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[Ahmad Zaini Miftah](#)*, [Ida Widianingsih](#)*, [Entang Adhy Muhtar](#), Ridwan Sutriadi

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Article

Reviving Bandung's Economic Engine: COVID-19 Pandemic Impact and the Private Sector's Engagement

Miftah Ahmad Zaini ^{1,*}, Widianingsih Ida ^{2,*}, Muhtar Entang Adhy ³ and Sutriadi Ridwan ⁴

¹ Public Administration Department, Faculty of Social and Political Sciences, Universitas Padjadjaran; a.z.miftah@unpad.ac.id

² Public Administration Department, Faculty of Social and Political Sciences, Universitas Padjadjaran; ida.widianingsih@unpad.ac.id

³ Public Administration Department, Faculty of Social and Political Sciences, Universitas Padjadjaran; entang@unpad.ac.id

⁴ Regional and Urban Planning Department, School of Architecture, Planning and Policy Development, Institut Teknologi Bandung; readone@sappk.itb.ac.id

* Correspondence: a.z.miftah@unpad.ac.id; ida.widianingsih@unpad.ac.id

Abstract: The COVID-19 pandemic has not only affected public health but has also significantly impacted the economy. Bandung, a bustling city in Indonesia serving as a satellite to the capital, has been hit hard due to its high population density, mobility, and reliance on the tourism, trade, and transportation sectors. Using a Computable General Equilibrium (CGE) model developed at the inter-regional level of Indonesia, this study investigates the microeconomic indicators of several economic activities in Bandung to assess the impact of the pandemic. Additionally, the study examines the role of private sector actors in contributing to the sustainable recovery efforts toward achieving Sustainable Development Goals (SDGs) amidst the pandemic. The findings reveal that Bandung's transportation, accommodation, food and beverage, water supply, and trade sectors experienced a significant decline in economic activity. However, there was a gradual recovery with increased economic activity between 2019 and 2021. Private sector actors and the health sector were the main drivers of economic recovery, with other sectors also contributing to the efforts.

Keywords: economic activity; Computable General Equilibrium (CGE); sustainable development goals (SDG's); COVID-19

1. Introduction

The COVID-19 pandemic has profoundly impacted the global community, posing a significant threat to public health and economic stability (World Health Organization, 2020). The pandemic has also had far-reaching effects on the progress toward achieving the 2030 Sustainable Development Goals (SDGs), triggering social, economic, and political changes that have resulted in development equity setbacks [3]. To curb the spread of the virus, many countries have implemented measures such as population movement restrictions that have slowed down economic activity, resulting in a trade-off between the health system and the economy [4–6]. The government was faced with the unique challenge of handling and minimizing risks associated with these trade-offs and developing integrated policies that involve various actors to build resilience and promote recovery after the pandemic [7–12].

The COVID-19 pandemic has also demonstrated that developed countries, despite their higher wealth, are not necessarily more resilient than developing countries [13,14]. Even several Western countries with advanced healthcare systems, such as France, England, Spain, Italy, and the United States, have struggled to manage the pandemic, leading to many confirmed cases [15–17]. The impact of the pandemic is complex, posing distinctive challenges in its handling [18]. Governments face various uncertainties in policymaking due to unforeseen circumstances. This emphasizes the need

for innovative and integrated policy management responses to health emergencies and their impacts [19,20].

In Indonesia, after the COVID-19 pandemic crisis was announced, the Indonesian government replied with Decision of the Ministry of Health No: HK.01.07/MENKES/104/2020 dated February 4, 2020 [21]. The COVID-19 pandemic has not only impacted the health system but has also had a significant impact on the economy. The effects of the pandemic were first seen in Q1 of 2020, with annual GDP growth at 3% (Figure 1), which continued to decline until the lifting of restrictions on population movement in Q4 of 2020 [22]. During this time, government spending was the only GDP component that showed significant positive growth, reflecting efforts to address the COVID-19 pandemic and support vulnerable groups [22]. The COVID-19 crisis has decreased economic activity in sectors such as tourism [23–25], trade [26,27], and transportation [28,29].

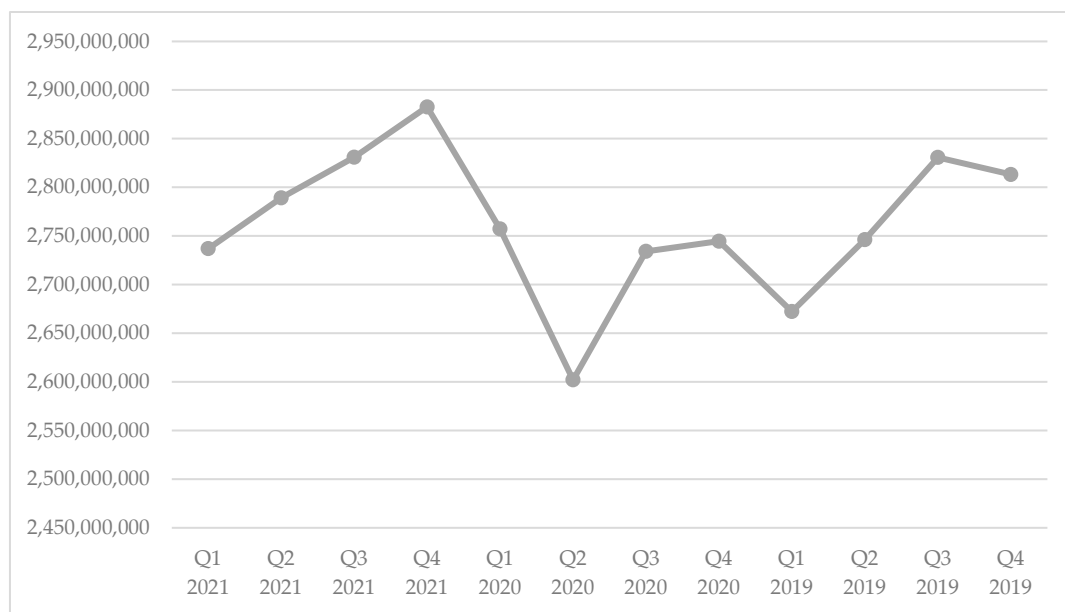


Figure 1. Indonesian GDP (Q1 2019 - Q4 2020) (Source: Central Bureau of Statistics, 2022).

Bandung City is a densely populated and highly mobile satellite city of the nation's capital [30], [31]. The city has long been a popular tourists destination due to its unique topography, historical buildings, cultural heritage, and delicious regional cuisine (Indira et al., 2013; Sukriah, 2014). The city has adopted the branding "music-design-culinary" to promote cultural change and build a positive image as a tourism hub [32]. The Bandung City Government has implemented numerous policies and programs to develop micro, small, and medium-sized enterprises (MSMEs) in the trade sector [33]. The city has recently experienced rapid growth, as evidenced by the establishment of new buildings such as markets, malls, hotels, and other structures [34]. The transportation sector has also played a significant role in the city's growth, particularly in the tourism industry, with positive impacts on the local economy and surrounding areas that can help reduce poverty [35]. The city's Gross Regional Domestic Product (GRDP) data shows that the trade, hotel, and restaurant sectors are the most significant contributors to the economy, accounting for 40.06% of the city's GRDP. The industrial sector contributed 25.73%, followed by the transport and communication sector (11.70%), service sector (9.15%), and building sector (4.31%) [36].

The COVID-19 pandemic has had a significant impact on the rate of economic growth in the city of Bandung. In 2020, the economic growth rate declined to -2.28%, a sharp drop from 6.79% in the previous year (Figure 2).

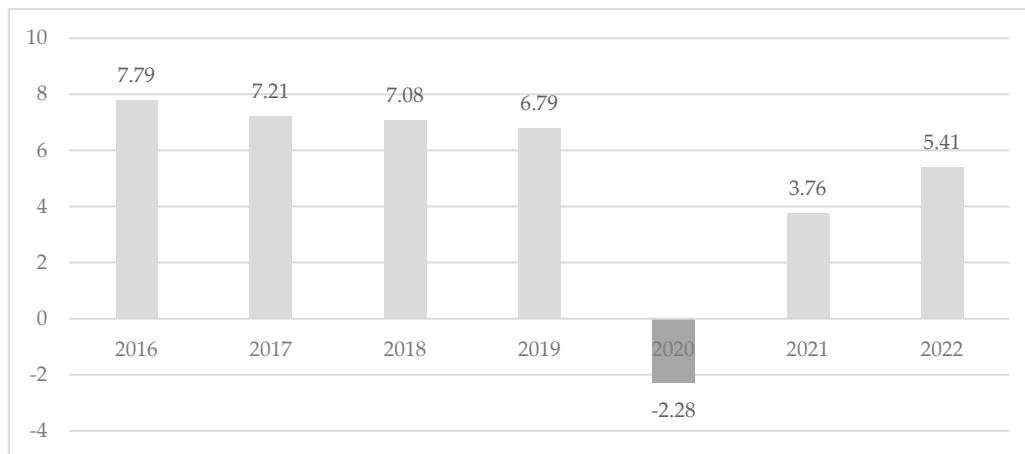


Figure 2. Bandung City Economic Growth Rate (Source: Central Bureau of Statistics, 2022).

The decline in economic growth during the COVID-19 pandemic has highlighted the need for other sectors, such as NGOs, researchers, and communities, to play a role in post-pandemic recovery [11,37,38]. Although some stakeholders sometimes have different perceptions regarding the handling of the Covid-19 pandemic [39]. As a critical stakeholder in economic development, the private sector also plays a crucial role in economic recovery during a crisis. The coupling of public and private policies can mitigate the negative impact of economic activities on the SDG's [40]. This is particularly important when government resources are limited due to spending to deal with the COVID-19 pandemic [41].

Several studies have utilized the Computable General Equilibrium (CGE) model to analyze the impact of the COVID-19 pandemic. The CGE model is an effective tool for simulating economic scenarios [42]). For instance, [42] utilized the CGE model to assess the fiscal stimulus from the government that would offset the decline in GDP due to COVID-19. The study projected a decrease in GDP in most Brazilian states with sectoral projections at both the national and state levels. Another study conducted by [43] also employed the CGE model to evaluate the economic impact of transportation consumption during the COVID-19 pandemic in China. The researchers examined the impact of transportation investment policies as a government economic stimulus. The study results revealed that reduced transportation consumption affects China's macro-economy and decreases all industrial sectors' output. Furthermore, the service sector is the most adversely impacted. Based on these two studies, it is evident that gaining insight into the scale of impact on several economic activity sectors at the local level in developing countries is crucial during a crisis.

The objective of this study is to present an analysis of the impact of the COVID-19 pandemic on the local economic activity of Bandung City before, during, and after the crisis, as well as to examine the role of private sector actors in addressing and recovering from the pandemic. It is crucial to assess the contributions of all sector actors to determine the sustainability of the economic recovery process, especially considering the crisis's impact on attaining Sustainable Development Goals (SDGs).

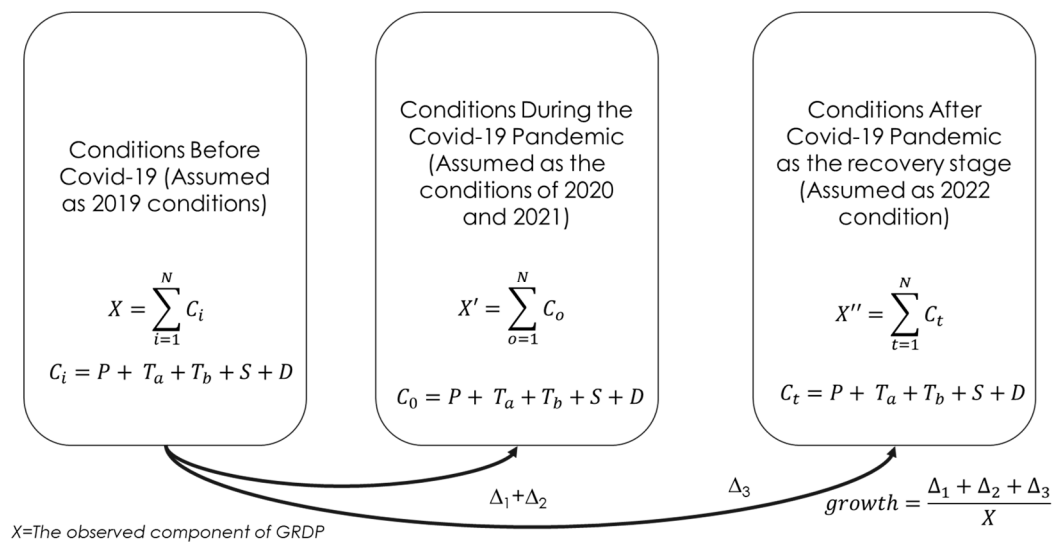
2. Materials and Methods

This study employed the Computable General Equilibrium (CGE) method [44] specifically applied at the Indonesian inter-regional level statically. The study examined microeconomic indicators such as transportation, accommodation and food-beverage, water use, and trade.

Table 1. Observed Indicators.

GRDP Parameters	Observed Indicators	Data Used
Transportation and Warehousing	Transportation	Number of land transport passengers (public transportation) before, during and after COVID-19 (P)
Provision of Accommodation and Food-Beverage	Accommodation and Food-Beverage	Hotel Tax Revenue before, during, and after COVID-19 (Ta) Restaurant Tax Revenue before, during, and after COVID-19 (Tb)
Water Procurement, Waste Management, and Recycling	Water Procurement	Amount of Drinking Water Distributed in Bandung City (S)
Wholesale and Retail Trade; Car and Motorcycle Repair	Trade	Number of MSME Turnover in Bandung City (D)

Below are the formulas and notations used in the static Computable General Equilibrium (CGE) modeling employed in this study.

**Figure 3.** CGE Formula.

1. Conditions Before COVID-19 (Assumed as 2019 conditions)

$$X = \sum_{i=1}^N C_i$$

$$C_i = P + T_a + T_b + S + D$$

2. Conditions During the COVID-19 Pandemic (Assumed as the conditions of 2020 and 2021)

$$X' = \sum_{o=1}^N C_o$$

$$C_o = P + T_a + T_b + S + D$$

3. Conditions After the COVID-19 Pandemic as the recovery stage (Assumed as 2022 conditions)

$$X'' = \sum_{t=1}^N C_t$$

$$C_t = P + T_a + T_b + S + D$$

C = Conditions a, b and c

X = Economic indicators observed in 2019 (Baseline)

P = Number of land transport passengers before, during, and after COVID-19

Ta = Hotel Tax Revenue before, during, and after COVID-19

Tb = Restaurant Tax Revenue before, during, and after COVID-19

S = Amount of Drinking Water Distributed in Bandung City

D = Number of MSME Turnover in Bandung City

To calculate the growth of economic activity, the following formula was used:

$$growth = \frac{\Delta_1 + \Delta_2 + \Delta_3}{X}$$

Δ_1 = Economic activity growth 1 (2019–2020)

Δ_2 = Economic activity growth 2 (2019–2021)

Δ_3 = Economic activity growth 3 (2019–2022)

X = Economic indicators observed in 2019 (Baseline)

The economic assumptions utilized in analyzing the impact of the COVID-19 pandemic on the economic activities of the people of Bandung City via the CGE method were based on two main points. Firstly, the resulting impact on economic activity was only observed through economic indicators related to the Transportation, Accommodation and Food-Beverage, Water Procurement, and Trade sectors. This is because these sectors were the most affected during the COVID-19 pandemic [11,37,45,46]. Secondly, post-pandemic data for COVID-19 was obtained through projections based on data trends from the previous year, as the status of the COVID-19 pandemic had only recently been revoked under the Instructions of the Minister of Home Affairs of the Republic of Indonesia Numbers 50 and 51 of 2022. The Health Emergency Status under RI Presidential Decree number 11 and 12 of 2020, as well as the Public Health Emergency of International Concern from WHO, are still being maintained by the Government of Indonesia in anticipation of a new wave of the COVID-19 pandemic.

3. Results

The COVID-19 pandemic is a public health crisis that has a multiplier effect on other sectors [47]. In Indonesia, social restriction policies have been implemented through Large-Scale Social Restrictions and the Enforcement of Restrictions on Community Activities [48]. Essentially, these policies limit population movement to curb the transmission of the COVID-19 virus, which impacts economic activity [49]–[51]. Transportation restrictions have a significant impact on economic activity as they disrupt distribution, value chains, consumption, and production, leading to an overall impact on development (Bonaccorsi et al., 2020 [52]; Martins et al., 2023 [3]; McKibbin & Fernando, 2020 [6]).

The data indicate a significant decline in the number of passengers using public transportation (Trans Metro Bandung or TMB) during the COVID-19 pandemic population movement restriction policies. In 2018, the number of passengers was 1,054,397, which decreased to 873,574 in 2019, and further decreased to 360,749 in 2020 and 337,261 in 2021. However, the number of passengers

increased in 2022 to 439,418. This data was converted into millions of rupiah units and projected for 2022 based on previous years' baseline data.

Table 2. Number of TMB Passengers (P) Before, During, and After the COVID-19 Pandemic (Source: Processed from Miftah et al., 2019 & Bandung City Transportation Office, 2022).

TMB Passengers (P) in Million Rupiah					
Year	2018	2019	2020	2021	2022
Number of TMB Passengers	958,453	990,873	360,749	337,261	439,418
In million rupiah	2,157	2,229	812	759	989

Furthermore, the following are the results of the hotel tax data processing before, during, and after the COVID-19 pandemic in Bandung City.

Table 3. Total Hotel Tax Revenue (Ta) Before, During, and After the COVID-19 Pandemic (Source: Processed from the Bandung City Office for Management of Regional Revenue, Finance and Assets, 2022).

Hotel Tax Receipt (Ta) in Million Rupiah						
Year jh	2017	2018	2019	2020	2021	2022
Bandung Hotel Tax	295,385	300,756	314,144	300,756	163,856	327,277

The results of restaurant tax data processing in Bandung City in million rupiahs are presented in the following table.

Table 4. Total Restaurant Tax Revenue (Tb) Before, During, and After the COVID-19 Pandemic (Source: Processed from the Bandung City Office for Management of Regional Revenue, Finance and Assets, 2022).

Restaurant Tax Receipt (Ta) in Million Rupiah						
Year	2017	2018	2019	2020	2021	2022
Bandung Restaurant Tax	325,362	368,644	212,685	208,580	333,334	325,362

Additionally, the following are the findings of the analysis of the consumption of drinking water in Bandung City. The data was compiled and then converted to millions of rupiahs by multiplying it with the average water tariff per cubic meter in Bandung City, which is Rp. 900,-/m³. Moreover, projections for 2022 data were conducted using the baseline data from previous years.

Table 5. Amount of Drinking Water Distributed in Bandung City (S) Before, During, and After the COVID-19 Pandemic (Source: Processed from Bandung City Waterworks, 2022).

Amount of Drinking Water Distributed in Bandung City (S)							
	2016	2017	2018	2019	2020	2021	2022
Total (m ³)	42,528,447	42,000,663	41,859,962	39,349,569	37,929,761	37,847,379	37,958,921
In Million Rupiah	38,276	37,801	37,674	35,415	34,137	34,063	34,163

The following are the results of the processed data on the total turnover of each micro, small, and medium enterprise (MSME) in Bandung City. Moreover, data projections have been conducted for 2021 and 2022 using the baseline data from the previous several years.

Table 6. Total MSMEs Turnover in Bandung City (D) Before, During, and After the COVID-19 Pandemic (Source: Processed from the Bandung City Planning, Research, and Development Agency, 2022).

Total MSME Turnover in Bandung City (D) in Million Rupiah					
	2018	2019	2020	2021	2022
In Million Rupiah	508,665	608,808	614,787	561,726	661,869

The CGE method is crucial in evaluating the effects of major shocks, such as the COVID-19 pandemic crisis, on regional economic activity [44]. Below are the results of an analysis of the impact of the COVID-19 pandemic on economic activity in Bandung City.

Table 7. CGE calculations on observed economic activities in Bandung City.

Before the COVID-19 Pandemic (2019) in Million Rupiah							
	P	Ta	Tb	S	D	C _t	X
2019	2,229	314,143	368,643	35,414	608,807	1,329,239	1,329,239
During the COVID-19 Pandemic (2020 and 2021) in Million Rupiah							
	P	Ta	Tb	S	D	C ₀	X'
2020	812	300,756	212,685	34,137	614,787	1,163,176	1,163,176
2021	759	163,856	208,580	34,063	561,726	968,985	968,985
After the COVID-19 Pandemic (2022) in Million Rupiah							
	P	Ta	Tb	S	D	C _t	X''
2022	989	327,277	333,334	34,163	661,869	1,357,631	1,357,631

Table 8. Growth of economic activity generated from CGE analysis.

Economic Activity Impact			
$\Delta 1$	$\Delta 2$	$\Delta 3$	Growth
-166,064	-360,255	28,391	-37,41%
-12.49%	-27.10%	2.14%	

Based on the results presented above, Delta 1 ($\Delta 1$) reflects the changes in economic activity during the COVID-19 pandemic in 2020 compared to 2019, before the pandemic affected Bandung City. This means there was a decrease in economic activity in the Transportation, Accommodation and Food-Beverage, Water Supply, and Trade (MSMEs) sectors by -12.49% in 2020, which can be attributed to the impact of the COVID-19 pandemic. The negative number indicates a decline in several economic activities, which can be considered a significant negative impact of the COVID-19 pandemic on the economic activity in Bandung City.

Delta 2 ($\Delta 2$) represents the changes in economic activity during the COVID-19 pandemic in 2021, compared to 2019, before the pandemic affected Bandung City. This indicates a decrease in economic activity in the Transportation, Accommodation and Food-Beverage, Water Supply, and Trade (MSMEs) sector by 27.10% in 2021, which can be attributed to the impact of the COVID-19 pandemic. The negative value implies a substantial negative impact of the pandemic on several economic activities in Bandung City.

Delta 3 ($\Delta 3$) illustrates changes in economic activity after the peak wave of COVID-19, namely in 2022, compared to 2019, before the arrival of COVID-19 in Bandung City. This indicates that there has been growth in economic activity in the Transportation, Accommodation and Food-Beverage, Water Supply, and Trade (MSMEs) sector of 2.14% in 2022, which can be attributed to the impact of the COVID-19 pandemic. This upbeat number suggests that there has been an increase in several economic activities in Bandung City. Consequently, in 2022, Bandung City has shown signs of recovery, with a notable increase of 2.14% in several sectors of economic activity.

Growth indicates the change in overall economic activity in the region due to the COVID-19 Pandemic. In this case, the *Growth* value of the economic activity in the Transportation, Accommodation and Food-Beverage, Water Supply, and Trade (MSMEs) sector is -37.41%. This

indicates a decrease in the value of overall economic activity by 37.41% compared to the value of economic activity before the COVID-19 Pandemic. This represents a significant negative impact on the growth of economic activity in Bandung City.

The COVID-19 pandemic poses challenges not only for the health sector but also for the economic, social, political, and environmental sectors, and may lead to a global recession due to the cessation of mobility and slowing economic growth [11,37]. And conversely, chaos in the social context, economic and political environment also played a role in creating the perfect storm of crisis [54]. Covid-19 has revealed a different way of life than usual [55]. Moreover, the pandemic has jeopardized sustainable development achievements [3]. Even without the pandemic, achieving the 2030 sustainable development targets would be challenging for several countries [37]. To attain sustainable development, it is essential to focus on economic development and other aspects, such as social culture and the environment [56].

The recovery from the COVID-19 pandemic, under the slogan “Build Back Better,” presents an opportunity and a challenge for fostering innovation in sustainable development [11,57]. Achieving sustainable development is not an easy task and requires the involvement and contribution of various actors based on the Sextuple Helix Model, ranging from local government to the international community [10,11]. Policy integration, both vertically and horizontally, is also crucial to support the effective implementation of sustainable development [58]. The government needs to learn and concretize the role of policy integration from the complexity of handling the COVID-19 pandemic for coordinating multi-sectoral policies toward achieving sustainable development goals [10].

The role of local authorities in developing an integrative strategy that involves stakeholders such as the business sector, NGOs, researchers, and other communities is crucial for post-pandemic recovery from COVID-19 [10,11,37]. The private sector's contribution is essential, mainly when government resources are limited due to the spending on handling the COVID-19 pandemic [41]. In handling and recovering from the COVID-19 pandemic in Bandung City, private companies, Regional Owned Enterprises, and State-Owned Enterprises have contributed through two programs, namely Social and Environmental Responsibility (SER) and Corporate Social Responsibility (CSR).

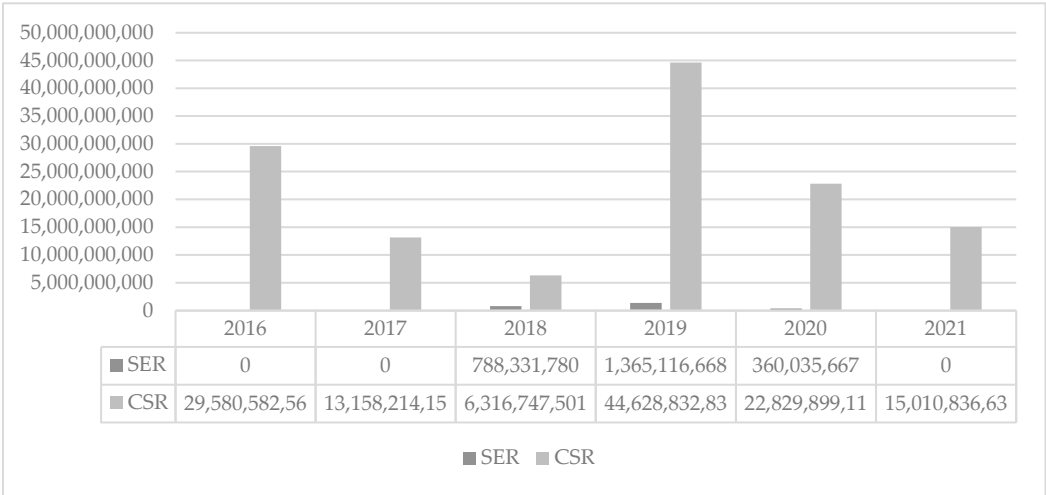


Figure 4. Number of Post-Pandemic Handling and Recovery Assistance through the SER and CSR Programs (Rp) (Source: Processed from the Bandung City Planning, Research, and Development Agency, 2022).

In 2020, private sector assistance increased significantly by 1.3 billion from SER and 44.6 billion from CSR funds, despite strict social restrictions imposed in Bandung City, leading to a slowdown in economic growth to -2.28 in 2020 (BPS Kota Bandung, 2022). Private sector assistance focused on providing basic needs and social safety nets to stabilize society. Additionally, private sector assistance facilitated the health sector by providing oxygen cylinders and COVID-Kits and implementing education and law enforcement programs to curb virus transmission. The most significant proportion

of private sector contributions for handling and recovering after the COVID-19 pandemic in Bandung City from 2019–2021 was in the economic recovery sector at 32.52%, followed by the health sector at 28.12%, the religious sector at 13.25%, the environmental sector at 13.25%, the education sector at 10.57%, the arts and culture sector at 1.29%, and the sports sector at 0.48%. Various industrial fields and types of companies, including private companies, regionally owned enterprises, and state-owned enterprises, were significant contributors outside the Bandung City Government through the SER and CSR Programs (see Figure 5).

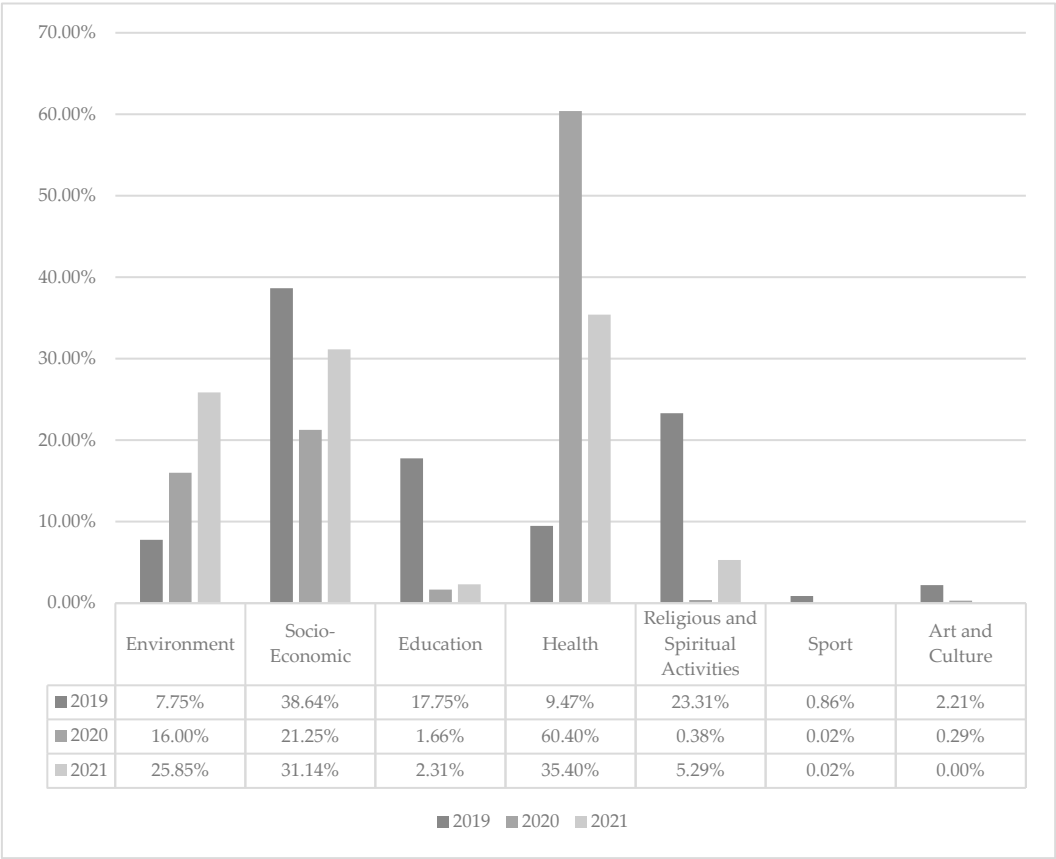


Figure 5. Percentage of per-Sector-Allocation of Post-Pandemic Handling and Recovery Assistance through SER and CSR Programs (Source: Processed from the Bandung City Planning, Research and Development Agency, 2022).

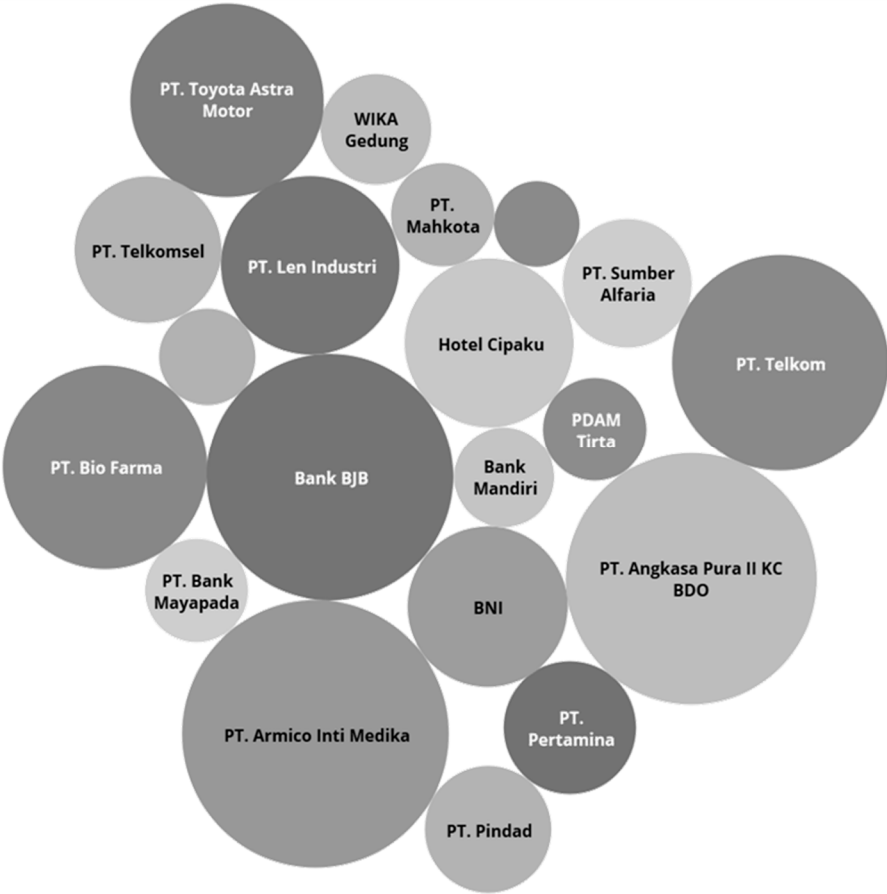


Figure 6. The 20 Most Dominant Actors Contributing to the Handling and Recovery of the Impact of the COVID-19 Pandemic Through the SER and CSR Programs in Bandung City (2019–2021).

4. Discussions

The COVID-19 pandemic has directly impacted the efforts to achieve the 2030 Sustainable Development Goals (SDGs) due to slowed economic growth and weakened purchasing power resulting from mobility restrictions aimed at suppressing the transmission of the COVID-19 virus. Furthermore, it has raised the threat of a global recession. During the pandemic, the economic growth rate in Bandung City declined significantly, reaching -2.28. The pandemic shock affected several sectors, including transportation, tourism, and others, causing a slowdown in economic activity before, during, and after the pandemic. Data from CGE's analysis show a significant decline in economic activity by 12.49% before the pandemic in the transportation, accommodation and food-beverage, water supply, and trade sectors in Bandung City. Economic activity decreased by 27.10% during the pandemic, but when the situation started to improve and plateaued, there was a 2.14% increase in economic activity. This demonstrates the significant impact of the pandemic on economic activity in Bandung City. Based on these data, when there is a trade-off between the health and economic sectors, the health sector must take precedence in COVID-19 to provide opportunities to increase people's economic activities.

The impact of the COVID-19 pandemic is complex. It has created a multiplier effect, requiring an integrative strategy that involves various actors through vertical and horizontal policy integration—the recovery efforts from the COVID-19 pandemic present opportunities and challenges in creating sustainable development innovations. When government resources are limited, the private sector plays a critical role in handling and recovering from the pandemic. The Bandung City Government involves the private sector through the Social and Environmental Responsibility (SER) and Corporate Social Responsibility (CSR) programs to deal with and overcome the COVID-19 pandemic. The role and contribution of the private sector in the city of Bandung are significant during the handling and recovery of the COVID-19 pandemic. The private sector is the most significant

contributor to economic recovery in Bandung during the 2019–2021 period, followed by the health sector, religious, environmental, and educational sectors. The arts, culture, and sports sectors made relatively minor contributions. Therefore, economic recovery in Bandung during the 2019–2021 period was mostly driven by the private and health sectors, while other sectors also contributed.

Achieving the 2030 Sustainable Development Goals (SDGs) in the aftermath of the COVID-19 pandemic requires contributions from multiple stakeholders (SDG's 17th - Partnership for the Goals). By combining efforts from both the private and public sectors, the impact of changes in economic activity caused by the pandemic can be mitigated to achieve sustainable development goals. From a policy integration perspective, the complexity of the challenges brought about by the pandemic serves as a lesson that the integration process requires a shared commitment to achieving sustainable development goals.

It is important to note that this study is limited in its focus on microeconomic indicators, specifically transportation, accommodation and food-beverage, water usage, and trade. It only describes the magnitude of the private sector's contribution during the handling and recovery from the COVID-19 pandemic. Further studies are needed to explore other economic indicators and the motives for actors' involvement.

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