THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 3 NO. 3 – DECEMBER 2022

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Research Paper

# How to Cope With Strategic Infrastructure Disparities in West Java?

## A Post-Pandemic Economic Recovery Analysis

**Satya Laksana [1], Angga Muchlish Al Rahmat [2]**

*Regional Planning, Research and Development of Tasikmalaya Regency West Java Indonesia [1]*
*Human Resource Development Agency of West Java Province, Indonesia [2]*

***) Corresponding author**: satya.laksana@tasikmalayakab.go.id*

**Abstract**

The availability of energy and telecommunication facilities has been claimed as two strategic infrastructures supporting the West Java economy during and the post-pandemic. This paper aims to identify the recent electrical energy access of households and the existing condition of telecommunication infrastructure; to configure the investment data in the last five years, and to analyze the opportunities and challenges of investment, development of electricity and telecommunication network in the future. This research uses the Desk Study method by collecting primary data from bureaucrats and secondary data from relevant Government agencies. The results show that electricity and telecommunications infrastructure conditions in West Java are still unequal between the Northern and Southern regions, particularly in terms of electrification ratio, cellular phone signal strength, and internet signal quality. Furthermore, investment in West Java was very unequal, with about two-thirds of foreign and domestic investment were in Bekasi and Karawang districts in the last-five-years. This study formulates recommendations for policy in the investment, electricity, and telecommunication sectors in dealing with interregional infrastructure development disparities as well as economic challenges during and after the pandemic.

**Keywords**: Electricity Access; Telecommunication; Regional Investment.

**ARTICLE INFO**

*Received: November 18, 2022*
*Received in revised form: November 28, 2022*
*Accepted: December 12, 2022*
*doi: 10.46456/jisdep.v3i3.353*



**THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING**
*Published by* Centre for Planners' Development, Education, and Training (Pusbindiklatren),
Ministry of National Development Planning/ National Development Planning Agency (Bappenas), Republic of Indonesia

**Address:** Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
**Phone:** +62 21 31928280/31928285
**Fax:** +62 21 31928281
**E-mail:**
journal.pusbindiklatren@bappenas.go.id

*Supported by* Indonesian Development Planners Association (PPPI)

## 1. Introduction

The Covid-19 Pandemic is still overshadowing the Indonesian economy. The increasing number of Covid-19 new variant infection cases in July 2022 (Wamad, 2022) indicated that the transformation of the pandemic to endemic has not been achieved yet (Aditama, 2022; Putra & Wayoi, 2022). Travel restriction policy, especially for passengers of long-distance transportation modes like airplanes and trains, is predicted to retard the economy again as it was in 2020 (Al Faqir, 2020).

Moreover, the global economic recession due to war, and rising commodity prices, especially food and energy prices, also affected the Indonesian national and regional economy (Agustin & Edhie, 2022). This condition requires crisis-sensitive public policies and regional development planning focused on strategic sectors. (Anbumozhi et al., 2022) emphasized the importance of enhancing the link between global dynamics and the multifaceted local reality, improving policy coherence, and providing a strategic option to strengthen regional's bargaining power internationally.

The regional development planning in the (post) pandemic stage consequently adjusts the new normal consumer behavior in fulfilling their daily needs. In the West Java context, (Laksana, 2021) has claimed that electricity infrastructure and telecommunications network development are strategic in regional development during and after the pandemic. The availability of energy (especially electricity) and telecommunication facilities are two of the main pillars of the economy in the new-normal era (less contact economy) onward the development of a virtual (Internet of Things/ IoT) lifestyle. (Mulyaman & Rahmani, 2021) concluded that internet access is becoming a new trait of citizens' welfare.

However, researchers found that the electricity and telecommunication infrastructure development in West Java is inequitable, especially between the Northern and the Southern areas and between rural and urban areas. Local policymakers' awareness of opportunities and challenges for infrastructure investment in the energy and telecommunication sector is urgently needed (Maqin, 2014). In the post-pandemic era, Infrastructure constraints in remote areas in Indonesia encourage more people to migrate to urban areas (Nurwaesari et al., 2022).

On the other hand, research examining investor interest in developing the West Java energy and telecommunication infrastructure has been rare. In addition, the regional investment policy and the electricity and telecommunication development plan still need to be Figured out to complete the puzzle pieces of the big picture question: How to Cope with Strategic Infrastructure Disparities in West Java?

Based on the background, this paper aims to: 1) identify the electrical energy access of households and the existing condition of telecommunication infrastructure; 2) conFigure the investment data in the last five years, and 3) analyze the opportunities and challenges of investment, development of electricity, and development of telecommunication network in the future. It formulates policy recommendations to the West Java Provincial Government and Regencies / Municipalities in West Java on the orientation of electric power and telecommunications network development to face economic challenges in the (post) pandemic era as well as to cope with interregional development disparities.

## 2. Methodology

This paper is qualitative research that uses the Desk Study method. It analyzes primary data collected from competent bureaucrats and secondary as open datasets, laws, and regulations downloaded from Governments' official websites, as well as papers downloaded from scientific journal publications and news from the mass media.

Primary data collection was carried out at the end of July 2022 by semi-structured interviews with twelve competent bureaucrats in the Regional Offices: the Energy and Mineral Resources Office (*Dinas ESDM*), the Investment and One-Stop Integrated Service Office (*Dinas PMPTSP*), the Community Empowerment Service, and Villages Office (*Dinas PemDes*), as well as the Communication and Information Office (*Dinas KomInfo*). It was followed by a Focus Group Discussion (FGD) online through the Zoom meeting media at the end of August 2022 involving twenty participants.

Secondary data collection was conducted from July to August 2022 by downloading datasets and references from: https://opendata.jabarprov.go.id/ https://bps.go.id and https://jdih.jabarprov.go.id/.

In addition, this research also collected papers downloaded from scientific journal publisher websites and news from online mass media.

Furthermore, primary data from interviews and FGD were processed descriptively to produce policy recommendations. Meanwhile, the secondary data from official websites were processed using descriptive statistics to provide informative Tables and graphs. The results were presented in a deductive narrative to answer the research questions.

## 3. Results and Discussions

Energy is an essential factor in daily life. One of which is electricity as a primary type of energy that supports human activities, including activities on the internet and telecommunications networks. A total blackout that occurred on August 4, 2019, then almost repeated at the end of October 2020 (Akhir, 2020), gave a lesson about how highly dependent human life is on electrical energy.

The first total blackout, on August 4, 2019, was due to the disruption of the 500kV transmission in Ungaran. The State Electricity Company (PLN) cut off the electricity for several hours in the DKI Jakarta, West Java, and Banten areas affecting 21 million customers. It caused the paralysis of public transportation, telecommunications, water supply, and traffic. Hence, the sustainability of the electric power supply is vital for life today and in the future.

The indicator of electrical energy access of households in an area is the Electrification Ratio. The Indonesian Electrification Ratio in the third quarter of 2021 was 99.4%. The percentage spatially varies across regions, where only nine provinces have a ratio above 99.7%, one of which was West Java.

The Electrification Ratio of West Java was 99.72 percent in 2021 (Dinas ESDM, 2022). It means that there were still 28 of ten thousand households in remote areas (approximately 260,000 Households) who could not access the electrical power supply, either from PLN or others. Figure 1 shows the distribution of the electrification ratio of Regencies/Municipalities in West Java. The darker-colored indicates a lower Electrification Ratio than the lighter-colored region.

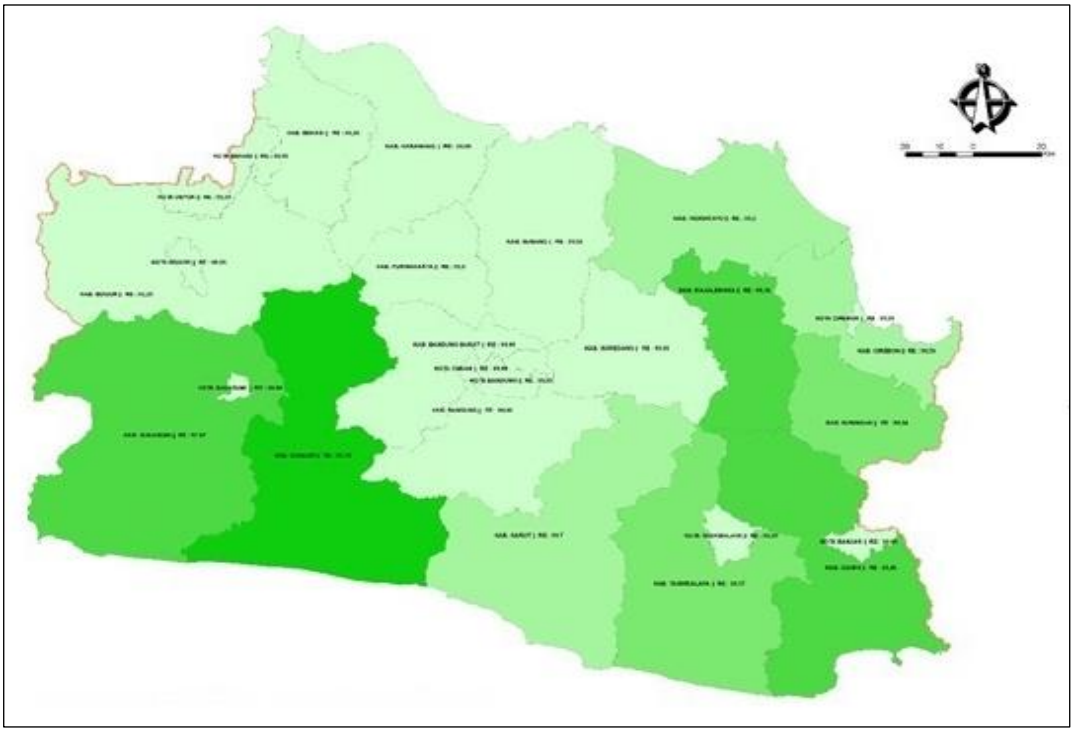

*Figure 1. The West Java Electrification Ratio, 2021 (Dinas ESDM, 2022)*

The Electrification Ratio in an area is closely related to the development of electricity infrastructure in that area. (Maqin, 2014) concluded that electricity infrastructure is a significant factor in economic development in the sub-Provincial administration of West Java. His study concluded that although the condition of West Java's electricity infrastructure looks better than in previous years, the available electricity supply has not been able to keep up with the electricity demand, especially for productive electricity consumption and electricity needs in remote areas.

The electric power supply is a substantial production factor for the industry which is the prominent contributors to the West Java Gross Domestic Product (GDP). However, it tends to be scattered in the Northern region, indicating the economic disparity between North and South of the West Java economy.

Apart from the electricity infrastructure, factors influencing the inequality of the Electrification Ratio in Indonesia are income and geographic location of residence (spatial) (Dwi Cahyani et al., 2020). Differences between rural and urban areas and the differences between areas close to the center of economic growth and conservation areas also determine the electrification ratio.

### 3.1 Household Electricity Access

The official data from the West Java Provincial Government in 2020 confirmed the spatial inequality of access to electrical energy. Figure 2 depicts the number of households in rural areas that have not yet enjoyed electricity covering 19 administrative authorities.

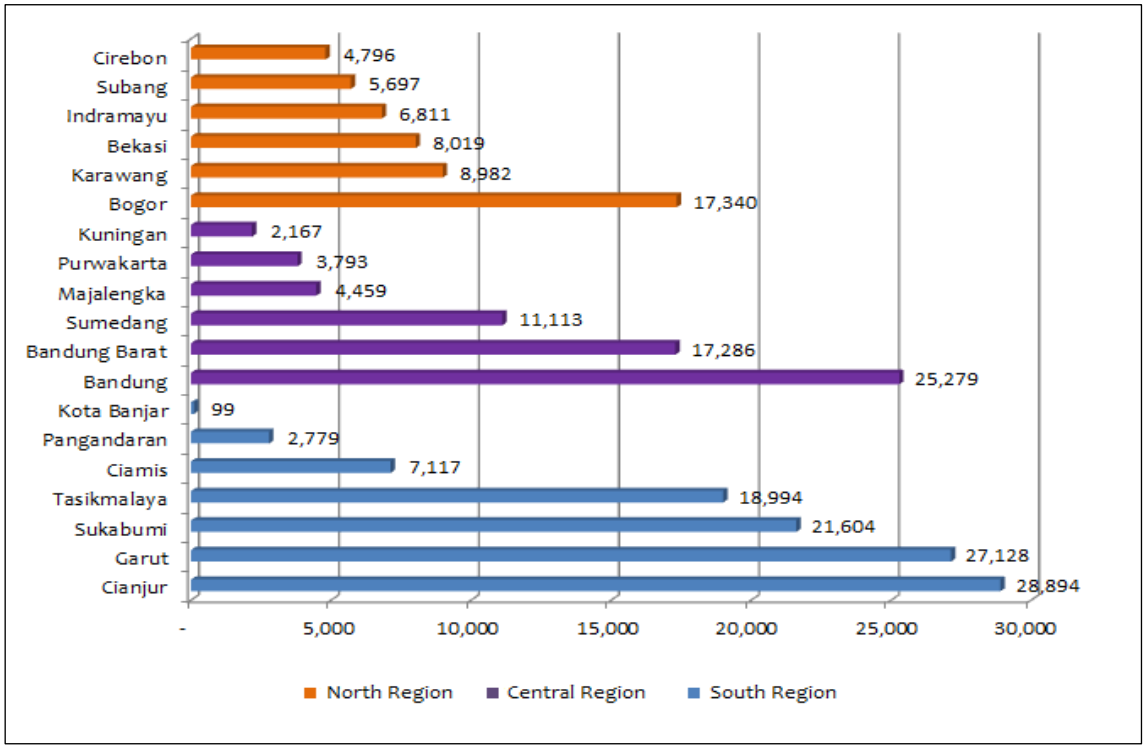


*Figure 2. The number of Households without electrical power access in West Java, 2020*

Source: https://opendata.jabarprov.go.id/

Figure 2 indicates that the Southern region was the worst in terms of households' electricity access compared to the Central region as the buffer zone of the Provincial capital and the North as the buffer zone of the national capital. Generally, houses in forest outskirts and plantation areas are without an electric power supply. In contrast to the other eight municipalities having a one hundred percent Electrification Ratio, Banjar does not have it, as it is located in the South and has Batulawang Plantation Area administered by the PTPN VIII.

The electricity supply in Indonesia mainly provides by PLN. In 2017, 93% of household electricity was from PLN (on-grid), and only 2.3% was off-grid. For housing costumer, electricity supply from PLN is classified into several power groups, ranging from 450VA to above 6600VA. Low-income customers enjoy Government subsidies by consuming 450VA or 900VA power (Dwi Cahyani et al., 2020).

However, the National Team for the Acceleration of Poverty Reduction (TNP2K) reported that 40% of low-income households receive only 26% of the electricity subsidies. At the same time, 30% of high-income enjoy 40% of that (TNP2K, 2016). Following up on the report, in 2017, the Government revoked subsidies from non-poor households and determined 23.2 million households with 450 VA and 4.1 million households with 900VA as subsidy recipients.

In 2020, 1.4 percent of households in rural areas of West Java (approximately 152,437 Households) utilized electricity power from non-PLN suppliers. Assuming that in West Java 100 percent of municipal electricity is from PLN, Figure 3 shows the proportion of rural households using PLN and Non-PLN electricity sources in 19 administrative areas.

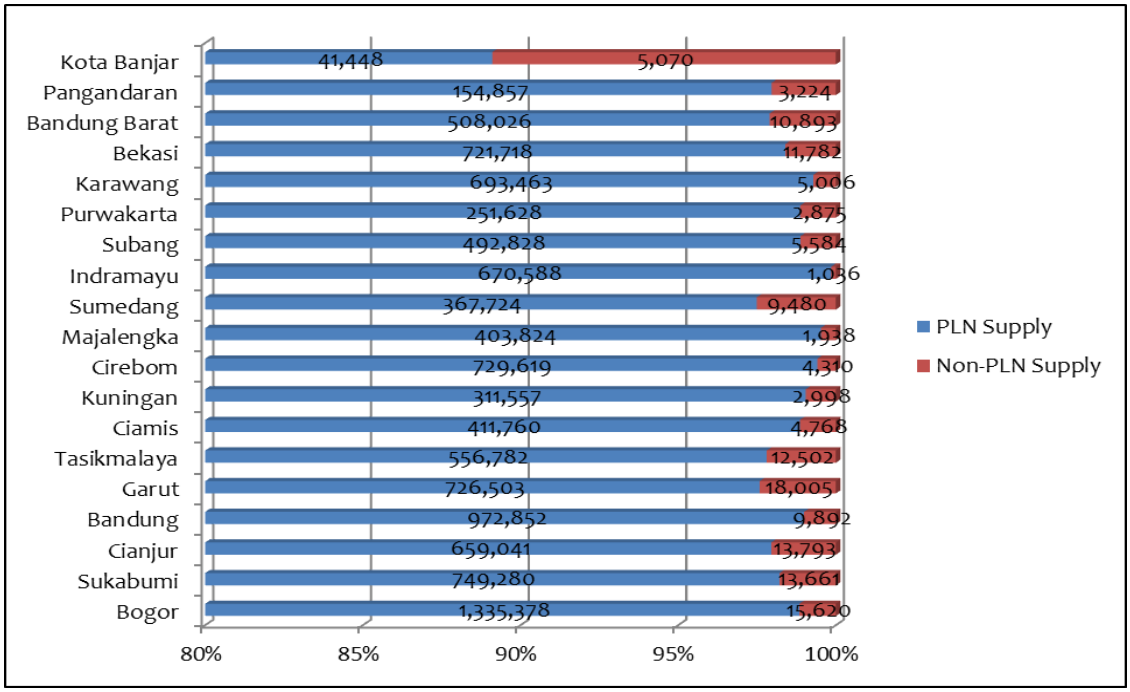


*Figure 3. The number of Households based on the electricity suppliers in West Java, 2020*

Source: https://opendata.jabarprov.go.id/

Another subject of energy consumption patterns is alternative energy use. Official data shows that apart from conventional energy commonly used, households in rural areas also utilize alternative energy sources. Table 1 details the number of families in 19 administrations in West Java that utilize various alternative energies, namely liquid biofuels, wind power, biomass energy, and solar energy.

Table 1: The Number of Households in West Java Utilizing Alternative Energy, 2020

| No | Regency / Municipality | Alternative Energy Source | | | |
|---|---|---|---|---|---|
| | | Liquid Biofuels | Wind Power | Biomass Energy | Solar Energy |
| 1 | Bogor | 56 | 10,228 | 1 | 10,737 |
| 2 | Sukabumi | 382 | 3 | 6 | 4,369 |
| 3 | Cianjur | 387 | 4 | - | 18,962 |
| 4 | Bandung | 85 | 2,215 | 35 | 2,222 |
| 5 | Garut | - | - | 0 | 4 |
| 6 | Tasikmalaya | 587 | 2,897 | 3,003 | 2,956 |
| 7 | Ciamis | 1,477 | 6,812 | - | 22,045 |
| 8 | Kuningan | 120 | - | - | 2,857 |
| 9 | Cirebon | 50 | - | - | 6,009 |
| 10 | Majalengka | 800 | - | 1671 | 2,538 |
| 11 | Sumedang | - | - | 1 | 2,168 |
| 12 | Indramayu | 10 | 3,246 | - | 9,368 |
| 13 | Subang | 2,003 | 17 | 59 | 49 |
| 14 | Purwakarta | 198 | 607 | 2 | 7,039 |
| 15 | Karawang | 2,754 | 4,204 | - | 18,832 |
| 16 | Bekasi | - | 12,000 | - | 12,023 |
| 17 | Bandung Barat | 215 | 1,891 | 85 | 1,943 |
| 18 | Pangandaran | 389 | - | 10 | 1,345 |
| 19 | Kota Banjar | - | - | - | - |

Source: https://opendata.jabarprov.go.id/

Apart from electricity, strategic infrastructure to support the economy during the pandemic is telecommunications facilities. The session on the condition of the existing telecommunications infrastructure in West Java is in the following subsection.

### 3.2 The Existing Condition of Telecommunication Infrastructure

Telecommunications infrastructure development in West Java indicates positive trends in recent years. Figure 4 shows that in one year (2020-2021), the number of villages with strong cellular signal conditions increased by 80, while those with weak cellular signals decreased by 75. However, in 2021 there were still 23 villages without cellular phone signals, which were distributed larger in the South: Garut (7 villages), Cianjur, and Sukabumi (3 villages each).

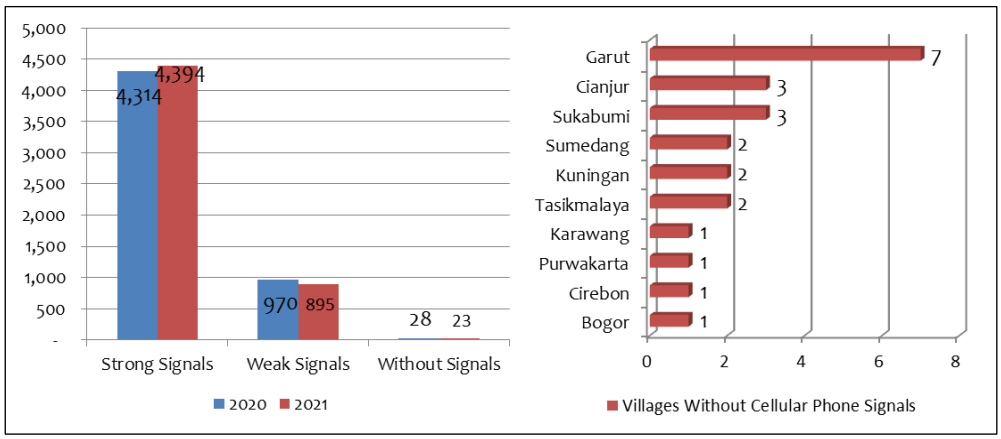


*Figure 4. The Number of Villages Based on Cellular Phone Signals Strength, 2020-201, and The Distribution of Villages Without Cellular Phone Signals, 2021*

Source: https://opendata.jabarprov.go.id/

Cellular telecommunications services are from several provider companies shown in Table 2. The Table resumes that yet 100 percent of villages in West Java are covered by cellular signals. In 2020, Telkomsel was the leader covering 98.26% of the total villages, followed by Indosat (94.22%), XL (92.25%), and other operators (77.98%).

Table 2: The Number of Villages in West Java Covered by Cellular Phone Signals, 2020

| No | Regency / Municipality | Telkomsel | | Indosat | | XL | | Others | |
|---|---|---|---|---|---|---|---|---|---|
| | | Village | % | Village | % | Village | % | Village | % |
| 1 | Bogor | 402 | 96.63% | 406 | 97.60% | 374 | 89.90% | 339 | 81.49% |
| 2 | Sukabumi | 359 | 94.23% | 375 | 98.43% | 340 | 89.24% | 237 | 62.20% |
| 3 | Cianjur | 341 | 96.33% | 338 | 95.48% | 323 | 91.24% | 254 | 71.75% |
| 4 | Bandung | 270 | 100.00% | 263 | 97.41% | 263 | 97.41% | 246 | 91.11% |
| 5 | Garut | 413 | 98.10% | 371 | 88.12% | 360 | 85.51% | 265 | 62.95% |
| 6 | Tasikmalaya | 344 | 98.01% | 298 | 84.90% | 278 | 79.20% | 197 | 56.13% |
| 7 | Ciamis | 257 | 99.61% | 235 | 91.09% | 237 | 91.86% | 194 | 75.19% |
| 8 | Kuningan | 351 | 97.23% | 330 | 91.41% | 323 | 89.47% | 245 | 67.87% |
| 9 | Cirebon | 410 | 99.51% | 393 | 95.39% | 404 | 98.06% | 317 | 76.94% |
| 10 | Majalengka | 324 | 98.18% | 314 | 95.15% | 301 | 91.21% | 263 | 79.70% |
| 11 | Sumedang | 265 | 98.15% | 254 | 94.07% | 254 | 94.07% | 233 | 86.30% |
| 12 | Indramayu | 309 | 100.00% | 302 | 97.73% | 306 | 99.03% | 276 | 89.32% |
| 13 | Subang | 243 | 99.18% | 228 | 93.06% | 236 | 96.33% | 201 | 82.04% |
| 14 | Purwakarta | 179 | 97.81% | 174 | 95.08% | 180 | 98.36% | 164 | 89.62% |
| 15 | Karawang | 292 | 98.32% | 293 | 98.65% | 285 | 95.96% | 248 | 83.50% |
| 16 | Bekasi | 174 | 96.67% | 180 | 100.00% | 174 | 96.67% | 157 | 87.22% |
| 17 | Bandung Barat | 165 | 100.00% | 160 | 96.97% | 162 | 98.18% | 151 | 91.52% |
| 18 | Pangendaran | 92 | 98.92% | 74 | 79.57% | 66 | 70.97% | 54 | 58.06% |
| 19 | Kota Banjar | 16 | 100.00% | 16 | 100.00% | 16 | 100.00% | 14 | 87.50% |
| | Sum and % Average | 5,206 | 98.26% | 5,004 | 94.22% | 4,882 | 92.25% | 4,055 | 77.92% |

Source: https://opendata.jabarprov.go.id/

One of the factors influencing cellular phone service quality is the availability of a Base Transceiver Station (BTS). The prime function of BTS is sending and receiving radio signals from and to a telecommunication device such as a personal computer, wired and cellular phone, and other types of gadgets. Figure 5 depicts the proportion of villages with and without a BTS tower in West Java based on sub-province administration.

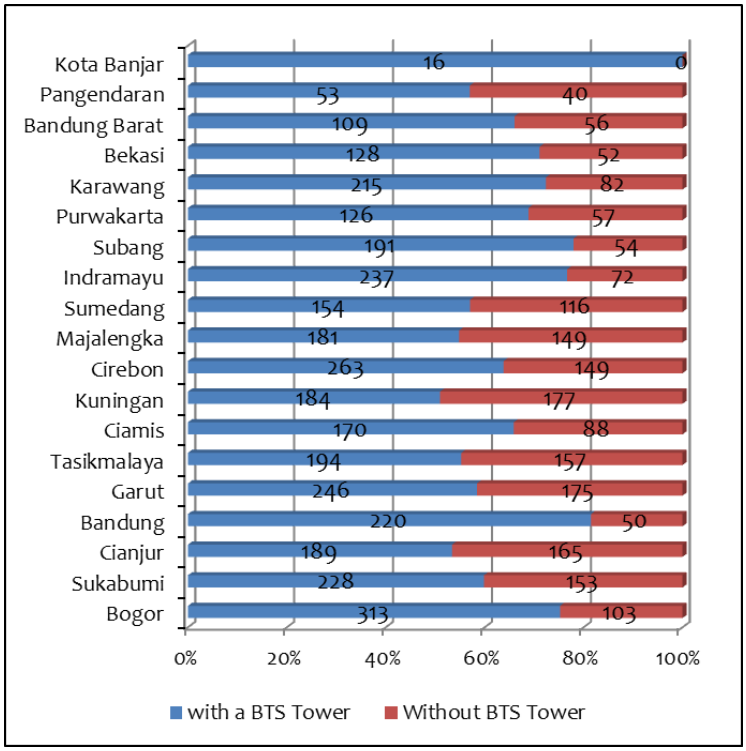


*Figure 5. The Number of Villages with and without a BTS Tower in West Java, 2021*

Source: https://opendata.jabarprov.go.id/

Nevertheless, a BTS operates without recognizing the administrative area of the village. A BTS services depend on its spatial position on the earth's surface. (Virgana, 2016) conducted a spatial analysis using triangulation techniques to map telecommunication services from BTS towers in West Java in Figure 6.

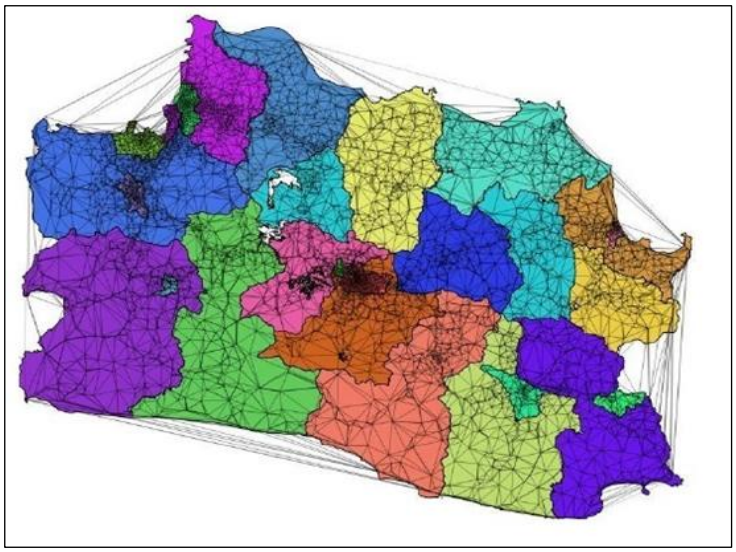

*Figure 6. The Triangulation Analysis of BTS Towers Services in West Java, 2018*

Source: Virgana, 2018

The triangulation analysis in Figure 6 illustrates that if the nets on the map are sparse or not as dense, the signal coverage transmitted by BTS tends to be weak. Such areas are the potential to be blank spots. The map shows the tendency that the cities and the Northern areas to have better signal coverage than the Southern.

BTS towers also transmit internet signals. Figure 7 illustrates the quality of internet services that reach villages in West Java. In 2018, half of the villagers enjoyed 4G networks, and the others accessed 3G and 2G networks. There was still one percent (66 villages) without internet signals or blank spots distributed in 18 Regencies majority in Tasikmalaya District (14 Villages).

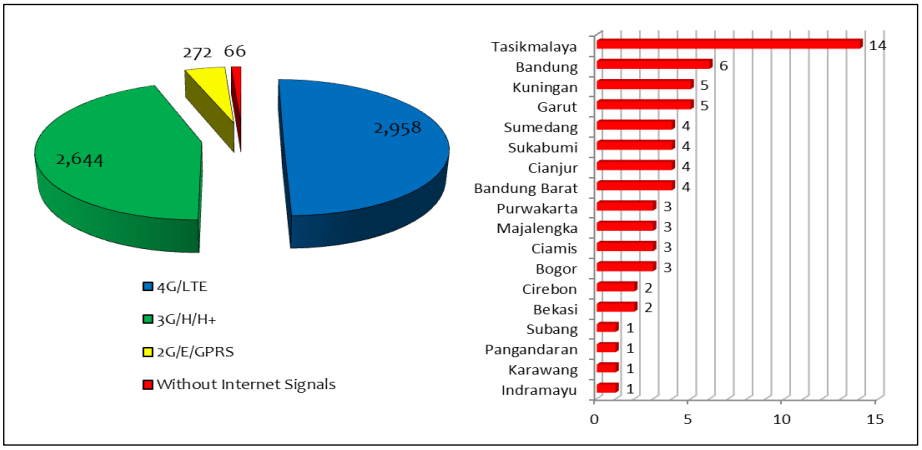


*Figure 7. The Number of Villages Based on Internet Signals Strength and the Distribution of Blank Spots Villages in West Java, 2018*

Source: https://opendata.jabarprov.go.id/

To provide internet access to villagers, the Government sets up internet facilities at the village offices. Figure 8 describes the proportion of the availability of internet facilities in village offices in 19 administrations.

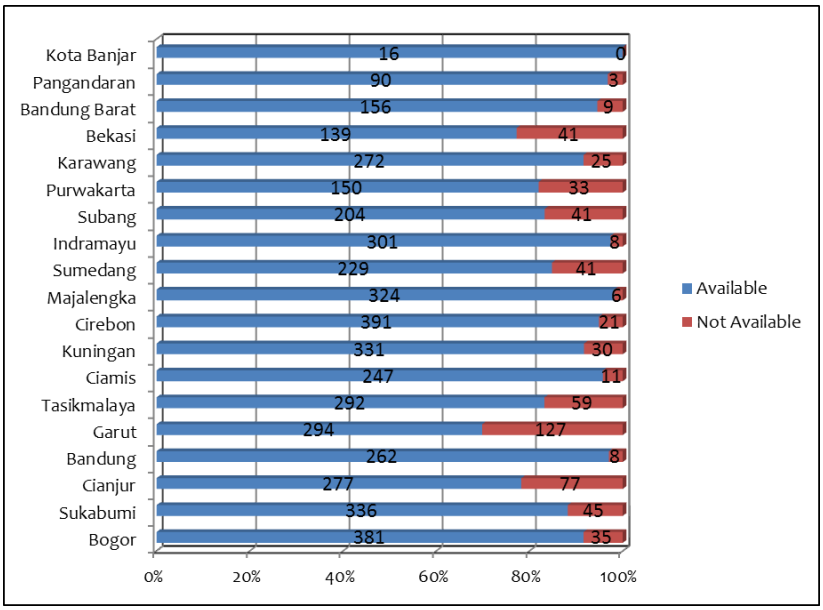


*Figure 8. The Availability of Internet Facilities in Villages Offices in West Java, 2021*

Source: https://opendata.jabarprov.go.id/

The indicator of the telecommunication sector development in a country or region is the Information, Communication, and Telecommunication (ICT) Development Index. The Index consists of three sub-indices: 1) Access and Infrastructure, 2) the Use of ICT, and 3) Expertise.

Based on Indonesian Central Statistics Bureau (BPS) data, the West Java ICT Development Index increased from 5.38 in 2017 to 6.00 in 2020, indicating a moderate grade stagnantly (Figure 8). Relating to this research, Figure 8 also depicts the sub Index of ICT Access and Infrastructure of West Java still in the moderate index, despite its progress from 6.02 to 6.65 in the period.

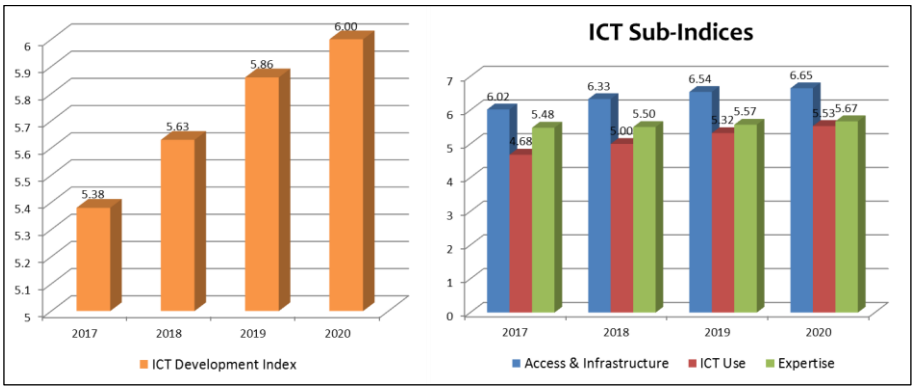


*Figure 9. The West Java ICT Development Index, 2017-2020*

Source: https://bps.go.id/

In 2020, there were only two provinces with high indexes In terms of Sub-index Access and Infrastructure of ICT, namely DKI Jakarta and DI Yogyakarta. While others, still had a moderate and low index, one of which was West Java. The Top Ten Access and Infrastructure of the ICT Development sub-index are: 1) DKI Jakarta, 2) DI Yogyakarta, 3) Bali, 4) Riau Islands, 5) East Kalimantan, 6) West Java, 7) Banten, 8) Central Java, 9) East Java, 10) North Kalimantan.

To improve ICT Development Index and electrical facilities in West Java, the Government needs to seek adequate investment. The next session discusses the investment profile in West Java, starting with foreign and ending with domestic investment.

### 3.3 Foreign Investment Profile

The foreign investment data in 2016-2021 based on administrative area is in Table 3, with highlights in the highest investment location and the Provincial capital as a comparison. The Table also reveals that in those years, more than half of foreign investment was in Bekasi and Karawang. Meanwhile, other Regencies and Municipalities in the South, like Banjar, Tasikmalaya, and Ciamis, had almost zero foreign investment.

The aggregate data in Table 3, represented by Figure 10, shows the foreign Investment info-graphic in West Java. The Graphic reveals that from 2016 to 2020, Bekasi was the foreign investors' favorite, followed by Karawang as the second. Meanwhile, in other regions, even in Bandung as the Provincial capital, the proportion of foreign investment is below ten percent.

Figure 10 illustrates that the total foreign investment fluctuated from IDR 74.99 trillion in 2016 to IDR 88.22 trillion in 2019. In 2020 it decreased to IDR 69.03 trillion, supposedly due to the pandemic, although higher than those in 2017, signaling that the pandemic has an insignificant effect on foreign investment in West Java.

Table 3: Total (in trillion IDR) and Percentage of Foreign Direct Investment in West Java Based on Spatial Distribution, 2016—2020

| No | Regency / Municaplity | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rp | % | Rp | % | Rp | % | Rp | % | Rp | % |
| 1 | Bogor | 5.12 | 6.83% | 4.26 | 6.20% | 4.95 | 6.63% | 4.77 | 5.40% | 2.86 | 4.14% |
| 2 | Sukabumi | 0.97 | 1.29% | 0.42 | 0.61% | 0.61 | 0.82% | 0.37 | 0.42% | 0.21 | 0.31% |
| 3 | Cianjur | 0.73 | 0.97% | 0.43 | 0.63% | 0.04 | 0.05% | 0.28 | 0.32% | 0.09 | 0.12% |
| 4 | Bandung | 0.44 | 0.58% | 0.60 | 0.87% | 0.38 | 0.51% | 3.18 | 3.61% | 2.85 | 4.13% |
| 5 | Garut | 0.18 | 0.24% | 0.14 | 0.20% | 0.17 | 0.23% | 0.15 | 0.17% | 0.40 | 0.58% |
| 6 | Tasikmalaya | 0.01 | 0.01% | 0.05 | 0.07% | 0.07 | 0.10% | 0.00 | 0.00% | 0.00 | 0.00% |
| 7 | Ciamis | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% |
| 8 | Kuningan | 0.06 | 0.08% | 0.10 | 0.14% | 0.07 | 0.09% | 0.00 | 0.00% | 0.04 | 0.06% |
| 9 | Cirebon | 1.27 | 1.69% | 4.58 | 6.66% | 3.84 | 5.14% | 8.94 | 10.14% | 4.68 | 6.77% |
| 10 | Majalengka | 0.13 | 0.18% | 0.95 | 1.38% | 1.22 | 1.63% | 0.40 | 0.46% | 0.20 | 0.29% |
| 11 | Sumedang | 0.24 | 0.32% | 0.24 | 0.35% | 0.11 | 0.14% | 0.00 | 0.00% | 0.04 | 0.05% |
| 12 | Indramayu | 0.02 | 0.02% | 0.32 | 0.46% | 0.12 | 0.15% | 1.47 | 1.66% | 0.19 | 0.27% |
| 13 | Subang | 0.84 | 1.12% | 1.01 | 1.48% | 1.03 | 1.37% | 0.93 | 1.05% | 4.17 | 6.04% |
| 14 | Purwakarta | 2.22 | 2.96% | 2.11 | 3.07% | 5.83 | 7.80% | 5.24 | 5.94% | 3.69 | 5.35% |
| 15 | Karawang | 17.77 | 23.69% | 20.63 | 30.05% | 11.64 | 15.58% | 21.32 | 24.17% | 14.24 | 20.63% |
| 16 | Bekasi | 41.37 | 55.16% | 26.44 | 38.51% | 39.06 | 52.30% | 27.15 | 30.78% | 25.91 | 37.54% |
| 17 | Bandung Barat | 0.14 | 0.18% | 0.82 | 1.20% | 0.77 | 1.03% | 4.08 | 4.63% | 2.94 | 4.26% |
| 18 | Pangandaran | 0.00 | 0.00% | 0.00 | 0.00% | 0.01 | 0.02% | 0.00 | 0.00% | 0.00 | 0.00% |
| 19 | Kota Bogor | 0.46 | 0.61% | 0.25 | 0.36% | 0.27 | 0.36% | 0.03 | 0.03% | 0.08 | 0.12% |
| 20 | Kota Sukabumi | 0.01 | 0.01% | 0.00 | 0.00% | 0.00 | 0.00% | 0.01 | 0.01% | 0.00 | 0.01% |
| 21 | Kota Bandung | 0.78 | 1.04% | 1.08 | 1.58% | 0.27 | 0.36% | 3.79 | 4.30% | 2.00 | 2.90% |
| 22 | Kota Cirebon | 0.19 | 0.26% | 0.26 | 0.38% | 0.04 | 0.05% | 0.01 | 0.01% | 0.01 | 0.01% |
| 23 | Kota Bekasi | 1.47 | 1.96% | 2.64 | 3.85% | 3.70 | 4.95% | 3.15 | 3.58% | 2.87 | 4.16% |
| 24 | Kota Depok | 0.48 | 0.64% | 1.02 | 1.48% | 0.46 | 0.62% | 1.69 | 1.92% | 0.71 | 1.03% |
| 25 | Kota Cimahi | 0.07 | 0.10% | 0.31 | 0.46% | 0.03 | 0.04% | 1.23 | 1.40% | 0.83 | 1.20% |
| 26 | Kota Tasikmalaya | 0.04 | 0.06% | 0.01 | 0.01% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.01% |
| 27 | Kota Banjar | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% | 0.00 | 0.00% |
| | Total | 74.99 | 100.00% | 68.67 | 100.00% | 74.69 | 100.00% | 88.22 | 100.00% | 69.03 | 100.00% |

Source: https://opendata.jabarprov.go.id/

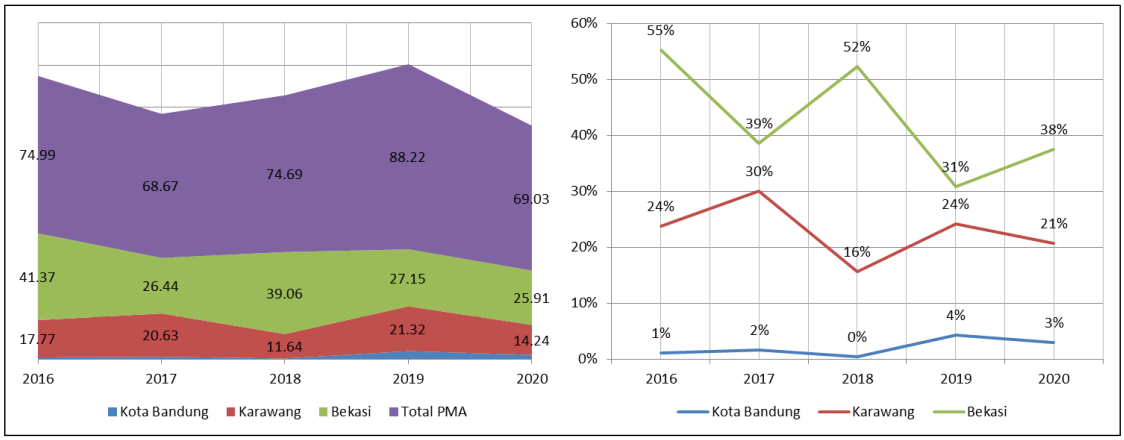


*Figure 10. The Info-graphic of Foreign Direct Investment in West Java Based on Spatial Distribution, 2016—2020*

Source: https://opendata.jabarprov.go.id/

Although foreign investment in West Java tends to be insensitive to the pandemic spatially, the correlation between the pandemic effect and foreign investment appeared from a business-sector point of view. Table 4 details the foreign investment time series data based on the business sector from 2016 to 2021. The Table highlights the dominant business sector each year.

Table 4: Total (in trillion IDR) and Percentage of Foreign Direct Investment in West Java Based on Business-Sector Distribution, 2016—2020

| No | Business Sector | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rp | % | Rp | % | Rp | % | Rp | % | Rp | % |
| 1 | Hotel & Restaurant | 1.13 | 1.51% | 1.46 | 2.13% | 0.17 | 0.22% | 0.22 | 0.25% | 0.24 | 0.34% |
| 2 | Leather & Footwear Industry | 0.41 | 0.55% | 0.68 | 1.00% | 0.94 | 1.25% | 0.75 | 0.85% | 0.76 | 1.10% |
| 3 | Medical Instrument, Optic, Clock, & Precision Industry | 0.01 | 0.01% | 0.00 | 0.00% | 0.03 | 0.04% | - | 0.00% | - | 0.00% |
| 4 | Rubber & Plastic Industry | 5.32 | 7.09% | 4.00 | 5.82% | 2.60 | 3.49% | 2.38 | 2.70% | 0.76 | 1.11% |
| 5 | Wood Industry | 0.04 | 0.05% | 0.02 | 0.02% | 0.12 | 0.16% | 0.16 | 0.18% | 0.15 | 0.22% |
| 6 | Motor Vehicle and Other Transportation Equipment Industry | 29.97 | 39.97% | 15.27 | 22.24% | 11.56 | 15.48% | 9.65 | 10.94% | 11.30 | 16.37% |
| 7 | Paper & Printing Industry | 0.84 | 1.12% | 1.81 | 2.63% | 2.80 | 3.75% | 1.55 | 1.75% | 0.55 | 0.80% |
| 8 | Chemical and Pharmaceutical Industry | 3.11 | 4.14% | 4.41 | 6.42% | 4.26 | 5.71% | 5.25 | 5.95% | 2.19 | 3.18% |
| 9 | Other Industries | 0.22 | 0.29% | 0.67 | 0.97% | 0.93 | 1.25% | 2.66 | 3.01% | 3.15 | 4.57% |
| 10 | Metal, Machinery and Electronics Industry | 8.04 | 10.72% | 10.54 | 15.35% | 13.81 | 18.50% | 1.33 | 1.51% | 2.69 | 3.89% |
| 11 | Food Industry | 8.01 | 10.68% | 2.45 | 3.57% | 2.72 | 3.64% | 2.56 | 2.90% | 3.30 | 4.79% |
| 12 | Minerals and Metals Industry | 1.97 | 2.63% | 3.10 | 4.51% | 3.02 | 4.04% | 1.53 | 1.74% | 0.36 | 0.52% |
| 13 | Textile Industry | 1.72 | 2.30% | 2.13 | 3.10% | 1.88 | 2.52% | 2.09 | 2.37% | 1.12 | 1.63% |
| 14 | Other Services | 1.02 | 1.36% | 5.35 | 7.79% | 1.49 | 1.99% | 0.48 | 0.55% | 2.94 | 4.26% |
| 15 | Forestry | 0.05 | 0.06% | 0.00 | 0.00% | 0.00 | 0.00% | 0.01 | 0.01% | 0.00 | 0.00% |
| 16 | Construction | 0.16 | 0.21% | 1.08 | 1.57% | 0.09 | 0.12% | 0.54 | 0.61% | 1.44 | 2.09% |
| 17 | Electricity, Gas & Water | 1.00 | 1.33% | 4.11 | 5.98% | 4.71 | 6.31% | 17.58 | 19.93% | 10.32 | 14.94% |
| 18 | Trading & Reparation | 1.45 | 1.93% | 1.37 | 2.00% | 0.94 | 1.26% | 1.10 | 1.25% | 0.58 | 0.84% |
| 19 | Fishery | - | 0.00% | 0.07 | 0.11% | 0.02 | 0.02% | 0.01 | 0.02% | 0.00 | 0.00% |
| 20 | Mining | 0.58 | 0.77% | 0.06 | 0.09% | 0.02 | 0.03% | 0.04 | 0.05% | 0.01 | 0.02% |
| 21 | Housing, Industrial Estate and Offices | 8.32 | 11.10% | 6.36 | 9.26% | 16.67 | 22.32% | 14.00 | 15.87% | 9.39 | 13.61% |
| 22 | Husbandry | 0.17 | 0.23% | 0.50 | 0.73% | 0.47 | 0.63% | 0.22 | 0.25% | 0.00 | 0.00% |
| 23 | Food Crops & Plantation | 0.03 | 0.04% | 0.10 | 0.14% | 0.05 | 0.07% | 0.28 | 0.32% | 0.30 | 0.43% |
| 24 | Transportation, Warehouse & Communication | 1.44 | 1.92% | 3.13 | 4.57% | 5.37 | 7.19% | 23.81 | 26.99% | 17.46 | 25.30% |
| | Total Foreign Investment | 74.99 | 100% | 68.67 | 100.00% | 74.69 | 100.00% | 88.22 | 100.00% | 69.03 | 100.00% |

Source: https://opendata.jabarprov.go.id/

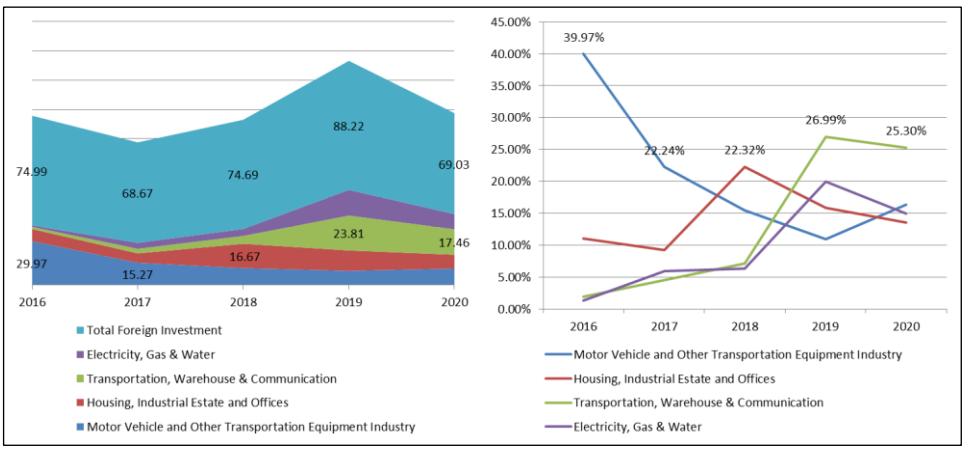


*Figure 11. The Info-graphic of Foreign Direct Investment in West Java Based on Business-Sector Distribution, 2016—2020*

Source: *https://opendata.jabarprov.go.id/*

Historical data shows that in 2016-2017 foreign investors were more interested in the motor-vehicle and transportation equipment sectors. Next, in 2017, they shifted to housing, industrial estates, and offices. Furthermore, in 2019-2020, when the covid-19 pandemic hit the world economy, they invested in transportation, warehouse, and communication.

Figure 11 reveals the most attractive business sector for foreign investors showing their trend in 2016-2020. The Electricity, Gas, and Water sector was also included in the graph to support the research topic discussion. The next session discusses the Domestic Investment Profile.

### 3.4 Domestic Investment Profile

Table 5 details domestic investment in West Java based on spatial distribution during 2016-2020. From a spatial point of view, the domestic investment profile in West Java indicates a similar trend to foreign investment where it were majority in Bekasi and Karawang. However, from a total investment-trend point of view, domestic and foreign investments were different. As illustrated in Figure 12 comparing Figure 10, the trend of total foreign investment fluctuated while the domestic dramatically increased even during the pandemic period.

Table 5: Total (in billion IDR) and Percentage of Domestic Direct Investment in West Java Based on Spatial Distribution, 2016—2020

| No | Regency / Municipality | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rp | % | Rp | % | Rp | % | Rp | % | Rp | % |
| 1 | Bogor | 2,706.52 | 8.91% | 2,137.30 | 5.57% | 3,733.24 | 8.83% | 4,414.69 | 8.96% | 6,300.89 | 12.26% |
| 2 | Sukabumi | 97.97 | 0.32% | 79.12 | 0.21% | 351.70 | 0.83% | 218.17 | 0.44% | 1,490.13 | 2.90% |
| 3 | Cianjur | 862.35 | 2.84% | 246.66 | 0.64% | 143.34 | 0.34% | 704.48 | 1.43% | 508.73 | 0.99% |
| 4 | Bandung | 425.22 | 1.40% | 2,561.49 | 6.67% | 2,757.56 | 6.52% | 2,078.08 | 4.22% | 1,096.96 | 2.13% |
| 5 | Garut | 150.62 | 0.50% | 1,937.78 | 5.05% | 116.48 | 0.28% | 625.12 | 1.27% | 322.55 | 0.63% |
| 6 | Tasikmalaya | 0.01 | 0.00% | - | 0.00% | - | 0.00% | - | 0.00% | 141.22 | 0.27% |
| 7 | Ciamis | - | 0.00% | 52.40 | 0.14% | 0.07 | 0.00% | - | 0.00% | 0.25 | 0.00% |
| 8 | Kuningan | - | 0.00% | 59.51 | 0.16% | 34.74 | 0.08% | 5.01 | 0.01% | 1.93 | 0.00% |
| 9 | Cirebon | 349.61 | 1.15% | 323.24 | 0.84% | 971.68 | 2.30% | 34.59 | 0.07% | 278.96 | 0.54% |
| 10 | Majalengka | - | 0.00% | 2,645.00 | 6.89% | 4,326.83 | 10.23% | 637.80 | 1.29% | 793.74 | 1.54% |
| 11 | Sumedang | 340.64 | 1.12% | 3,999.44 | 10.42% | 998.33 | 2.36% | 1,226.61 | 2.49% | 1,142.82 | 2.22% |
| 12 | Indramayu | 1.61 | 0.01% | 68.00 | 0.18% | 110.87 | 0.26% | 33.73 | 0.07% | 355.30 | 0.69% |
| 13 | Subang | 66.68 | 0.22% | 178.30 | 0.46% | 519.04 | 1.23% | 1,534.88 | 3.11% | 78.27 | 0.15% |
| 14 | Purwakarta | 1,748.58 | 5.76% | 1,967.38 | 5.12% | 344.24 | 0.81% | 990.51 | 2.01% | 3,291.09 | 6.40% |
| 15 | Karawang | 5,651.66 | 18.62% | 8,361.86 | 21.78% | 3,199.80 | 7.57% | 2,972.15 | 6.03% | 2,500.16 | 4.86% |
| 16 | Bekasi | 7,435.01 | 24.49% | 6,183.34 | 16.11% | 15,000.98 | 35.48% | 20,206.86 | 41.00% | 11,411.42 | 22.20% |
| 17 | Bandung Barat | 835.59 | 2.75% | 201.50 | 0.52% | 43.74 | 0.10% | 41.70 | 0.08% | 174.95 | 0.34% |
| 18 | Pangandaran | - | 0.00% | - | 0.00% | 15.50 | 0.04% | - | 0.00% | 11.21 | 0.02% |
| 19 | Kota Bogor | 259.96 | 0.86% | 4,938.41 | 12.86% | 2,830.91 | 6.70% | 2,353.14 | 4.77% | 1,521.40 | 2.96% |
| 20 | Kota Sukabumi | - | 0.00% | 1.69 | 0.00% | - | 0.00% | 35.88 | 0.07% | 77.71 | 0.15% |
| 21 | Kota Bandung | 6,389.00 | 21.04% | 994.31 | 2.59% | 2,128.59 | 5.03% | 2,517.68 | 5.11% | 8,623.64 | 16.78% |
| 22 | Kota Cirebon | - | 0.00% | 30.73 | 0.08% | 523.08 | 1.24% | 2.66 | 0.01% | 30.73 | 0.06% |
| 23 | Kota Bekasi | 1,794.23 | 5.91% | 1,192.41 | 3.11% | 2,674.86 | 6.33% | 4,086.28 | 8.29% | 3,788.75 | 7.37% |
| 24 | Kota Depok | 230.41 | 0.76% | 62.85 | 0.16% | 1,264.32 | 2.99% | 4,470.03 | 9.07% | 7,175.44 | 13.96% |
| 25 | Kota Cimahi | 1,012.75 | 3.34% | 52.62 | 0.14% | 144.72 | 0.34% | 91.88 | 0.19% | 261.51 | 0.51% |
| 26 | Kota Tasikmalaya | 1.80 | 0.01% | 115.31 | 0.30% | 43.59 | 0.10% | 2.22 | 0.00% | 15.40 | 0.03% |
| 27 | Kota Banjar | - | 0.00% | - | 0.00% | - | 0.00% | - | 0.00% | 5.39 | 0.01% |
| | Total Domestic Investment | 30,360.21 | 100.00% | 38,390.65 | 100.00% | 42,278.21 | 100.00% | 49,284.16 | 100.00% | 51,400.55 | 100.00% |

Source: https://opendata.jabarprov.go.id/

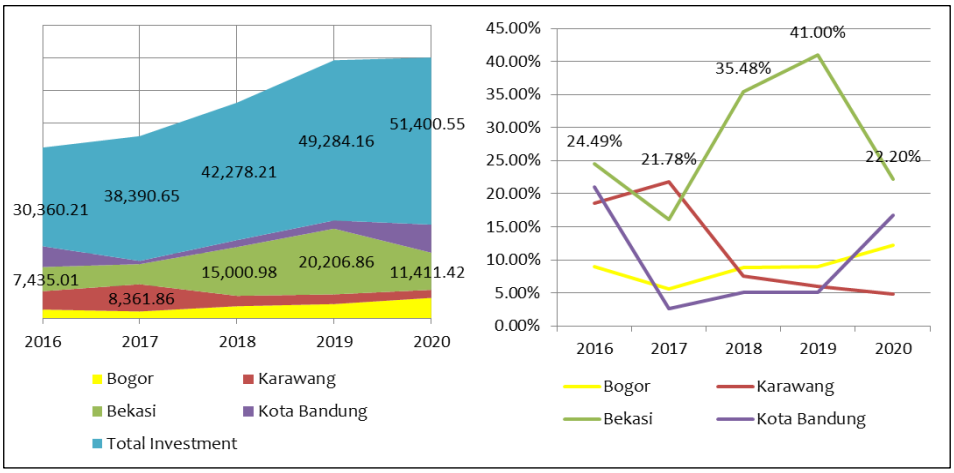


*Figure 12. The Info-graphic of Domestic Direct Investment in West Java Based on Spatial Distribution, 2016—2020*

Source: https://opendata.jabarprov.go.id/

From a business-sector distribution point of view, domestic investors had different interests than foreigners'. The majority of them invested in the Construction and Food Industry sectors. Table 6 shows the Domestic Investment Profile of West Java in 2016-2020 based on business-sector distribution. The aggregate data is then illustrated in Figure 13 to see the investment trend.

Table 6: Total (in billion IDR) and Percentage of Domestic Direct Investment in West Java Based on Business Sector Distribution, 2016-2020

| No | Business Sector | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rp | % | Rp | % | Rp | % | Rp | % | Rp | % |
| 1 | Hotel & Restaurant | 147.96 | 0.49% | 1,293.12 | 3.37% | 260.99 | 0.62% | 1,600.89 | 3.25% | 1781.0147 | 3.46% |
| 2 | Leather & Footwear Industry | - | 0.00% | 34.72 | 0.09% | 47.49 | 0.11% | 4.92 | 0.01% | 50.075 | 0.10% |
| 3 | Medical Instrument, Optic, Clock, & Precision Industry | - | 0.00% | - | 0.00% | 1.12 | 0.00% | - | 0.00% | 0 | 0.00% |
| 4 | Rubber & Plastic Industry | 1,033.97 | 3.41% | 2,301.55 | 6.00% | 489.75 | 1.16% | 643.56 | 1.31% | 1603.9456 | 3.12% |
| 5 | Wood Industry | 1.76 | 0.01% | 131.10 | 0.34% | 27.74 | 0.07% | 3.72 | 0.01% | 6.0646 | 0.01% |
| 6 | Motor Vehicle and Other Transportation Equipment Industry | 732.00 | 2.41% | 395.56 | 1.03% | 237.44 | 0.56% | 69.00 | 0.14% | 423.8854 | 0.82% |
| 7 | Paper & Printing Industry | 2,051.58 | 6.76% | 5,512.93 | 14.36% | 252.85 | 0.60% | 81.39 | 0.17% | 475.7163 | 0.93% |
| 8 | Chemical and Pharmaceutical Industry | 2,681.67 | 8.83% | 2,767.90 | 7.21% | 3,820.37 | 9.04% | 1,421.95 | 2.89% | 2473.9828 | 4.81% |
| 9 | Other Industries | 336.66 | 1.11% | 79.33 | 0.21% | 164.15 | 0.39% | 268.64 | 0.55% | 124.3703 | 0.24% |
| 10 | Metal, Machinery and Electronics Industry | 4,334.47 | 14.28% | 2,555.94 | 6.66% | 2,501.97 | 5.92% | 3,665.33 | 7.44% | 1486.3191 | 2.89% |
| 11 | Food Industry | 3,673.04 | 12.10% | 6,755.10 | 17.60% | 4,573.68 | 10.82% | 2,287.34 | 4.64% | 1536.804 | 2.99% |
| 12 | Minerals and Metals Industry | 1,051.48 | 3.46% | 935.70 | 2.44% | 613.48 | 1.45% | 795.58 | 1.61% | 713.0269 | 1.39% |
| 13 | Textile Industry | 1,193.77 | 3.93% | 3,613.07 | 9.41% | 866.56 | 2.05% | 382.79 | 0.78% | 1234.9345 | 2.40% |
| 14 | Other Services | 404.60 | 1.33% | 432.76 | 1.13% | 744.63 | 1.76% | 1,562.17 | 3.17% | 748.4092 | 1.46% |
| 15 | Forestry | 0.37 | 0.00% | - | 0.00% | - | 0.00% | - | 0.00% | 4 | 0.01% |
| 16 | Construction | 6,246.26 | 20.57% | 894.07 | 2.33% | 10,191.01 | 24.10% | 16,655.32 | 33.79% | 25232.92 | 49.09% |
| 17 | Electricity, Gas & Water | 1,985.33 | 6.54% | 2,484.49 | 6.47% | 5,139.29 | 12.16% | 3,670.65 | 7.45% | 2254.989 | 4.39% |
| 18 | Trading & Reparation | 368.91 | 1.22% | 409.55 | 1.07% | 496.10 | 1.17% | 761.55 | 1.55% | 416.8859 | 0.81% |
| 19 | Fishery | - | 0.00% | 3.56 | 0.01% | 5.19 | 0.01% | 0.04 | 0.00% | 9.5168 | 0.02% |
| 20 | Mining | 6.27 | 0.02% | 1.02 | 0.00% | 146.91 | 0.35% | 95.06 | 0.19% | 128.9004 | 0.25% |
| 21 | Housing, Industrial Estate and Offices | 2,595.16 | 8.55% | 3,411.61 | 8.89% | 3,763.14 | 8.90% | 7,886.20 | 16.00% | 7648.3064 | 14.88% |
| 22 | Husbandry | 143.75 | 0.47% | 55.07 | 0.14% | 145.20 | 0.34% | 146.86 | 0.30% | 0 | 0.00% |
| 23 | Food Crops & Plantation | 26.95 | 0.09% | 17.00 | 0.04% | 3.30 | 0.01% | 698.88 | 1.42% | 53.0206 | 0.10% |
| 24 | Transportation, Warehouse & Communication | 1,344.24 | 4.43% | 4,305.48 | 11.21% | 7,785.85 | 18.42% | 6,582.33 | 13.36% | 2993.4581 | 5.82% |
| | Total Domestic Investment | 30,360.21 | 100.00% | 38,390.65 | 100.00% | 42,278.21 | 100.00% | 49,284.16 | 100.00% | 51,400.55 | 100.00% |

Source: https://opendata.jabarprov.go.id/

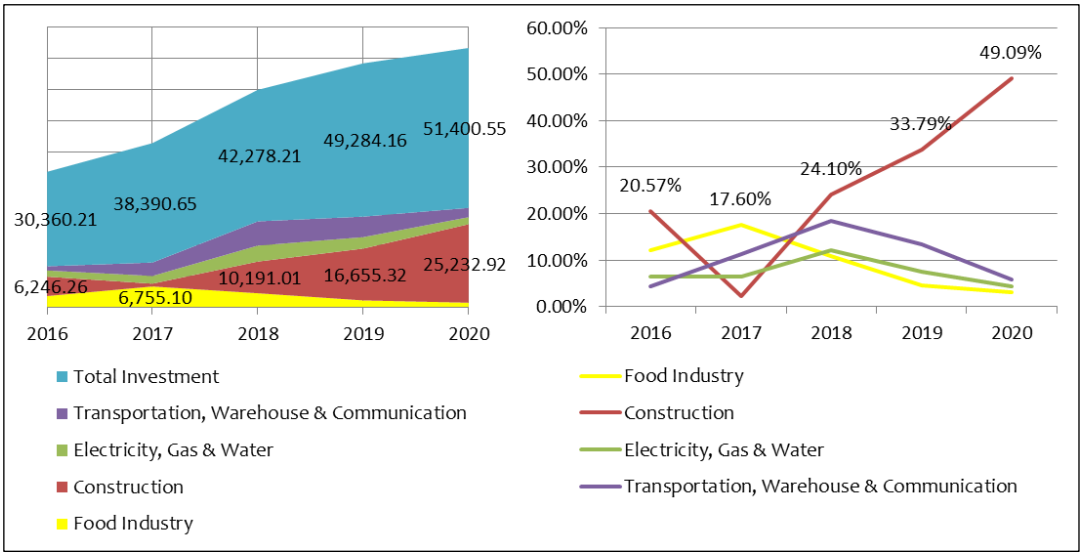


*Figure 13. The Info-graphic of Domestic Direct Investment in West Java Based on Business-Sector Distribution, 2016—2020*

*Source: https://opendata.jabarprov.go.id/*

Based on the Figure 13 configuration, the highest proportion of domestic investment in 2016 was for the Construction sector or 20.57%. Even though it turned to the Food Industry sector (17,60%) in 2017, It return to construction sector in the following years with a significant increase in the proportion from 24,10% to 33.79 % in 2018 and 2019, respectively. In 2020 almost half of domestic investment was in the Construction sector, indicating the domestic investment climate in West Java insensitive to the pandemic situation.

The elaboration of electricity, telecommunication infrastructure, and regional investment in the previous section, then the subjects for confirmation to interviewees privately. The results of the interviews were a resume of points, and the long list of opportunities and challenges of each sector development. The all together, then discussed on the FGD to formulate policy recommendations which analyzed in the following section. The analysis is started with the issues on investment, followed by issues on electricity, and ends with issues on telecommunication.

### 3.5 The Opportunities and Challenges Analyses of the Regional Investment

The interviews discussed the function of the West Java Provincial Government in the investment sector on conceptual and managerial aspects. The local Government policies in the investment sector conceptually are contained in the General Investment Plan (RUPM) document. The RUPM of West Java Province ratified in Governor Regulation 13 of 2013 concerning the General Plan of Investment of West Java Province (Peraturan Gubernur Jawa Barat Nomor 13, 2013).

Managerially, the local executive institution (OPD) of RUPM is the Regional Investment Coordinating Board (BKPMD). In addition, following the development of laws and regulations regarding Regional Government, in 2016, a restructuring took place. The OPD handling investment is the One Stop Integrated Licensing and Investment Office (DPMPTSP).

Based on the Governor's Regulation (Pergub) Number 26 of 2016 concerning Main Duties, Functions, Details of Unit Tasks, and Work Procedures of the DPMPTSP, the OPD function is more likely to be an investor service executive than a coordinating function (Peraturan Gubernur Jawa Barat Nomor 26, 2016). Thus, the Local Governments focus on providing excellent service to investors, especially in terms of ease of investment, business licensing services, and other permits.

In 2021, the investment coordination function is then carried out by the BUMD, Investment, and Development Administration Bureau under the Provincial Secretariat based on Governor Regulation

Number 4 of 2021 concerning Main Duties, Functions, Details of Duties, and Work Procedures for the Regional Secretariat of West Java Province (Peraturan Gubernur Jawa Barat Nomor 4, 2021).

Interviews and FGDs reveal that the vision of West Java Development, namely "***Jabar Juara Lahir Batin dengan Sinergi dan Kolaborasi,"*** is very relevant to developing investment in West Java. With such development vision, West Java Province enjoys synergy with central Government programs (through Ministry/Agency programs), with neighboring Provincial Governments, and with local Governments in foreign countries through Sister Province programs. In addition, the development of West Java does not only rely on the Government budget, but also collaborates with investment from the private sector.

Among the forms of development synergy (between Government agencies) is the issuance of Presidential Regulation 87 of 2021 concerning the Acceleration of Development of the Rebana and Southern of West Java Regions (Peraturan Presiden Republik Indonesia Nomor 87, 2021). With the priority program activities of Ministries/Institutions (K/L) and optimization of the Specific Purpose Allocation Fund (DAK), both physical and non-physical, Regional Incentive Funds (DID) and Co-administration Tasks (TP) from Ministries/Agencies can be a solution to budget constraints of local Governments in developing.

In addition, development synergies are also through cooperation between local Governments. Not only with bordering provinces, such as DKI Jakarta, Banten, and Central Java, but also with provinces that are geographically far apart, such as the Province of West Sumatra for the 50-hectare corn planting program. Furthermore, in the West Java Tourism, Trade and Investment Partnership (WJ-TRIP), the Governor of West Java, M. Ridwan Kamil, opened up opportunities for cooperation with 33 provinces in Indonesia. He said: "The economy does not need to be limited to political areas. There is supply and demand, there is prosperity. So the important thing is optimizing interregional trade and cooperation" (Nugraha, 2021).

The development of West Java is not only in synergy with local governments in Indonesia, but also with several local Governments in foreign countries. Among them are 1) South Australia; 2) South Chungcheong Province, South Korea; 3) prefecture Shizuoka, Japan; and 4) four provinces in the People's Republic of China (PRC), namely Guangxi Zhuang, Chongqing, Sichuan, and Heilongjiang.

Furthermore, the West Java Provincial Government conducted development Collaboration with the private sector through Public Private Partnerships (PPP) mechanism. The public can monitor the progress by accessing the website http://kpbu.jabarprov.go.id/ page containing comprehensive information about PPPs in West Java, including eight forthcoming strategic projects.

One of the eight strategic projects relevant to this research is the construction of a Solar Power Plant (PLTS) to reduce dependence on fossil fuels. By installing solar panels in Regional Government buildings, schools, sports buildings, and health facilities, the Provincial Government will cooperate with private companies which resell the power to PLN. When this paper written, the project was still in the preliminary study stage.

Based on interviews and FGD, the summary of investment development opportunities in West Java are:

1. The West Java Development Vision, which relies on synergy and Collaboration, can be a solution to limited local budgets in development investment.
2. The existence of the Presidential Regulation 87/2021 on the Acceleration of Development of the Rebana and Southern West Java Areas can trigger the emergence of a new center of economic growth in West Java Province.
3. Foreign investors are interested in the telecommunication sector, especially during the pandemic.

In addition, to identifying opportunities, the interviews and FGDs also identified challenges faced by the West Java Provincial Government in investment. Summary the challenges facing the investment sector in West Java include:

1. The interregional investment inequality may increase the economic and development gap across regions in West Java.
2. Sectorial Investment Gap: Foreign Investors were interested in Transportation Sector, while Domestic Investors were interested in Construction Sector.

3. DPMPTSP roles are still limited to investment permit administration, while electricity and the telecommunication infrastructure development administer by each technical OPD.

The above opportunities and challenges are then analyzed to produce policy recommendations as tabulated in Table 7.

Table 7: Policy Recommendations on Investment in West Java

| Challenges \ Opportunities | West Java Development Vision achieved by Synergy and Collaboration | Presidetial Regulation 87/2001 on Rebana and Southern of West Java Region Development Acceleration | FDI tends to be interested in electricity and telecommunication sector in West Java |
|---|---|---|---|
| interregional investment gap: majority in Bekasi and Karawang | Synergy of development in the Rebana and Southern areas of West Java | Interregional Equitable Development | Promoting investment in the electricity and telecommunications sectors in South West Java to foreign investors |
| Sectorial Investment Gap: Foreign Investors were interested in Transportation Industry, Domestic Investors were interested in Construction Sector | Collaboration between the business interests and regional development priorities | Promotion of investment in the Rebana and the Southrn West Java Regions | Mainstreaming the electricity sub-sector and telecommunications sector |
| Local Government Roles still limited on investment permit administration | Optimization of DAK and DID and TP of K/L in areas with minimal investment | Optimization of DAK and DID and TP of K/L in areas with minimal investment | Ease of Investment, especially in the Electricity and Telecommunication sector |

Source: FGD

Investment policy recommendations in West Java presented in Table 7 which is regarded as expert justification (professional judgment). The analysis of opportunities and challenges for developing the electrical energy sub-sector reviewed in the next sub-section.

### 3.6 The Opportunities and Challenges Analyses of Electricity Development

Based on the explanation of the interviewees, the national electricity policy is juridical based on Law Number 30 of 2009 concerning Electricity (Undang-Undang Republik Indonesia Nomor 30, 2009). In West Java, the implementation of the regulations translated into Regional Regulation Number 4 of 2019 concerning Amendments to Regional Regulation Number 21 of 2001 concerning the Implementation of Electricity (Peraturan Daerah Nomor 4, 2019). The technical planning, namely the Regional General Electricity Plan (RUKD), comprehensively ruled in the West Java Provincial Regulation Number 2 of 2019 concerning the General Regional Energy Plan / RUED (Peraturan Daerah Provinsi Jawa Barat Nomor 2, 2019).

Based on regulatory references provided by informants, the RUED contains long-term modeling of energy needs based on the energy mix, including Electricity, Gas, Fuel Oil (BBM), and Bioenergy. Energy demand modeling includes five sector categories, namely: 1) Transportation Sector, 2) Industrial Sector, 3) Household Sector, 4) Commercial Sector, and 5) Other Sectors. Energy Demand Modeling in the household sector in West Java in units of Million Ton Oil Equivalent (MTOE) detailed in Table 8.

Table 8: Final Energy Demand Modeling Results in the Household Sector per Energy Type 2015 – 2025 (MTOE Unit)

| Energy Type | 2015 | 2016 | 2017 | 2017 | 2018 | 2020 | 2025 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|
| Electric | 1.4 | 1.6 | 1.9 | 2.1 | 2.3 | 2.6 | 4.1 | 5.9 | 10.6 | 16.2 |
| | 46.0% | 48.7% | 51.3% | 53.6% | 55.8% | 57.9% | 66.4% | 72.5% | 80.5% | 85.2% |
| Gas | 1.69 | 1.72 | 1.75 | 1.79 | 1.82 | 1.85 | 2.01 | 2.17 | 2.47 | 2.74 |
| | 53.8% | 51.0% | 48.4% | 45.9% | 43.6% | 41.5% | 32.8% | 26.6% | 18.8% | 14.4% |
| Fuel (BBM) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.16% | 0.15% | 0.14% | 0.13% | 0.12% | 0.11% | 0.07% | 0.05% | 0.02% | 0.00% |
| Bionergy | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 0.04% | 0.15% | 0.16% | 0.37% | 0.48% | 0.49% | 0.73% | 0.85% | 0.68% | 0.40% |
| Total | 3.1 | 3.4 | 3.6 | 3.9 | 4.2 | 4.5 | 6.1 | 8.1 | 13.1 | 19.0 |

Source: Proceed from Perda No. 2/2019 concerning the General Regional Energy Plan (RUED)

Table 8 indicates that the proportion of household energy needs in 2015 was mainly gas (53.8%), then electricity (46.0%). From year to year, it projected that starting in 2017, the main household energy will switch from gas to electricity. In the future, by 2025, 66.4% of household energy needs will be electrical energy; furthermore, in 2050, electrical energy needs will reach 85.2% of the various total types of energy consumed.

The discussion then continued to the scope of the Provincial Government authority in the electrical energy sub-sector based on regulations. The article 6 of the West Java Provincial Regulation 4/2019 concerning Electricity Management details 11 (eleven) authorities of the West Java Provincial Government. The eleven points of authority position the Provincial Government as the electricity regulator in its administrative area. The operation of providing electricity for the public interest, as mentioned in Article 16, carried out by the electricity provider.

Operators of electricity providers carry out business activities based on the Electricity Supply Business Plan (RUPTL). Until this paper was written, the Governor's Regulation on RUPTL has not been published. Thus, the RUPTL in West Java refers to Government Regulation (PP) Number 23 of 2014 concerning Amendments to Government Regulation number 14 of 2012 concerning Business Plans for the Provision of Electricity (Peraturan Pemerintah Republik Indonesia Nomor 23, 2014).

In the explanation of PP number 23/2014, it is written:

"...***the development of electricity infrastructure is capital-intensive and technology-intensive, while the availability of the State Revenue and Expenditure Budget (BUMN) for the development of electricity infrastructure has not been able to meet the total increase in electricity demand, so it is necessary to provide wider opportunities for private sectors to participate in the provision of electricity***.

***In order to accelerate the fulfillment of electricity needs more efficiently, it is necessary to provide opportunities for private sectors and developers who are already operating to expand the supply of electricity to the local electric power system through direct appointment or direct selection mechanisms.***"

Because it is capital-intensive and technology-intensive, the business of providing electricity is massive and beyond administrative boundaries to meet economies of scale and be feasible in business calculations. For example, the scope of work of one of the power and grid units (PIKITRING) belonging to the State Electricity Company (PLN) covers Java, Bali, and Nusa Tenggara (JBN). This condition may be one of the reasons why the RUPTL has been sufficiently regulated by the PP so that the Governor's Regulation on RUPTL has not yet urgently issued.

Nevertheless, West Java has a Regional State Owned Enterprise (BUMD), which engaged in the electricity sector, namely PT. Tirta Gemah Ripah. This BUMD operates a Micro Hydro Power Plant (PLTM) in Cirompang, Garut Regency. The business prospect of this BUMD considered bright due to the potential

of river water resources with high water discharge and steep topography, as well as the electrification ratio, which not yet one hundred percent in the South West Java region.

Although the BUMD business in the electricity sector has promising prospects in the future, the regional budget (APBD) for BUMD capital participation as an effort to expand business in the electricity sector still needs political support from the DPRD. Meanwhile, the strategy to anticipate the threat of a national and global economic recession, as recommended by the Regional Economic Recovery Committee (KPED) of West Java, prioritizes the food sector and its supply chain (Humas Jabar, 2022).

The resume of the interview with the informants, accompanied by the literature submitted, is as follows. The West Java opportunities in the electricity sector include:

1. The pattern of needs, along with strategic steps to fulfill the need for electrical energy (comprehensively with other types of energy) in the long term (until 2050), has been taken into account by the Government and stipulated in the West Java Provincial regulation Number 2 of 2019 concerning the General Plan of Regional Energy.
2. The Regional Regulation 4 of 2019 concerning the Implementation of Electricity took place.
3. West Java has the PT. Tirta Gemah Ripah, a BUMD which operates a Micro Hydro Power Plant (PLTM) located in Cirompang, Garut Regency. The electrification ratio in South West Java and the presence of rivers with high water discharge and steep topography are opportunities for BUMD's business expansion in providing electricity in remote areas.

The challenges for West Java electricity development are:

1. Future energy needs (2050 projections) in the household sector mostly (85.2% of total energy demand) are electrical energy with a volume of 16.2 Million Ton Oil Equivalent (MTOE)
2. Electricity supply business is Capital-Intensive and technology-intensive, so the feasibility of the business requires a large production scale and a wide range of services (beyond administrative limits). Thus, the role of local Governments in the field of electrical energy is still limited.
3. BUMD's business expansion in the electricity sector requires political will. At the same time, the Regional Economic Recovery Strategy recommended by KPED focus on the food sector and its supply chain.

The identified opportunities and challenges discussed in the FGD were then processed to formulate policy recommendations as described in Table 9.

Table 9: Policy Recommendations on Investment in West Java

| Challenges \ Opportunities | The existence of Electricity Technical Plan Regulation | The existence of electricity governance regulations | The Exisence of Regional SOE PT. Tirta Gemah Ripah operating Microhydro Power Plan |
|---|---|---|---|
| Household energy needs in the future (2050) are projected to be highly dependent (85.6%) on electricity | Public Private Partnership (PPP) in developing electricity Infrastructure | Ease of Investment in Electricity Sector | Regional SOE Revitalitazion |
| The role of the Local Government in the electricity sector is still limited | Supplying the "niche market" of household electrical energy in remote areas | Supplying the "niche market" of household electrical energy in remote areas | Regional SOE Revitalitazion |
| Local Governments focus on the food sector and its supply chain, not yet on the energy sector | Mainstreaming of the electrical energy sub-sector | Mainstreaming of the electrical energy sub-sector | B to B collaboration between Regional SOE and other Business Entities |

Source: FGD

Electrical power supply sustainability can guarantee the economic activities sustainability of various sectors, including the telecommunication sector. The analysis of opportunities and challenges development of the telecommunications sector in West Java discussed in the next subsection.

### 3.7 The Opportunities and Challenges Analyses of Telecommunication Facilities Development

Interviewees revealed that the development of the telecommunications sector in West Java is based on Regional Regulation (Perda) Number 4 of 2021 concerning the Implementation of Communication, Informatics, Statistics, and Encryption (Peraturan Daerah Provinsi Jawa Barat Nomor 4, 2021). Technically, the implementation carried out by the Telecommunications and Information Office regarding to the Governor's Regulation 60 of 2017 concerning Duties, Functions, Details of Unit Tasks, and Work Procedures for the Office of Communication and Information (Peraturan Gubernur Jawa Barat Nomor 60, 2017). Based on the discussion, it identified the relevant mandates of Perda Number 4/2021 with this research are: 1) the implementation of Electronic-Based Government System Services (SPBE) and 2) the development of a digital province.

In line with this research, on 27-28 July 2022, the West Java Provincial Government, in Collaboration with ITB and BAKTI Kominfo held a Hybrid-Webinar with two discussion agendas: 1) Discussion on digital transformation in the economic, social and environmental fields after the Covid-19 pandemic, and 2) Discussion on the impact and potential of digital development Collaboration for economic, social, and environmental recovery. The event enriched the information, sharpened issues, and expanded the perspective of the research discussions, as well as confirmed that the research theme is relevant to strategic issues in West Java.

The Covid-19 pandemic considered as the trigger for the acceleration of digitalization in almost all sectors. The digital transformation occurs in business, education, and bureaucracy. The Government (both national and regional) believe that public service digitalization support the national economy, financial governance, and inclusive finance. Furthermore, digitalization may increase the efficiency and effectiveness of public services, supporting transparency in the Government system, as well as optimizing regional revenues and fiscal health. The strategy by promote digital Government transactions for regional expenditure and income transactions, and digital-based or cashless payments to the public.

Public service digitalization was then supported by Presidential Decree no. 3 of 2021 concerning the Task Force for the Acceleration and Expansion of Regional Digitization (Keputusan Presiden Republik Indonesia Nomor 3, 2021). The Task Force aims to 1) encourage the implementation of Regional Government Digital Transactions (ETPD) in order to increase the transparency of regional financial transactions, support governance, and integrate regional financial management systems to optimize regional revenues; and 2) support the development of public digital payment transactions, realize financial inclusion, and increase economic integration and national digital finance.

In West Java, public service digitalization accelerates by collaborating with local Governments in foreign countries through the Sister Province program. One of them is cooperation with Chungcheongnam-do, South Korea. According to Governor M. Ridwan Kamil, the Sister Province program has seven new economic opportunities, namely: 1) seizing investment opportunities for companies moving from China, 2) achieving food self-sufficiency, 3) accelerating technology self-sufficiency, 4) encouraging business opportunities in the health sector, 5) adapting digital economy, 6) Implementing a sustainable economy, and 7) promoting local tourism.

In local scope, the West Java Provincial Government develops digital villages. The progress of the Digital Village development can be accessed by the public at https://desadigital.jabarprov.go.id/. To realize a self-sustaining village in West Java, the Provincial Government encourages academics, business, and communities, especially in rural areas, to participate on mainstreaming Internet of Things (IoT) activities, and training digital literacy for villagers. With the Penta-helix concept, until now 2,205 villages have become program beneficiaries and 22 partners have been collaborating.

Nevertheless, empirical facts disclose blank spots area of cell phone and internet signals in rural areas in West Java. It may the reason why the Access and Infrastructure Sub-index in West Java ICT Development Index was at 6.65 or still in the moderate category. Nationally, the ranking of West Java is still stagnant at ranking 6 in the last two years, even though one of the expectations of West Java's development is to become a Cyber Province.

The FGD then opened up potential solutions for the blank spot village. The Village Fund and Village authority in determining development priorities through the Village Medium-Term Development Plan (RPJMDes), may encourage the acceleration of digital village development even in remote areas. The

Village Fund Budget may use to provide free WIFI in rural areas. In addition, the business Collaboration between Village Owned Enterprises (BUMDes) and internet service providers (B to B cooperation) in providing paid internet access for villagers were some of the alternative solutions elaborated in the FGD.

Based on the results of the FGD and the relevant seminar resumes, it can conclude that the opportunities for telecommunications development in West Java are as follows:

1. The Covid-19 pandemic has triggered a digital transformation in almost all aspects of human life.
2. The existence of Digital Economy cooperation with foreign Provincial Governments (Sister Province)
3. Village Governments have budgetary capacity and flexibility in determining village development priorities, so they may fulfill the needs of electricity, telecommunications, and internet access infrastructure based on their capacity.

The challenges faced in a resume are:

1. There are still 23 villages with blank spots for cell phone signals and 66 villages for internet signal blanks.
2. West Java is determined to become a Cyber Province, but West Java's IP-TIK is still in the medium category, and the Access and Infrastructure sub-index were ranked six nationally in 2020.
3. The role and capacity of the Provincial, Regency/Municipal Governments in the Telecommunication sector are limited

The FGD then formulated the telecommunication sector policy recommendations, which detailed in Table 10.

Table 9: Policy Recommendations on Telecommunication Sector in West Java

| Challenges \ Opportunities | The Covid-19 pandemic has triggered digital transformation in almost all sectors of life | G to G cooperation with foreign provincial governments (Sister Province) on Digital Economy took place | The village government has budgetary capacity and flexibility in determining village development priorities |
|---|---|---|---|
| There are still a number of blank spot areas for cell phone and internet signals | Optimization of DAK and DID and TP of K/L | G to G cooperation to increase infrastructure capacity in the digital economy | Utilization of the Village Fund for the provision of free WIFI for education and village tourism |
| ICT Development Index of West Java is still in the medium category; Access and Infrastructure sub-Index rank 6 | Optimization of DAK and DID and TP of K/L | G to G cooperation to increase infrastructure capacity in the digital economy | Facilitation of B to B PKS between BUMDES and ISP Companies for the provision of paid internet networks |
| The role and capacity of local governments in the telecommunications sector is still limited | Optimization of DAK and DID and TP of K/L | G to G cooperation to increase infrastructure capacity in the digital economy | Facilitation of B to B PKS between BUMDES and ISP Companies for the provision of paid internet networks |

Source: FGD

This study formulates recommendations for policy directions (quo Vadis) in the investment, electricity, and telecommunications sectors to face West Java's economic challenges during and after the pandemic. However, the limited respondents/research informants, namely bureaucrats, make the perspective of discussing the topics, and conclusions of this study potentially biased (bureaucrat bias).

In addition, the research just focused on households' users, while users of electrical energy include the industrial, commercial (business), and transportation sectors. Recent issues regarding Government policies that reduce fuel subsidies and encourage the conversion of LPG gas into electricity in the household sector, and the conversion of fossil fuel vehicles (BBM) into electric-powered vehicles in the transportation sector, have discussed yet in this paper.

Another limitation is the time of the study, making the implications of the recommended policies potentially out of context when the situation and conditions change rapidly. Therefore, further research are needed by involving non-Government respondents such as energy and telecommunications experts, business actors, and social media users or citizens of cyberspace (Netizens), as well as other parties. The further research may recommend policies to **Recover Together and Recover Stronger from the Covid-19 Pandemic**.

## Conclusions

Based on the discussion, the conclusions of this study are: firstly, household electricity access and telecommunication infrastructure conditions in West Java were unequal between the Northern and Southern regions, particularly in terms of: electrification ratio, cellular phone signal strength, and internet signal quality. Although the Access and Infrastructure Sub-index in the West Java Information and Communication Technology Development Index (IP-TIK) increased from 6.54 in 2019 to 6.65 in 2020, West Java's ranking is stagnant ranked 6th nationally.

Secondly, the value of FDI investment in West Java had fluctuated in the last five years, while PMDN investment had a positive trend, and even tends to be unaffected by the pandemic situation. However, spatial analysis shows that investment in West Java was very unequal, with about two-thirds of investment annually in Bekasi and Karawang districts. Meanwhile, a number of areas in the South West Java Region had almost zero FDI investment. In terms of the business sector, domestic investors are more interested in the construction sector, while foreign investors tend to be attracted to the motor vehicle and transportation equipment industry.

And finally, infrastructure investment in electricity and telecommunications in West Java has not become a major concern for local Governments. The characteristics of the electricity supply business and telecommunications services are capital-intensive and technology-intensive, so that it is feasible in business calculations on a broad business scale (across administrative boundaries). Thus, until now the electricity sub-sector and the telecommunications sector are dominantly operated by BUMN. While investment in the regions tends to follow the business logic of investors (private sector), it has not been integrated with the interests (priorities) of regional development (public sector).

Suggestions that are recommended based on the conclusions of the study are: (1). Interregional inequality of electricity and telecommunications infrastructure in West Java is recommended to be adjusted by: 1) Optimizing DID, DAK and K/L Assistance Tasks, 2) G to G cooperation in the Digital Economy through the Sister Province program with local Governments in abroad, and 3) synergy with village Government. This effort is recommended so that the West Java ICT Access and Infrastructure Development Sub-index, which nationally remains at rank 6 (in 2019 and 2020), increases in the future. Equitable development of electricity and telecommunications infrastructure are recommended so that the vision of "*Jabar Juara Lahir Batin*" can be achieved, one of which is by making West Java a Cyber Province. (2). Local Governments are recommended to maintain a positive trend of Domestic Direct Investment which according to empirical data continues to increase even during the pandemic by integrating the attractiveness of return on investment for investors (business interests) to regional development priorities (public interests) through Public Private Partnership (PPP) Mechanism. Furthermore, equitable-oriented development is recommended to adjust spatial inequality of investment in West Java. Therefore, Presidential Regulation No. 87/2021 concerning the acceleration of development in the Rebana and Southern West Java areas is recommended to be implemented seriously and consistently in regional development. (3). Local Governments are recommended to be sensitive in recognizing the niches / gaps in the development of electricity and telecommunications infrastructure that have not been develpoped by the Government and BUMN based on their capacity. For example, revitalizing the BUMD PT Tirta Gemah Ripah which operates a Micro-hydro Power Plant (PLTM) in Cirompang Garut to make it more reliable in providing electrical energy in remote areas. Another example is that Local Governments can be a mediator of B to B agreement between ISP and BUMDes in providing paid internet access in rural areas. In addition, the Village Fund is encouraged to provide free WIFI for the benefit of education and village tourism in order to improve the quality of education and to accelerate village economic activity.

## Acknowledgments

This research is also written in Bahasa Indonesia entitled: "*Quo Vadis Investasi Infrastruktur Strategis di Jawa Barat Pasca Pandemi*". The Indonesian version paper was submitted to a research competition (Kompetisi Riset Rekomendatif) conducted by the West Java Economic Society (WEJS) in Collaboration with the Bank Indonesia West Java Representative Branch on September to November 2022. We express gratitude to Mr. Setiawan Wangsaatmadja, the Secretary of the West Java Provincial Government, for his final review and valuable advice.

**Reference**


Aditama, T. Y. (2022). Dua Tahun Pandemi COVID-19. *EJournal Kedokteran Indonesia*, *10*(1), 1–3. https://doi.org/10.23886/ejki.10.157.1-3

Agustin, E. S. A. S., & Edhie, S. (2022). Kajian Tengah Tahun INDEF 2022: Reformulasi Kemandirian Ekonomi di Tengah Dinamika Global. *INDEF*.

Akhir, J. (2020). *Sebagian Wilayah Jakarta Blackout, Kasus 4 Agustus 2019 Terulang Lagi, Berita online*. https://economy.okezone.com/read/2020/11/01/320/2302337/sebagian-wilayah-jakarta-blackout-kasus-4-agustus-2019-terulang-lagi

Al Faqir, A. (2020). *Pembatasan Mobilitas Manusia Potensi Sebabkan Ekonomi Dunia Terkontraksi Lebih Dalam*. https://www.merdeka.com/uang/pembatasan-mobilitas-manusia-potensi-sebabkan-ekonomi-dunia-terkontraksi-lebih-dalam.html

Anbumozhi, V., Kalirajan, K., & Kimura, F. (2022). Introduction: Regional Catalysts for the Realisation of the SDGs in the Post Pandemic Era. In *Anbumozhi, V., Kalirajan, K., Kimura, F. (eds) Sustainable Development Goals and Pandemic Planning*. Springer. https://doi.org/https://doi.org/10.1007/978-981-16-6734-3_1

Dinas ESDM. (2022). *Elektrifikasi Rasio Jawa Barat*. https://esdm.jabarprov.go.id/bidang-ketenagalistrikan/

Dwi Cahyani, A., Nachrowi, N. D., Hartono, D., & Widyawati, D. (2020). Modern residential energy inequalities in Indonesia: spatial and income analyses. *Energy Sources, Part B: Economics, Planning and Policy*, *15*(6), 329–350. https://doi.org/10.1080/15567249.2020.1803450

Humas Jabar. (2022). *Antisipasi Ancaman Global, Ini Strategi Ekonomi KPED Jabar*. https://jabarprov.go.id/berita/antisipasi-ancaman-global-ini-strategi-ekonomi-kped-jabar-6329

Keputusan Presiden Republik Indonesia Nomor 3. (2021). *Satuan Tugas Percepatan dan Perluasan Digitalisasi Daerah*. https://jdih.jabarprov.go.id/page/info/produk/27058

Laksana, S. (2021). Post Pandemic Indonesian Regional Development Planning, New Normal, New Orientation: The Case of West Java. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, *5*(1), 32–50. https://doi.org/https://doi.org/10.36574/jpp.v5i1.150

Maqin, A. (2014). Pengaruh Kondisi Infrastruktur Terhadap Pertumbuhan Ekonomi di Jawa Barat. *Trikonomika*, *10*(1), 10–18.

Mulyaman, D., & Rahmani, A. A. (2021). *Renewing the Leapfrog Vision for Indonesia in the Post-Pandemic Order, the Habibie Center*. http://www.habibiecenter.or.id/img/publication/3bffacbe2fc7315a2bd208dcd3b6f10b.pdf

Nugraha, A. (2021). *Pulihkan Ekonomi, Jawa Barat Buka Peluang Kerjasama dengan 33 Provinsi, Berita online*. https://www.liputan6.com/bisnis/read/4830044/pulihkan-ekonomi-jawa-barat-buka-peluang-kerjasama-dengan-33-provinsi

Nurwaesari, N., Maulidiyah, P., & Fitri, D. M. (2022). Inequality Impact of MSME Assistance in Indonesia on Urban Migration in the Post Pandemic Era. *Proceedings of the 2nd International Indonesia Conference on Interdisciplinary Studies (IICIS 2021)*, *606*(2), 67–72. https://doi.org/10.2991/assehr.k.211206.010

Peraturan Daerah Nomor 4. (2019). *Perubahan atas Peraturan Daerah Nomor 21 tahun 2001 tentang Penyelenggaran Ketenagalistrikan*. https://jdih.jabarprov.go.id/page/info/produk/8021

Peraturan Daerah Provinsi Jawa Barat Nomor 2. (2019). *Rencana Umum Energi Daerah*. https://jdih.jabarprov.go.id/page/info/produk/8013

Peraturan Daerah Provinsi Jawa Barat Nomor 4. (2021). *Penyelenggaraan Komunikasi, Informatika, Statistik, dan Persandian*. https://jdih.jabarprov.go.id/page/info/produk/25581

Peraturan Gubernur Jawa Barat Nomor 13. (2013). *Rencana Umum Penanaman Modal Provinsi Jawa Barat*. https://jdih.jabarprov.go.id/page/info/produk/7082

Peraturan Gubernur Jawa Barat Nomor 26. (2016). *Tugas Pokok, Fungsi, Rincian Tugas Unit, dan Tata Kerja Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu*. https://jdih.jabarprov.go.id/page/info/produk/8919

Peraturan Gubernur Jawa Barat Nomor 4. (2021). *Tugas Pokok, Fungsi, Rincian Tugas dan Tata Kerja Sekretariat Daerah Provinsi Jawa Barat*. https://jdih.jabarprov.go.id/page/info/produk/25528

Peraturan Gubernur Jawa Barat Nomor 60. (2017). *Tugas, Fungsi, Rincian Tugas Unit, dan Tata Kerja Dinas Komunikasi dan Informatika Pemerintah Daerah Provinsi Jawa Barat*. https://jdih.jabarprov.go.id/page/info/produk/8732

Peraturan Pemerintah Republik Indonesia Nomor 23. (2014). *Perubahan atas Peraturan Pemerintah nomor 14 tahun 2012 tentang Rencana Usaha Penyediaan Tenaga Listrik*. https://jdih.setneg.go.id/viewpdfperaturan/PP Nomor 23 Tahun 2014.pdf

Peraturan Presiden Republik Indonesia Nomor 87. (2021). *Percepatan Pembangunan Kawasan Rebana dan Kawasan Jawa Barat Bagian Selatan*. https://jdih.setneg.go.id/viewpdfperaturan/1. Salinan Peraturan Presiden Nomor 87 Tahun 2021.pdf

Putra, D. G., & Wayoi, A. E. (2022). *Ketika Pandemi Menjadi Endemi*. SCU Knowledge Media.

TNP2K. (2016). *Kesiapan data dalam pemberian subsidi listrik tepat sasaran*. http://www.tnp2k.go.id/downloads/kesiapan-data-dalam-pemberian-subsidi-listrik-tepat-sasaran

Undang-Undang Republik Indonesia Nomor 30. (2009). *Ketenagalistrikan*. https://jdih.setneg.go.id/viewpdfperaturan/UU Nomor 30 Tahun 2009.pdf

Virgana, R. A. E. (2016). Membangun Awareness Kesenjangan Telekomunikasi Pedesaan di Jawa Barat Dengan GIS Analysis for ICT Blank Spot Area menuju Jabar Cyber Province. *Seminar Nasional Teknik Elektro 2016*, *2*, 10–17. http://senter.ee.uinsgd.ac.id/repositori/index.php/prosiding/article/view/senter2016p2

Wamad, S. (2022). *Ridwan Kamil: Puncak Penyebaran Subvarian Omicron Juli 2022*. https://www.detik.com/jabar/berita/d-6141413/ridwan-kamil-puncak-penyebaran-subvarian-omicron-juli-2022