

Community Resilience Assessment to the Covid-19 Pandemic

(Case Study: Bandung City)

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Abstract—The COVID-19 pandemic has not only had an impact on public health, but also the condition of the economy, education, and social life. The decline in these activities has an impact on the socio-economic conditions of the community, especially the vulnerable and poor. A development concept emerged from the Resilient City, namely the Health Resilient City, which is an urban system that can maintain adequate protection for the population, the economy, and the environment to enable it to continue to grow sustainably in response to the Health Crisis. To realize a Health Resilient City, the first effort that needs to be done is to assess the level of community resilience to pandemics that occur in socio-economic aspects. This assessment was conducted in the city of Bandung, with the observed variables being the rate of economic growth, the number of poor people, food prices, food security programs, efforts to protect the business world, social assistance, business model innovation, community empathy, cultural-based handling, and local wisdom, dissemination of information, crime rates, and the number of people who have been vaccinated. The approach taken is a descriptive quantitative approach with the Rapfish Analysis. Based on the results of the analysis that has been carried out, the level of community resilience in the socio-economic aspect is in a position of moderately resilient.

Keywords—resilient city, community resilience, Covid-19 pandemic, rapfish analysis

I. INTRODUCTION

The Covid-19 pandemic hit the world in 2020. Most of the victims of the pandemic are urban communities, where activity is very high and varied. The population most at risk of a pandemic is people living in urban areas [1]. Based on this, the Resilient City concept is one of the solutions to make the urban system have adequate protection for the population, the economy, and the environment. A resilient city is prepared to absorb and recover from any shock or stress while maintaining its essential functions, structures, and identity as well as adapting and thriving in the face of continual change [2].

The application of the Resilient City concept is very important, considering that natural and non-natural disasters do not stop threatening in the past, present, and future. Resilient City is one of the efforts to develop the capacity to help absorb future shocks and emphasizes its social, economic and, technical systems and infrastructure so that they can maintain

the same functions, structures, systems and, identities [3]. A resilient city is prepared to absorb and recover from any shock or stress while maintaining its essential functions, structures, and identity as well as adapting and thriving in the face of continual change [4].

The concept of Resilient City is currently developing into a Health Resilient City as a response to a health disaster. A health resilient city, then, is an urban system able to maintain adequate protection of its population, economy and environment that enables it to continue to grow sustainably in response to a health crisis [1]. Cities are responsible for the higher pandemic transmission rate because cities have rapid urbanization, huge growth of population, and high level of transportation usage and contribute 80% of the global GDR [5].

A pandemic differs from most other disasters in that it threatens society but does not damage infrastructure, has a long duration, and large economic impact so it requires mitigation mainly with regard to protection and providing economic security, with little need for infrastructure protection and repair. [6]. Building resilience requires identifying and assessing hazard risks, reducing vulnerability and exposure, and lastly, increasing resistance, adaptive capacity, and emergency preparedness [7]. The first effort that needs to be done is to assess the level of community resilience to pandemics that occur in socio-economic aspects. The purpose of this study is to identify the Community resilience of Bandung City to the Covid-19 pandemic.

II. METHODS

This study uses a quantitative descriptive approach. Descriptive research is not intended to test a particular hypothesis but only describes a variable [8]. The quantitative research approach is a method used to answer research problems related to data in the form of numbers and statistical programs [9]. The data used in this study are in the form of primary data and secondary data. Primary data is obtained from interviews, while secondary data is obtained from reports, journals, study results from related agencies.

The analytical method used in this research is multivariate statistical analysis, Multidimensional Scaling (MDS). The MDS analysis in this study aims to see the condition of the

toughness status of each dimension so that the imbalance between dimensions is known. The MDS analysis in this study was developed using the RAP-Fish (Rapid Appraisal for Fisheries) method. RAP-Fish is based on the technique of ordination by placing the appropriate on measurable attributes. Based on the method, Rapfish is a method of rapid assessment of the sustainability status of an object based on a number of attributes, a multi-criteria decision-making method based on a multi-dimensional scale, attributes can be redefined or replaced according to available information, and uses the ordinance method to determine sustainability status [10].

The assessment of the overall attributes of each dimension will be grouped into 4 (four) categories as follows (table 1).

TABLE I. RESILIENCE INDEX

No.	Indeks Value	Category	Resilience Index
1.	0,00 – 25,00	Bad	Not Resilient
2.	25,01 – 50,00	Less	Less Resilient
3.	50,01 – 75,00	Moderate	Moderately Resilient
4.	75,01 – 100,00	Good	Resilient

The variables used in this study include 3 (three) dimensions, namely the spatial dimension, the social dimension, and the economic dimension. For more details can be seen in the following table 2.

TABLE II. RESEARCH VARIABLES

No.	Dimension	Variables
A	Spatial	1 Development Policy
		2 Spatial Policy
		3 Spatial Structure Plan
		4 Building Regulations
		5 Infrastructure Development Plan
		6 Green Open Space
		7 The Distribution of Slums
B	Social	1 Empathy
		2 Involvement of Local Wisdom
		3 Information Dissemination
		4 Crime Rate
		5 Number of people who have been vaccinated
C	Economy	1 Food Price
		2 Food Security Program
		3 Business Protection
		4 Number of Poverty
		5 Social Assistance
		6 Business Model Innovation
		7 Economic Growth Rate

III. RESULT AND DISCUSSION

A. Spatial Dimension Resilience Index

The social dimension indicators analyzed include Development Policy, Spatial Policy, Spatial Structure Plan, Building Regulations, Infrastructure Development Plan, Green Open Space, and The Distribution of Slums. On the indicator of the existence of Green Open Space, its existence is very important during a pandemic because it can improve the

physical and psychological health of the city community (it can improve one's mood and mental health) [11]. Even in history, there are several examples of how open green spaces and natural features were key elements of urban planning and design used during and after pandemics [12]. Urban green spaces could contribute to enhancing individual and community resilience during stressful times [13]. For the city of Bandung, the area of green open space is still 12.22% in 2019. The amount of green open space in the city is still far from the 30% target regulated by law.

Meanwhile, related to the indicators of slum settlements, this area has become the object of the threat of the spread of Covid-19. Broadly, slums are defined as ‘communities characterized by insecure residential status, poor structural quality of housing, overcrowding and inadequate access to safe water, sanitation and other infrastructure’ [14]. There is much to be said about the fact that the COVID-19 threat is particularly prevalent in low-income countries, particularly the poorer parts of the population; inhabitants of slums could be especially impacted by the pandemic [15]. Based on the Decree of the Mayor of Bandung Number: 648/Kep.1227-DPKP3/202 2020, it is known that the area of housing and slum settlements in Bandung City is spread over 25 sub-districts, 63 urban villages, covering an area of 491.95 ha or 2.9% of the total area of Bandung City. The existence of the Covid-19 pandemic which is spread through breathing, talking, coughing, and sneezing, is certainly a challenge for slum settlements which tend to have narrow space for movement [16]. For policy indicators in the city of Bandung, in principle, it has been integrated with disaster risk mitigation, but only limited to floods, earthquakes, landslides, and fires, not yet related to pandemic disasters/disease outbreaks.

The results of the Rap-Tape ordinance obtained that the community resilience index on the spatial dimension is 50.02 (Moderately Resilient). Stress value is 0.16, or <0.25, which means that the data is suitable for use in analysis. The value of R2 (coefficient of determination) is 0.9412 indicating that the model using these indicators has explained 94.12% of the existing model (See Fig 1).

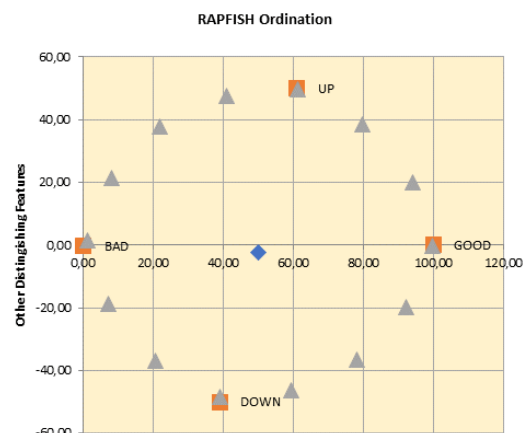


Fig. 1. Raptape ordination for spatial dimension.

The attribute of the distribution of slums and green open space is the biggest lever factor for the resilience index of Bandung City from the spatial dimension with RMS (Root Mean Square) values are 1.23 and 1.28. This means that if there is intervention on these attributes, it can affect the resilience index (See Fig 2).

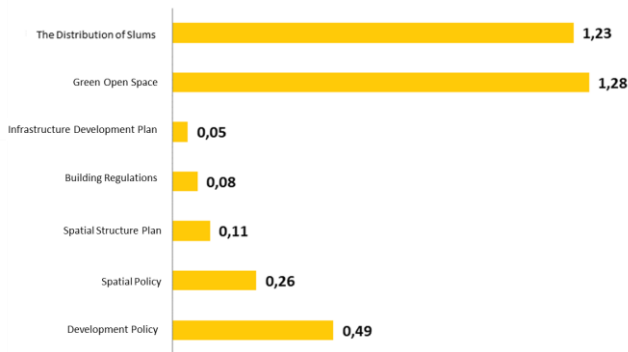


Fig. 2. Leverage of attributes for spatial dimension.

The monte carlo analysis carried out shows the stability of the results of the Rap – Tape Ordination and Leverage of Attributes analysis with 25 iterations. Monte Carlo shows that the results do not have a significant error range, the iteration result point is between 49,16 – 50,54. This indicates that the error in making the score for each attribute is relatively small and supports the accuracy of determining the ordinance of toughness status that has been studied in the Rap-Tape Ordination position analysis (50.02) See Fig 3.

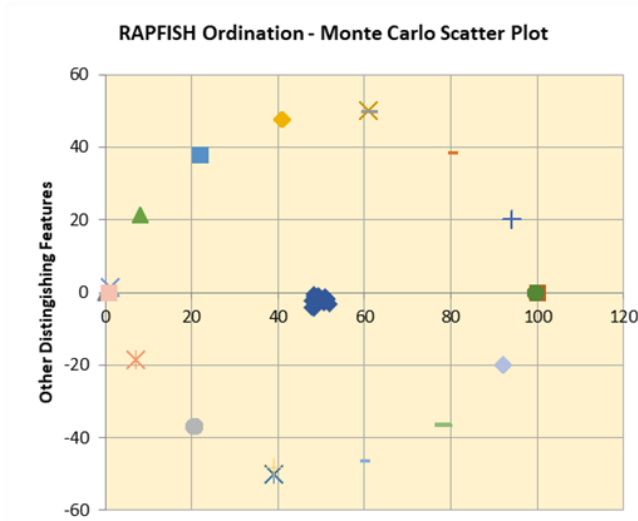


Fig. 3. Monte carlo for spatial dimension.

B. Social Dimension Resilience Index

The social dimension indicators analyzed include Empathy, Involvement of Local Wisdom, Information Dissemination, Crime Rate, and Number of people who have been vaccinated. For the empathy indicator, this is important to consider in the

analysis. Empathy is an umbrella term capturing the range of a person’s responses to another individual’s experience [17]. This pandemic condition has also caused a lot of negative stigma to both suspected people, positive patients and health workers involved [18]. In Bandung, the stigma has greatly decreased. This can be seen from a large number of fundraising/donations for people affected by Covid, the community and the city government ensure basic needs for people who are self-isolating through the Sabandung program (Sangu Bancakan urang Bandung) [19].

In addition to empathy, the social resilience of the city of Bandung can also be seen from the handling of the pandemic based on local culture and wisdom. Local wisdom can be interpreted as principles of life, behavior, rules, and punishments, as well as a view of life that regulate life, so that it can regulate and managing natural resources in the natural, social, and economic environments [20]. Management of disease outbreaks must be done with a social-cultural approach. Various historical records handling outbreaks throughout the world provide information that the handling of disease outbreaks cannot be done by only involving the medical aspects. On the other hand, the disease has an extraordinary impact on aspects of human culture [21]. The city of Bandung, which is “Urang Sunda”, has a view of life that is “silih asah, silih asih, silih asuh”. “Silih asah” has the meaning of educating each other, broadening each other's insight and inner and outer experiences, “silih asih” meaning loving each other by giving sincere affection, “silih asuh” has the meaning of guiding, nurturing, fostering, guarding, directing carefully [22]. Spirit of sabilulungan, silih asih, silih asah, silih asuh, which is typical of the people of West Java, continues to be the key in handling Covid-19 in Bandung.

However, social resilience in the city of Bandung was tested by the existence of hoax information related to Covid, as well as the increasing crime rate during the pandemic. The health crisis brought about by Covid-19 has generated a heightened need for information as a response to a situation of uncertainty and high emotional load, in which fake news and other informative content have grown dramatically [23]. Some examples of hoax information about Covid that exist in the community include many people who violate health protocols because they are consumed by hoaxes that the Covid-19 pandemic is a conspiracy [24]. People are afraid and panicked to do a COVID-19 vaccine because hoaxes circulated stating that barcodes on vaccines will control humans to death, contain magnetic microchips, or have an impact on health. The existence of such hoax information will certainly be an obstacle in handling Covid in the city of Bandung. So, the West Java Government then formed the "Jabar Saber Hoaks".

The number of crimes in Bandung has increased from 3.248 cases (2019) to 3.414 cases (2020). The pandemic is one of the factors that increase the number of crimes in the city of Bandung. The city of Bandung has long been the epicenter (central point) of crime, due to a very high economic turnover factor. The occurrence of a pandemic changed the pattern of crime in urban areas. People spend less time out of their homes

and offices, many employees work from home, children are learning from home, and mask-wearing and social distancing have become the new social order [25]. Residential burglary decreased, fraud and embezzlement increased.

The results of the Rap-Tape ordinance obtained that the community resilience index on the social dimension is 55.40 (Moderately Resilient). Stress value is 0.15, or <0.25, which means that the data is suitable for use in analysis. The value of R2 (coefficient of determination) is 0.9377 indicating that the model using these indicators has explained 93.77% of the existing model (See Fig 4).

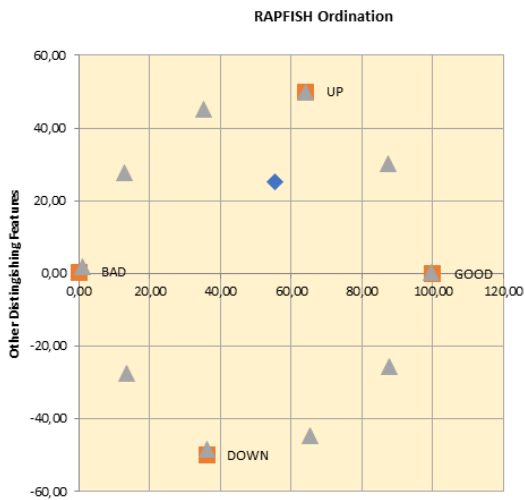


Fig. 4. Raptape ordination for social dimension.

The attribute of crime rate and involvement of local wisdom is the biggest lever factor for the resilience index of Bandung City from the social dimension with RMS (Root Mean Square) values are 11.02 and 10.94. This means that if there is intervention on these attributes, it can affect the resilience index (See Fig 5).

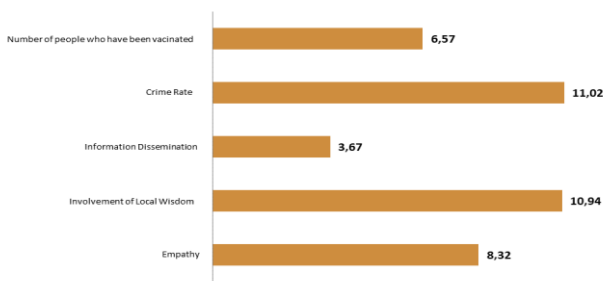


Fig. 5. Leverage of attributes for social dimension.

The monte carlo analysis carried out shows the stability of the results of the Rap – Tape Ordination and Leverage of Attributes analysis with 25 iterations. Monte Carlo shows that the results do not have a significant error range, the iteration result point is between 51.17 – 55.99. This indicates that the error in making the score for each attribute is relatively small and supports the accuracy of determining the ordinance of

toughness status that has been studied in the positional Rap-Tape Ordination analysis (55.40) See Fig 6.

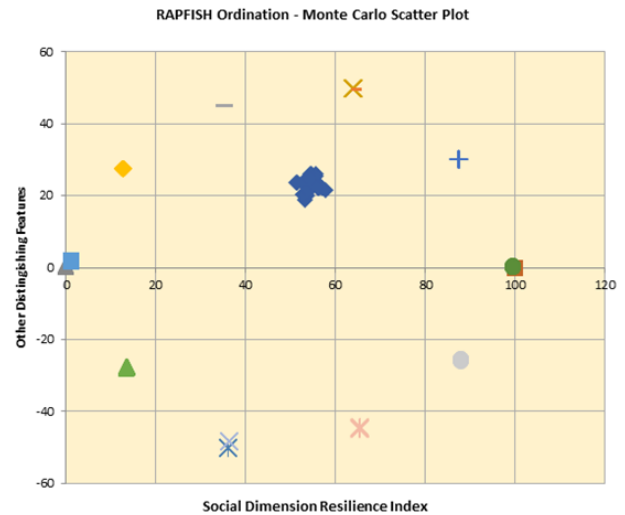


Fig. 6. Monte carlo for social dimension.

C. Economic Dimension Resilience Index

The economic dimension indicators analyzed include Food Price, Food Security Program, Business Protection, Number of Poverty, Social Assistance, Business Model Innovation, and Economic Growth Rate. The economy of Bandung City has been hit hard by the Covid-19 pandemic. During this pandemic, the city of Bandung experienced a decline in both the rate of economic growth (LPE) and local revenue. At the rate of economic growth, the performance decreased from a growth rate of 6.79% in 2019 to -2.28% in 2020.

Meanwhile, for food prices, the Bandung City Government has made various efforts to keep food prices stable. The uncertainty of when the pandemic will end has the potential to disrupt food availability, stability, and access. The most worrying thing if this condition continues is the food crisis. Therefore, an innovative and creative food security program is needed. Moreover, 96% of Bandung's food supply comes from other cities. The city of Bandung is currently carrying out a food security program, Buruan SAE. Buruan Sae is an integrated urban farming program promoted by the Dinas Pangan dan Pertanian (DISPANGTAN), aimed at tackling the inequality of food problems in the city of Bandung, using the existing yard or land by gardening to meet the food needs of the family itself.

Based on BPS data, the number of poor people in Bandung has increased to 3.99% from the previous year's 3.38%. In fact, in the few years before the pandemic, the percentage of the poor population in Bandung decreased but increased when the pandemic occurred. These poor people receive social assistance from the government. The government also assists business actors affected by the pandemic. The central government seeks to provide several stimuli through loan restructuring policies,

additional capital assistance, easing of electricity bill payments, and other financing support. The government has provided support incentives for UMKM through the National Economic Recovery program in 2020 and continued in 2021.

The results of the Rap-Tape ordination obtained that the community resilience index on the economic dimension is 58.76 (Moderately Resilient). Stress value is 0.14, or <0.25, which means that the data is suitable for use in analysis. The value of R2 (coefficient of determination) is 0.9463 indicating that the model using these indicators has explained 94.63% of the existing model (See Fig 7).

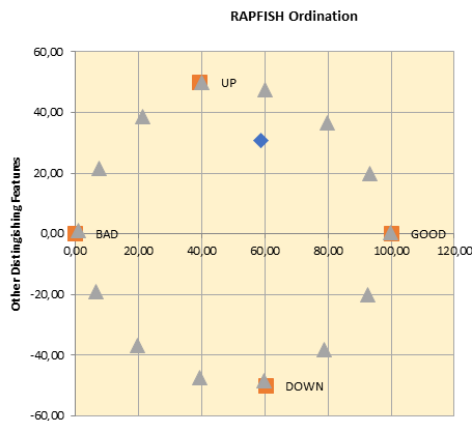


Fig. 7. Raptape ordination for economic dimension.

The attribute of economic growth rate and social assistance is the biggest lever factor for the resilience index of Bandung City from the economic dimension with RMS (Root Mean Square) values are 9.64 and 8.69. This means that if there is intervention on these attributes, it can affect the resilience index (See Fig 7).

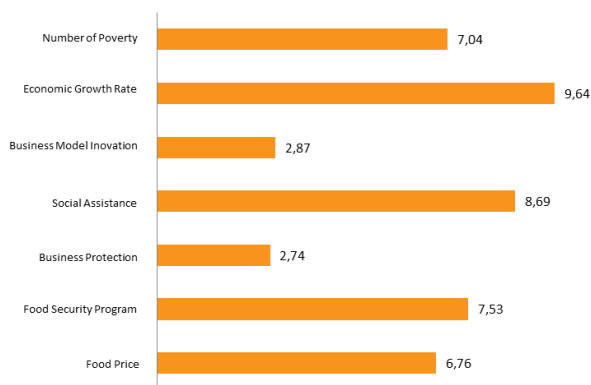


Fig. 8. Leverage of attributes for economic dimension.

The monte carlo analysis carried out shows the stability of the results of the Rap – Tape Ordination and Leverage of Attributes analysis with 25 iterations. Monte Carlo shows that the results do not have a significant error range, the iteration result point is between 56,18-60,39. This indicates that the

error in making the score for each attribute is relatively small and supports the accuracy of determining the ordinance of toughness status that has been studied in the Rap-Tape Ordination position analysis (58,76).

IV. CONCLUSION

Based on the results of research, it can be concluded that the Community of Bandung is in a moderately resilient position, with the position of each dimension is The Economic Dimension included Moderately Resilient with resilient index 58,76; The Social Dimension included Moderately Resilient with resilient index 55,40; He Spatial Dimension included Moderately Resilient with resilient index 50,02.

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