AHP to find the parameter hierarchy of the causes of urban sprawl.

The result of priority parameters through AHP shown of the two key factors is shown in Table 3 below. The percentage priority parameters of population growth and land limitation factors are: 29.5% of immigrant population ratio-transnational (P1) , 17.7% of birth ratio (P3), 16,8% of population growth rate (P4), 15.8% of land occupation ratio (P2), 11.6% of migration rate (P5), 3.3% of building density-built-up area growth (P6), 3.0% of residential area growth (P8) and 2.3% of variety of development (P7), with principal eigenvalue (□) = 8.678 and Consistency Ratio (CR) = 6.9% (0.069). The consistency ratio value is -0.005 ≤ 0.1, meaning that the matrix is consistent (table 3).

Therefore, based on the results of the AHP analysis, there are four priority parameters with the highest percentage in the range of 29.5% to 15.8%, namely immigrant population ratio-transnational (P1), birth ratio (P3), population growth rate (P4), and land occupation ratio (P2). The highest parameter is the immigrant population ratio which is more emphasized on transnational which is a social phenomenon due to the blurring of economic and social boundaries between countries. Compared with the birth rate, population growth rate, and land occupation ratio; transnational phenomena have the greatest threat to agricultural and coastal lands along with the accompanying impacts of land use change into multinational industrial lands and residences for foreign workers which causes a reduction in agricultural and coastal land which affects agricultural and marine production as well as threatens the sustainability of agricultural and coastal cities in Indonesia.

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Table 3. AHP Matrix and Percentage (Author, 2021)

No	Parameter	P1	P2	P3	P4	P5	P6	P7	P8	%
1	Immigrant population ratio (Transnational) **(P1)**	3.00	1.00	2.00	7.00	6.00	5.00	5.00	3.00	29.5%
2	Land occupation ratio **(P2)**	0.33	1	1.00	1.00	2.00	6.00	6.00	7.00	15.8%
3	Birth ratio **(P3)**	1.00	1.00	1	1.00	2.00	6.00	5.00	7.00	17.7%
4	Population growth rate **(P4)**	0.50	1.00	1.00	1	2.00	7.00	6.00	7.00	16.8%
5	Migration rate **(P5)**	0.14	0.50	0.50	0.50	1	7.00	7.00	7.00	11.6%
6	Building density-built up area growth **(P6)**	0.17	0.17	0.17	0.14	0.14	1	2.00	2.00	3.3%
7	Variety of development **(P7)**	0.20	0.17	0.20	0.17	0.14	0.50	1	2.00	2.3%
8	Residential area growth **(P8)**	0.20	0.17	0.20	0.17	0.14	0.50	1	2.00	3.0%

The transnational phenomenon that affects the increase in the immigrant population ratio is caused by an increase in the number of migrants due to the large number of workers arriving from other countries due to the large number of multinational companies built in Indonesia. Indonesia's growth as a developing country has attracted investors and world-scale companies that have opened branches in Indonesia such as Toyota Manufacturing in Karawang, West Java, near the city of Bandung; Nestle in Pasuruan, East Java, near the city of Surabaya; and Nivea Beiersdorf in Singosari, East Java, near the city of Batu. These companies recruit foreign workers to bring in large numbers of immigrants to work and live in Indonesia in line with the need for housing. Limited land and the high demand for housing causes an unbalanced land occupation ratio because the land is dominated by residential areas and causes social segregation problems (Wagistina and Antariksa, 2019).

Immigrants and births are the cause of the high population growth in Indonesia. The birth rate in Indonesia is quite high even though the Indonesian government has implemented the Family Planning called Keluarga Berencana (KB) program which contains a recommendation for the Indonesian citizen to have two children in each family. Unfortunately, this program only in the form of recommendations and does not have a legal element so that it has not been effective in reducing the population growth rate from the birth rate.

Therefore, to overcome urban sprawl in Indonesia, active efforts from the Indonesian government are needed in monitoring and evaluating urban development, both agricultural cities and coastal cities with a focus on monitoring and evaluation of the immigrant population ratio (transnational), birth ratio, population growth rate, and land occupation ratio. The Indonesian government can more explicitly impose restrictions on the number and tighten requirements for immigrants who will work and live in Indonesia, provide socialization and assistance to Indonesian citizens in rural areas about family planning programs, reduce birth rates, and maintain population growth. The Indonesian government needs to curb buildings that are not built according to land use plans by not issuing building permits so that land occupations that are not suitable for land use as agricultural land and traditional settlements can be overcome and the development of cities in Indonesia can be organized (CNN Indonesia, 2019).

The contribution of this study is to provide guidelines for the Indonesian government to focus on the immigrant population ratio (transnational), birth ratio, population growth rate, and land occupancy ratio so that it can monitor and evaluate the impact of urban sprawl and can be the basis for formulating development policies. In particular, in agricultural and coastal cities, the government must pay great attention to transnational phenomena that occur, seeing that there are many land use changes in the function of agricultural land into multinational industries due to the large area and low land prices. In addition, the existence of a coastal city that is close to the sea, has access to shipping lanes, and borders between countries has attracted foreign investors to build their multinational companies.

In the future, if monitoring and action are not carried out, this transnational phenomenon will not only cause urban sprawl problems but can also have an impact on other problems such as social segregation, food insecurity, pollution, and environmental degradation.

CONCLUSION

Urban sprawl in Indonesia specifically occurs in two types of cities, namely agricultural and coastal cities. From the results of the comparison of the two types of cities, four priority parameters are obtained out of eight for urban sprawl in Indonesia are immigrant population ratio (transnational), birth ratio, population growth rate, and land occupation ratio. These parameters are monitoring factors for the urban and policy-making governmental agencies in evaluating the impact of urban sprawl in cities of Indonesia for sustainability of agricultural and coastal cities in Indonesia.

This study has limitations on the number of journal articles reviewed which only screened 200 articles which resulted in 53 articles with the Google Scholar h-index and only nine articles that fulfilled the categories of the two keywords "urban sprawl" and "Indonesia"; and research locations which only examined six cities representing agricultural cities and coastal cities in Indonesia. Seeing these limitations, the direction for further research is to conduct research using sources with a greater number of articles by adding h-index articles such as Scopus and WoS and analyzing agricultural and coastal cities apart from the six cities in this study. Further research is also recommended using different keywords in PoP search and using analytical methods that are developed beyond AHP analysis.

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References

Al Jarah, S. H., Zhou, B., Abdullah, R. J., Lu, Y., & Yu, W. (2019) Urbanization and urban sprawl issues in city structure: A case of the Sulaymaniah Iraqi

Kurdistan region. *Journal Sustain*ability, 11(2), 485-505. doi.org/10.3390/su11020485

Central Statistics Agency. (2020) Statistik Indonesia 2020. Retrieved from https://www.bps.go.id/publication/2020/04/29/e9011b3155d45d70823c141f/statistik-indonesia-2020.html

CNN Indonesia. (2019) 329 Pelanggar IMB di Jakarta Pusat Jalani Sidang Yustisi. Retrieved from https://www.cnnindonesia.com/nasional/20191031133454-12-444498/329-pelanggar-imb-di-jakarta-pusat-jalani-sidang-yustisi

Correia, M., & Silva, J. (2015) The Costs of Urban Sprawl on Portuguese Municipalities in 2011. *Proceedings of the 55th Conference Congress of the European Regional Science Association: World Renaissance:* Changing roles for people and places. Lisbon, Portugal.

Dridi, H., Bendib, A., & Kalla, M. (2015) Analysis of Urban Sprawl Phenomenon in Batna City (Algeria) By Remote Sensing Technique. *Journal of Analele Universitatii din Oradea-Seria Geografie*, 2(1), 211-220. Retrieved from https://doaj.org/article/8fb57750c9974e1e8b4ad383f3c601be

Falatehan, A. F. (2016) Analitical Hierarchy Process (AHP). *Indomedia Pustaka*, Yogyakarta, Indonesia.

Firdaus, Asteriana, F., & Ramadhani, A. (2018), Karakteristik, Tipologi, Urban Sprawl. *Journal Saintis*, 18(2), 89-108. doi.org/10.25299/saintis.2018.vol18(2).3191

Giyarsih, S. R. (2010). Urban Sprawl of The City of Yogyakarta, Special Reference to The Stage of Spatial Transformation. *Indonesian Journal of Geography*, 42(1), 47-58. doi.org/10.22146/ijg.1576

Hidayah, Zainul & Suharyo, O. S. (2018). Analisa Perubahan Penggunaan Lahan Wilayah Pesisir Selat Madura. *Journal Ilmiah Rekayasa*, 11(1), 19-30. doi.org/10.21107/rekayasa.v11i1.4120

Kamran, J., Kamanrudi, K., & Gholiniya, S. (2020). An Investigation into Urban Development Patterns with Sprawl and Other Corresponding Changes: A Case Study of Babol City. *Journal of Urban Culture Research*, 20(1), 26-43. Retrieved from https://www.academia.edu/43874588/An_Investigation_Into_Urban_Development_Patterns_With_Sprawl_and_Other_Corresponding_Changes_A_Case_Study_of_Babol_City

Karakayaci. (2016). The Concept of Urban Sprawl and Its Causes. *Journal of International Social Research*, 9(45), 815-818.

Krisandriyana, M., Astuti, W., & Rini, E. F. (2019). Faktor yang Mempengaruhi Keberadaan Kawasan Permukiman Kumuh di Surakarta. *Journal Desa Kota*, 1(1), 24-33. doi.org/10.20961/desa-kota.v1i1.14418.24-33

Mahriyar, M. Zia & Rho, J. H. (2014). The Compact City Concept in Creating Resilient City and Transportation System in Surabaya. *Journal Procedia Social and Behavioral Sciences*, 135(1), 41-49. doi.org/10.1016/j.sbspro.2014.07.323

Mau, Wilfridus. (2016). Studies of Slums in The Area Along the River Based on Legality Aspect in Oro-oro Dowo District Malang City. *Journal Teknik Planologi*, 1(1), 1-21. Retrieved from http://eprints.itn.ac.id/3416/

Mehriar, M., Masoumi, H., & Mohino, I. (2020). Urban Sprawl, Socioeconomic Features, and Travel Patterns in Middle East Countries: A Case Study in Iran. *Journal Sustainability*, 12(22), 9620. doi:10.3390/su12229620

Nilayanti, V. Dhika & Brotosunaryo. (2012). Pengaruh Perkembangan Aktivitas Ekonomi Terhadap Struktur Ruang Kota di SWP III Kabupaten Gresik. *Journal Teknik PWK*, 1(1), 76-88. Retrieved from https://www.neliti.com/publications/214480/pengaruh-perkembangan-aktivitas-ekonomi-terhadap-struktur-ruang-kota-di-swp-iii

Polidoro, M., Lollo, J., & Barros, M. (2012). Urban Sprawl and the Challenges for Urban Planning. *Journal of Environmental Protection*, 3(1), 1010-1019. doi.org/10.4236/jep.2012.39117

Pradhan, P., Costa, L., Rybski, D., Lucht, W., & Kropp, J. (2017). A Systematic Study of Sustainable Development Goals (SDG) *Interactions. Journal Earth's Future,* 5(30), 1169-1179. doi:10.1002/2017EF000632

Ridlo, M. Agung. (2020). Permukiman Liar (Squatter Settlement) di Jalur Kereta Api Kota Semarang. *Jurnal Planologi*, 17(2), 150-167. doi.org/10.30659/jpsa.v17i2.12790

Rohmadiani, L., Kunce, Y., & Rachmawanti, I. (2020). Fenomena Urban Sprawl Wilayah Pembangunan Gresik Selatan. *Journal Penataan Ruang*, 15(1), 1-6. doi.org/10.12962/j2716179X.v15i1.6722

Saputra, Erlis. (2012). The Influence of Urbanization Toward City's Physical Growth Pattern and Facilities Carrying Capacity Case Study: Pekanbaru Municipality, Riau Province, Indonesia. *Proceedings of the 11th Asian Urbanization Conference Osmania University*. Hyderabad, India.

Setyono, D., Hariyani, S., & Haryani, B. (2019). Identifikasi Bentuk Struktur Ruang Kota Batu. *Journal Tata Kota dan Daerah*, 11(2), 85-92. doi.org/10.21776/ub.takoda.2019.011.02.5

Siswanto, V., Routray, J., Dewi, R. (2014). Rural Urban Disparity in and around Surabaya Region, Indonesia. *Journal IPTEK-Technology and Science*, 25(2), pp. 41-53. doi.org/10.12962/j20882033.v25i2.468

Wagistina, Satti & Antariksa (2019). Urban sprawl and Residential Segregation in Western Suburban Area of Malang City, East Java, Indonesia. *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktik dalam Bidang Pendidikan dan Ilmu Geografi*, 24(1), pp. 11-24. doi.org/10.17977/um017v24i12019p011

Wu, Junjie & Elena, Irwin. (2003). Human-Nature Interactions and the Spatial Pattern of Land Use. *Proceedings of the 2003 AERE Workshop Spatial Theory, Modeling, and Econometrics in Environmental and Resource Economics*, Madison, Wisconsin.

Widiawaty, M. A., Dede, M., & Ismail, A. (2018). Urban sprawl Typology Analysis in Bandung City using Geographic Information System. *Proceedings of the Seminar Nasional Geomatika 2018: Penggunaan dan Pengembangan Produk Informasi Geospasial Mendukung Daya Saing Nasional*. Bogor, Indonesia.

Yiran, G. A. B., Ablo, A. D., Asem, F. E., Owusu, G. (2020). Urban Sprawl in Sub-Saharan Africa: A Review of The Literature in Selected Countries. Ghana *Journal of Geography*, 12(1), 1-28. doi.org/10.4314/gjg.v12i1.1