

Agricultural Transformation Based on Food Collectivism to Actualize Food Smart Cities in Indonesia

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Abstract

Indonesia is experiencing a food crisis and an import emergency. Although Indonesia is considered an agricultural and megadiverse country, it is still not optimal in utilizing and managing the potential of natural and human resources to meet the availability, affordability, quality, sustainability, and adaptation of food to the community. In line with the Sustainable Development Goals (SDGs) on Goal 2 and on Goal 12. The author offers an idea to solve these problems by exploring the concept of food collectivism. This concept is actualized in the form of parameters or indicators as an effort to transform agriculture. In addition, the author also conceptualizes food collectivism to realize food-smart cities, which is closely related to the transformation of modern agriculture. The research method used is descriptive, and research materials were analyzed through literature studies. The results show that food collectivism embodies food sovereignty, food independence, food security, and food sovereignty, interconnected by prioritizing the right to food and local food-based community welfare. Food collectivism can be a guideline in realizing food-smart cities where cities can be said to have been able to balance food production with the food needs of their residents.

Keywords: food collectivism, food smart cities, food, agricultural transformation

7. Introduction

Food is essential for humans to consume from materials derived from biological natural sources to fulfill the needs of humans in large quantities, given the increasing number of people every day. However, the increase in population in a region is not directly proportional to the availability of food. For 11 years, starting from 2012-2022, Indonesia is still dependent on imports of food products from other countries, such as meat imports (35%), sugar (28%), salt (14%), and milk (13%) [1]

The import dependence that occurs undoubtedly has a significant impact on the economy. On the other hand, Indonesia is an agrarian country that is economically dependent on the agricultural sector. In addition, Indonesia is also one of the megadiverse countries with the richest biodiversity in the world. However, various natural and human potentials are still not optimal for food availability in Indonesia.

According to The State of Food Security and Nutrition In The World, the alarming facts of the condition of Indonesian people related to food are: First, in 2022, out of the total population of Indonesia, around 16.2 million people experienced hunger, as many as 5.9%[2]. Ironically, in 2022, Indonesia ranked second among countries with the highest percentage of hunger in Southeast Asia [3]. Second, there is a regional gap related to malnutrition. According to the Ministry of Health, in 2022, the prevalence of stunting in Indonesia reached 21.6%, a figure that exceeds the threshold set by the World Health Organization's standard of 20%, indicating that stunting in Indonesia is still classified as chronic. Third, according to the National Food Agency (NFA), in 2022, out of 416 regencies and 98 cities in Indonesia, 74 of them, or 14.43%, fell into priority categories 1-3 or conditions vulnerable to food insecurity [4].

Based on the challenges raised above, Indonesia's food crisis requires innovation and improvements. In accordance with the Sustainable Development Goals (SDGs) on Goal 2 (End hunger, achieve food security and improved nutrition, and promote sustainable agriculture) and Goal 12 (Ensure sustainable consumption and production patterns), the Author proposes a solution to this problem by focussing on the transformation of agriculture and food through food collectivism.

This study examines the concept of food collectivism through the lens of food security in order to attain food sovereignty, independence, and safety in Indonesia. This article also describes the appropriate parameters for achieving food-smart cities, which will be divided into several components: smart environment, smart living, smart citizen, and smart government in utilising their natural resources. Thus, the goal of this research is to propose a solution to Indonesia's food problem through agricultural transformation, with the goal of reducing Indonesia's reliance on imports and achieving people's welfare. Based on this background, the problem identified as a limitation of the Author's difficulties is: 1) What is the concept of food collectivism and its parameters? 2) How does agricultural transformation through food collectivism take place in Indonesia's food-smart cities?.

8. Method

The method used in this research is descriptive research, which focuses on solving actual problems. This research employs library studies to collect data through laws, books, journal articles, reports, research, and expert opinions. Then, all the data was collected and analyzed through descriptive exposition.

9. Results and Discussion

3.1 The Concept of Food Collectivism and its Parameters

Indonesia's Food Law Number 18 of 2012 addresses three food issues: sovereignty, independence, and security. This establishes Indonesia's Food Law as a new identity or framework for the development of Indonesia's agriculture and food sector. Nonetheless, there is no clear definition or comprehension of the ideas of food sovereignty, food independence, and food security. In this paper, the author reimagines food sovereignty, independence, and security as a single whole, combining food safety via food collectivism. However, it should be noted that there are no standard metrics for measuring food sovereignty, food independence, food safety, and food security, nor is there a clear statement on how to divide the four into cohesive and methodical stages. The author attempts to reconstruct these four features by including them into the concept of food collectivism using the following systematics or stages:

a. Food Sovereignty

According to the International Planning Committee (IPC), food sovereignty is built on four pillars: 1) the right to food, 2) access to productive resources, 3) integrating ecologically friendly agriculture (agroecological production), and 4) local commerce and markets. Food sovereignty cannot be achieved if the country is not self-sufficient in food procurement and continues to rely on foreign food cultures. Food sovereignty means control over food production, distribution, and consumption, making it appropriate for usage in Indonesia, since agriculture accounts for the majority of the land. Globally, it is recognised that food sovereignty is every nation's right to retain and expand its capacity to provide essential food while preserving its cultural variety and production systems [5].

Although the primary focus of this food collectivism is the smallest scale of society, mainly households, it is evident that the fundamental concept of food sovereignty also intends to benefit small farmers. The food sovereignty concept emphasises the idea that farmers can cultivate their crop kinds in their own way, using the local understanding of their location. Thus, food sovereignty fully supports family-based farming practices. Individual food demands can be satisfied in the context of food sovereignty, allowing trade to occur. Then, upon closer inspection, food sovereignty represents a breakthrough in developing comprehensive food policy to promote justice and sustainability based on interdependence and environmental respect [6].

b. Food Independence

The characteristics of achieving food independence are: 1) increased domestic food production based on local resources, 2) improved land-man ratio through the establishment of permanent land (irrigated and dry), 3) enhanced food reserve management capabilities, 4) expanded

distribution network and food access for producers and consumers, and 5) improved government capacity for early detection and response to food and nutrition insecurity issues [7].

Food independence is an urgent must for national resilience. Self-sufficient food supply must be implemented from the seedling stage, growing, and harvesting, to post-harvest, production, and distribution depending on available local potential. As a result, food processing activities are used to promote food independence and provide a sufficient food supply in the community [8]. To achieve food independence, several steps must be taken: 1) encouraging the acceleration of local food diversification and development programs supported by research; 2) optimising unproductive lands; 3) developing sustainable innovations; and 4) facilitating synergy between stakeholders and MSMEs [9]. Independence is not intended to be construed as isolating oneself from international contacts, but rather as optimising domestic strengths and collaborating with other countries on the basis of fair cooperation. Food independence, also known as food self-sufficiency, refers to Indonesia's ability to meet domestic food needs while exporting domestic food products to improve the country's foreign exchange [10].

c. Food Safety

Food safety has become one of the most important aspects of food management. The food safety system connects with numerous and complex issues, including monitoring and control, risk analysis, and regulation. It is closely related to several scientific areas, including food technology, microbiology, chemistry, toxicology, production management, and so on. To attain food security, efforts must be made at all levels, from community education to government policy. Several factors must be considered when preserving food safety, including: 1) the preservation of important ingredients or raw materials, 2) the storage of food raw materials, 3) the processing of food ingredients, and 4) serving.

On the other hand, the evolution of globalisation in the food business, which has turned towards the globalisation of food supply chains and industry, has ramifications for food security, which has emerged as a primary demand in food product export activities. These stringent standards have hampered Indonesia's ability to penetrate the worldwide market [11]. As a result, improving food product quality is critical for meeting export market demands. Thus, food security considers not just individual conditions but also national ones, particularly those affecting the country's economy.

d. Food Security

Food and nutrient consumption are the most important markers of food security. Food security consists of three major components: food availability, food accessibility, and food utilisation. The components of food availability, distribution, and consumption contribute to food security. Adequate food availability is achieved through domestic food production and trade; the stability of food availability and access at the macro, meso, and micro levels; the sufficiency of quality as evidenced by food diversity and safety; and the quantity of food consumed, all of which are supported by infrastructure improvements.

Policymakers must carefully and accurately restrict food imports, beginning with local production, food stocks, and regional and national food consumption needs. This suggests that food imports should be used as a last resort. In the case of Indonesia, which is considered to be in an import emergency, Indonesian food should not rely on imported commodities, as practically all imported food may be produced domestically [11].

The argument over the differences between food security and food sovereignty is unavoidable. There are only a few minor but significant distinctions between the two notions. Glopolis [5] distinguishes between food security and food sovereignty by stating that food security is concerned with the aim (setting the goal), whereas food sovereignty is concerned with the methods to attain it. Food security, on the other hand, addresses the state of food access, whereas food sovereignty discusses the lack of access to food and land tenure rights [12]. When considering these two notions,

there are differing perspectives; some see food security and food sovereignty as diametrically opposed, while others see them as coexisting. The author feels that these two concepts work in tandem, with food sovereignty serving as a supplement to, rather than a replacement for food security.

The concept of food collectivism parameters is one of the recommendations that can potentially be used in the food smart city system. Prioritising local potential and mastering technology can help Indonesia realise this goal. As a result, we can ensure an increase in food quality and quantity. Several relevant collectivism parameters for implementing food collectivism as the cornerstone of food smart cities in Indonesia include:

First, this food collectivism is centred on households, which are the smallest units of a nation or community. Efforts to attain food welfare at the lowest level of government, meaning households in every village or urban area, can be repeated on a regular basis to guarantee the community's food rights are enforced. Households play an important role in determining the success indicators of food collectivism. Because there is an imbalance or uneven distribution of food at the household level, such as the issue of long distances for households to obtain food and the problem of households' low income, food insecurity will undoubtedly increase due to the limitations in purchasing nutritious and safe food for consumption.

Second, food availability. Efforts to implement suitable food collectivism must be balanced against the state's ability to provide adequate staple food for all citizens. They must also address food distribution, particularly for homes, in order to avoid imbalances. Food availability becomes a critical factor in achieving food security. The Food Availability Approach (FAA), which focusses on food security through food provision, claims that achieving food security necessitates meeting its indications, specifically providing a sufficient food supply. The government must reform the agricultural sector, as 87.59% of farmer households continue to utilise conventional farming methods [13].

As a result, there is a need for technological advancements in agriculture. Farmers frequently ascribe their losses to weather-related variables, especially when discussing typical difficulties such as unpredictable weather resulting in low agricultural harvests. Furthermore, as Indonesia's population grows, the supply of agricultural land becomes more limited. As a result, we require technology as an alternative to ensure food availability and improve the architecture of the food supply chain for efficient distribution.

Third, food affordability is a metric for achieving food sovereignty. In addition, prices or access is an essential factor, just like food availability. Despite the abundance of food, the neighbourhood frequently faces access barriers. Food affordability refers to the ease with which households can get food at consistent costs, making it available to all parts of the population. Some measures that must be taken to realise food collectivism through food affordability include adjustments in the average cost of food or the development of new food aid policies for the part of the population living below the global poverty line. Communities battling malnutrition or hunger owing to budgetary constraints or those with low incomes must make food more accessible.

Furthermore, for every household to have access to affordable food, the government must ensure food distribution while maintaining high safety, quality, and nutrition standards. The author's proposed food collectivism covers food supply and distribution within the community. The large population and area add to the difficulty of getting food rights. Regional food surpluses are common, but rural villages with limited access to food supplies are unable to get them due to difficult geographical conditions.

One indicator of a country's food sovereignty is its capacity to supply the fundamental human need for food through food affordability. Furthermore, the government is accountable for maintaining food affordability in the community. We must pursue this by providing food assistance proportionate to the low-income population, distributing, marketing, or trading foodstuffs, and ensuring that the entire community has access to food in their particular regions.

Fourth, quality and safety are essential to achieving food independence in Indonesia. Quality and safety are important parameters in fulfilling food collectivism, considering that food quality and safety are

crucial stages in food fulfillment. Because food availability is not only about the availability of food itself but also about the quality of human life. Good food is high quality and safe for consumption in conditions far from endangering human health. Additionally, high-quality, safe, healthy, and nutritious food is essential for the growth, maintenance, and improvement of health levels and the enhancement of community intelligence.

Fifth, sustainability and adaptation are vital for achieving food independence, allowing individuals and households to creatively utilize agricultural products. Sustainable food collectivism ensures food sovereignty and security without compromising future conditions. Adaptation addresses climate change impacts, as global warming poses significant challenges. Both concepts are crucial for meeting increasing food demands driven by population growth. Additionally, sustainable agriculture that aligns with local conditions strengthens the economy and community welfare. Government intervention is essential to promote sustainable practices and ensure food stability in Indonesia, including financial assistance for farmers to develop eco-friendly technologies and improve training.

3.2 The Concept of Agricultural Transformation Through Food Collectivism to Realize Food Smart Cities in Indonesia

The author recognizes that initiating agricultural transformation requires considerable time. However, optimistic thinking is essential in developing such initiatives, especially given the agricultural sector's strategic role in national development. Transformative efforts through food collectivism will facilitate the emergence of food-smart cities. This shift will expand the paradigm, enabling not only rural communities but also urban areas to engage in agricultural activities by leveraging available land, knowledge, and technology.

The smart city concept faces challenges from population growth and urbanization, which reduce agricultural land for food production. This conversion can lead to increased poverty among urban residents as land ownership, agricultural income, and jobs in the sector change [14]. This situation triggers food insecurity, a complex issue that requires thorough analysis. Addressing food insecurity is essential for food collectivism. In urban areas, lower-middle-income households often lack access to safe, adequate food, while some well-resourced populations experience overnutrition. Thus, food collectivism aims to engage all societal segments at national and regional levels in both urban and rural contexts.

Urban farming, also known as urban agriculture, has emerged as a crucial component of urban food supply and a strategy to enhance food affordability. Developing agricultural areas in urban residential zones brings residents closer to food sources and improves access to food supplies. The design of residential and agricultural areas is also necessary to accommodate a variety of food commodities. Food diversity can also enhance the population's knowledge, making them more interested in consuming those ingredients.

Food-smart cities are cities that can balance food production with the food needs of their residents. Additionally, food-smart cities are also capable of addressing issues related to food quality and environmental issues related to the level of food production within the city. Food smart cities also offer various alternatives and sustainable efforts to produce, distribute, and consume food as a response to the problems of urbanization, accompanied by an increasing population and a decreasing rural population [15].

If we look at the definition of a Smart City, this term generally refers to technology and urban areas [16]. However, without a specific framework, the concept of a smart city extends beyond information and communication technology to include society and community needs [17]. Food-smart cities are ideal for innovating urban food policy. By integrating smart technologies, these cities can enhance the food supply chain, including production, distribution, logistics, and waste management. Their goal is to improve efficiency and productivity in the food system through information and communication technology, focusing on communication, information exchange, transactions, and knowledge transfer. As a result, they

emphasize the use of technology in the agricultural and food systems sectors [18]. In simple terms, food-smart cities can solve the food system's problems.

Definitively, food-smart cities can be defined as urban areas that emphasize a digitalized and democratized agricultural and food system [19]. Smart technology plays a crucial role in implementing smart cities, enabling humans to carry out their daily activities with greater ease and effectiveness. The use of technology in this concept not only optimizes the distribution process and supply chain but also ensures that the food system becomes more efficient and reliable through the use of advanced and intelligent technologies such as artificial intelligence (AI), the Internet of Things (IoT), and data analytics to help cities monitor and manage the production, transportation, and storage of food. Some indicators or supporting factors in realizing food-smart cities are as follows:

a. Smart Environment

A smart environment is part of a smart city, which involves the development of good, responsible, and sustainable environmental governance. City development should ideally be based on "building with nature," which can provide comfort, resource sustainability, and beauty both physically and non-physically for the public. There are three indicators of a smart environment: 1) environmental management grounded in science and technology, 2) technology-based natural resource management, and 3) the development of new energy sources [20].

Sustainable waste and waste management are key indicators of a smart environment. Implementing a smart environment relies on effective natural resource management and technology to address challenges. Indicators of a smart environment include smart buildings, resource management, and sustainable urban planning [21]. Urban areas frequently encounter the challenge of limited land for both housing and agriculture. Optimizing the use of remaining land for urban farming has become a priority. This approach not only enhances the aesthetic value of urban areas but also aims to provide green open spaces and improve access to food supplies at the household level.

b. Smart Living

Smart living, a dimension of Smart City, ensures the viability of people's living standards by harmonizing environmental governance, facilities and services, transportation and logistics development, as well as the comfort and safety of urban areas. Smart living in the food context manifests as creating a comfortable and harmonious environment that unites residential and agricultural areas (urban farming). Additionally, smart living focuses on ensuring access to healthy food and beverages and food services. Smart living also aims to improve community accessibility to food, facilitating mobility between individuals, the public, and food while fulfilling food logistics in a given area.

c. Smart Citizen

A smart citizen is a step towards centralizing human resources, which is crucial in determining 'intelligence' in an urban area. Participation from the community is crucial in utilizing technology to support all community activities, including information, transportation, trade, food, communication, and daily activities in the development of food-smart cities. Smart citizens play a crucial role in educating themselves to become proactive and productive individuals who consciously contribute to the progress of a modern and progressive city. Therefore, the key indicator of a smart citizen is their level of education. There are three benefits of involving the community, especially the general public: Community involvement in environment-based policies enhances democracy; 2) The public gains a more profound comprehension of ethical issues in a particular scenario; and 3) Involving the affected community often leads to a mutual agreement [22].

d. Smart Government

Smart government (or, in some sources, it is referred to as smart governance) is the extensive use of technology by the government to perform governance tasks. On the other hand, smart

government refers to the intelligent transformation efforts undertaken by the government with the involvement of community participation, information transparency, and service improvement. Several factors drive the development of smart government, including 1) the existence of laws and regulations that serve as the legal basis for government actions; 2) the availability of human resources and infrastructure resources; 3) the availability of supporting infrastructure; 4) comprehensive socialization and assistance at the bureaucratic and community levels; 5) collaborative governance that also involves the private sector and the community; and 6) the suitability of services and the precision of infrastructure for the community [23].

Community involvement, a form of democracy where the community participates in the government's policy-making process for the development of its society, closely aligns with smart government [24]. In the food context, the government should encourage formulating food policies using a bottom-up approach, ensuring community participation in the implementation process. In this case, the government should consider the community's perspective when formulating policies.

The transformation of agriculture in Indonesia relies on the integration of innovation and technology accessible to all societal layers. This evolution aims to create food-smart cities within the framework of food governance. Food organization is designed to satisfy basic human needs, ensuring equitable and sustainable benefits through principles of food collectivism, including food sovereignty, independence, safety, and security. Ultimately, this organization targets communities and individuals, promoting healthier, more active, and productive lives while prioritizing the agricultural sector. The goal is to achieve the availability, affordability, and fulfillment of diverse, balanced, and safe food consumption at both national and regional levels.

10. Conclusion

Food collectivism is a multisectoral approach to transform agriculture in Indonesia, focusing on food sovereignty, independence, safety, and security. It uses five indicators: food targets, availability, affordability, quality, and sustainability. The goal is to transform agriculture into a strategic sector, preventing food crises and import emergencies. Implementing food collectivism will lead to smart cities, addressing food supply issues and resolving food production, distribution, and consumption problems.

11. Conflict of Interest

The authors state that there is no conflict of interest related to the writing or publication of this article.

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13. References

- [1] Maruf M. Indonesia Negara Darurat Impor Pangan! *CNBC Indonesia*, <https://www.cnbcindonesia.com/research/20230704185303-128-451320/indonesia-negara-darurat-impor-pangan> (2023, accessed 18 October 2024).
- [2] Ahdiyat A. Angka Kelaparan Indonesia Masih Tergolong Tinggi di ASEAN. *Databoks*, <https://databoks.katadata.co.id/datapublish/2023/08/03/angka-kelaparan-indonesia-masih-tergolong-tinggi-di-asean> (2023, accessed 18 October 2024).
- [3] Yonatan AZ. Indonesia Harus Mulai Berbenah Masalah Kelaparan. *Goodstats*, <https://goodstats.id/article/indonesia-kudu-mulai-berbenah-masalah-kelaparan->

F5uAJ#:~:text=Sayangnya%2C%20Indonesia%20berada%20di%20urutan,total%20populasi%20Indonesia%20mengalami%20kelaparan%20(2023, accessed 18 October 2024).

- [4] CNN Indonesia. 74 Kabupaten dan Kota di Indonesia Rentan Pangan. *CNNIndonesia*, <https://www.cnnindonesia.com/ekonomi/20230621123836-92-964691/74-kabupaten-dan-kota-di-indonesia-rentan-rawan-pangan> (2023, accessed 18 October 2024).
- [5] Syahyuti, Sunarsih, Wahyuni S, et al. Kedaulatan Pangan sebagai Basis untuk Mewujudkan Ketahanan Pangan Nasional. *Forum penelitian Agro Ekonomi* 2016; 33: 95.
- [6] Flora CB. Schanbacer, William D: The Politics of Food: The Global Conflict Between Food Security and Food Sovereignty. *J Agric Environ Ethics* 2011; 24: 545–547.
- [7] Elizabeth R. Strategi Pencapaian Diversifikasi dan Kemandirian Pangan: Antara Harapan dan Kenyataan. *Iptek Tanaman Pangan* 2011; 6: 230–242.
- [8] Rosadi AHY. KEBIJAKAN KEMANDIRIAN INDUSTRI PANGAN DALAM MEMPERKUAT EKONOMI NASIONAL. *Jurnal Teknologi Industri Pertanian* 2023; 33: 20.
- [9] KOMINFO RI. Wapres Tegaskan Empat Langkah Wujudkan Kemandirian Pangan. *KOMINFO RI*, <https://www.kominfo.go.id/content/detail/45183/wapres-tegaskan-empat-langkah-wujudkan-kemandirian-pangan/0/berita> (2022, accessed 18 October 2024).
- [10] Hakim L, Irawan IA. STRATEGI MEMBANGUN KEMANDIRIAN PANGAN NASIONAL DENGAN MEMINIMALISIR IMPOR UNTUK KESEJAHTERAAN RAKYAT. *INDIKATOR: Jurnal Ilmiah Manajemen & Bisnis* 2019; 3: 219–2222.
- [11] Lestari TRP. Keamanan Pangan Sebagai Salah Satu Upaya Perlindungan Hak Masyarakat Sebagai Konsumen. *Aspirasi: Jurnal Masalah-masalah Sosial* 2020; 11: 57–72.
- [12] Clapp J. Food security and food sovereignty. *Dialogues Hum Geogr* 2014; 4: 206–211.
- [13] Probotrianto AF. Mengatasi Krisis Regenerasi di Sektor Pertanian Indonesia. *CNBC Indonesia*, <https://www.cnbcindonesia.com/opini/20230704141012-14-451144/mengatasi-krisis-regenerasi-di-sektor-pertanian-indonesia> (2023, accessed 18 October 2024).
- [14] Hartari A. Smart City Mandiri Pangan. In: *Optimalisasi Peran Sains dan Teknologi untuk Mewujudkan Smart City*. Tangerang Selatan: UniversitasTerbuka, 2017, pp. 295–314.
- [15] Rikolto. Food Smart City, Indonesia. *Rikolto Indonesia*, <https://indonesia.rikolto.org/en/project/food-smart-cities-indonesia> (2023, accessed 18 October 2024).
- [16] Yigitcanlar T, Kamruzzaman Md, Buys L, et al. Understanding ‘smart cities’: Intertwining development drivers with desired outcomes in a multidimensional framework. *Cities* 2018; 81: 145–160.
- [17] Albino V, Berardi U, Dangelico RM. Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology* 2015; 22: 3–21.
- [18] de Amorim WS, Borchardt Deggau A, do Livramento Gonçalves G, et al. Urban challenges and opportunities to promote sustainable food security through smart cities and the 4th industrial revolution. *Land use policy* 2019; 87: 104065.
- [19] Dela Cruz I, Thornton A, Haase D. Smart Food Cities on the Menu? Integrating Urban Food Systems into Smart City Policy Making. *Springer International Publishing* 2020; 71–84.
- [20] Sari DN. Penerapan smart environment pada Pemukiman Kumuh di Bantaran Kali Code Kota Yogyakarta. *GOVERNMENT : Jurnal Ilmu Pemerintahan* 2020; 34–42.

- [21] Rizky Gunawan, Fitri Kurnianingsih, Ramadhani Setiawan. Penerapan Konsep Smart Environment Melalui Program Kampung Iklim Menuju Tanjungpinang Smart City (Studi kasus Kelurahan Tanjung Unggat Kecamatan Bukit Bestari). *JURNAL HUKUM, POLITIK DAN ILMU SOSIAL* 2023; 2: 303–320.
- [22] Sovacool BK. What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda. *Energy Res Soc Sci* 2014; 1: 1–29.
- [23] Soraya D, Subiyakto R, Setiawan R. ANALISIS PERKEMBANGAN SMART GOVERNMENT DALAM PEMANFAATAN TEKNOLOGI DIGITAL PADA ERA REVOLUSI INDUSTRI 4.0 DI KOTA TANJUNGPINANG (STUDI KASUS DISKOMINFO). *JANE - Jurnal Administrasi Negara* 2023; 15: 1.
- [24] Mellouli S, Luna-Reyes LF, Zhang J. Smart government, citizen participation and open data. *Information Polity* 2014; 19: 1–4.