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Article

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OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

Connectivity, sport events, and tourism development of Mandalika's special economic zone: A perspective from big data cognitive analytics

Rezzy Eko Caraka^{1,2*}, Irwanda Wisnu Wardhana³, Yunho Kim^{2*}, Anjar Dimara Sakti⁴,
Prana Ugiana Gio⁵, Maengseok Noh⁶ and Bens Pardamean^{7,8}

Abstract: This study examines the interplay of air connectivity, sports events, infrastructures, and fiscal support during the period 2017 and 2022 in a designated area called Special Economic Zone in Mandalika, Lombok Island, West Nusa Tenggara to boost tourism development in Indonesia by utilizing big data cognitive analytics. We examine the tourism development impacted by the MotoGP event in 2022 and air connectivity. Further, this paper discusses the network connectivity of flights at Zainuddin Abdul Majid International Airport during the COVID-19 Pandemic and the new normal. We found that the combination of an international airport, globally recognized sports events, and government support has directly and positively improved the tourism industry's performance in the country and especially within Lombok Island. We suggest policy recommendations to support economic activities in Mandalika's Special Economic Zone and its hinterland to maintain business sustainability and utilize the existing infrastructures at the optimum level. Lessons learned from the Indonesian experience could help other developing countries that are devising policies and strategies to develop the tourism industry by employing proper instruments such as infrastructure, events, and fiscal policies.



Rezzy Eko Caraka

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Subjects: Business; Computation; Economics; Mathematics & Statistics for Engineers; Transport Industries

Keywords: Lombok; cognitive analytics; big data; special economic zone; MotoGP; airport; connectivity; fiscal policy

1. Introduction

COVID-19 Pandemic that happened was like a snowball effect that had many impacts on all areas of the Sustainable Development Goals (De Lara-Tuprio et al., 2022; Sharma et al., 2021; Shulla et al., 2021; Shupler et al., 2021). Every part of the collaborative economy and business around the globe is negatively impacted, especially in Indonesia. Then the threat of recession and even depression was felt by Indonesia (Caraka, Kurniawan et al., 2021; Caraka et al., 2020; Pramana et al., 2021; Susilawati et al., 2020). This situation creates an entrepreneurial government policy to cope with economic difficulties by utilizing available instruments. This paper examines the interplay of air connectivity, sport events, infrastructures, and fiscal supports during the period 2017 and 2022 in a designated area called Special Economic Zone in Mandalika to boost tourism development in Indonesia by utilizing big data cognitive analytics.

According to the Central Statistics Agency, in the two-quarters of 2021, Indonesia's economic growth contracted to 5.32%. Conditions during COVID-19 Pandemic made investors hesitant to start investing, therefore, economic growth has slowed. The pandemic conditions that require restrictions on mobility and activities also encourage budget reallocations and budget refocusing in addition to being based on income pressures that are not following previous projections (Djalante, Lassa et al., 2020; Nurlaila et al., 2021; Olivia et al., 2020). This also creates uncertainty and causes many people and entrepreneurs to hesitate to start investing.

There are doubts whether the investments made are in accordance with the conditions and needs of the community (Djalante et al., ((2020, 2020, 2020, 2012). Indonesia has promising potential in the tourism sector, which involves elements of tourism (Florida-Benítez, 2021, 2022a, 2022b; Nurjaya et al., 2021; Pahrudin et al., 2021a, 2021b; Purnomo et al., 2021; Wulung et al., 2021), entertainment (Mansur et al., 2021), arts and culture (Carboni et al., 2014; Din, 1989; Jenkins & Romanos, 2014), local transportation (Gayialis et al., 2022; RM & Adnyana, 2016), and culinary, which also declined during COVID-19 local-based potential and regional income decreased, and many MSME businesses ultimately lost (Badoc-Gonzales et al., 2021; Belitski et al., 2021; Caraka, Kurniawan et al., 2021; Hendijani, 2016; Tambunan, 2021)

At the same time, COVID-19 Pandemic has also changed the paradigm of society in using ICT for access to information, and several studies explain that business patterns are also different in unusual models (Al-Ansi et al., 2021; Anandhita, 2020; Anggoro et al., 2022; Arendt, 2008; Barba-Sánchez et al., 2007; S. Yang et al., 2020). Information and communication technology is a bridge for all parties to continue to survive in various conditions. Adaptation and implementation of information and communication technology in the economic sector are inevitable. The application of Information and Communication Technology is not only monopolized by certain circles or high-class entrepreneurs but has become a need for all circles today. However, it becomes an obstacle for business people who cannot adapt and implement information and communication technology in their business. Technical barriers and other things are a challenge for every business person at every level to stay afloat in a pandemic condition. The local and central Governments need to be aware of the actual conditions in the community (Cabrera-Flores et al., 2020; Calzada, 2020; Purnomo et al., 2021; Sjögren Forss et al., 2021).

The tourism sector is one of the essential contributors to the country's foreign exchange earnings. It can become a trigger for the national economy through increasing national productivity, high labor absorption, and equitable distribution of people's income. With these various essential roles, the tourism

industry has become one of the focuses of the Government's post-pandemic recovery through various policies on a local to national scale (Sparrow et al., 2020; Susanto et al., 2020; Toharudin et al., 2021).

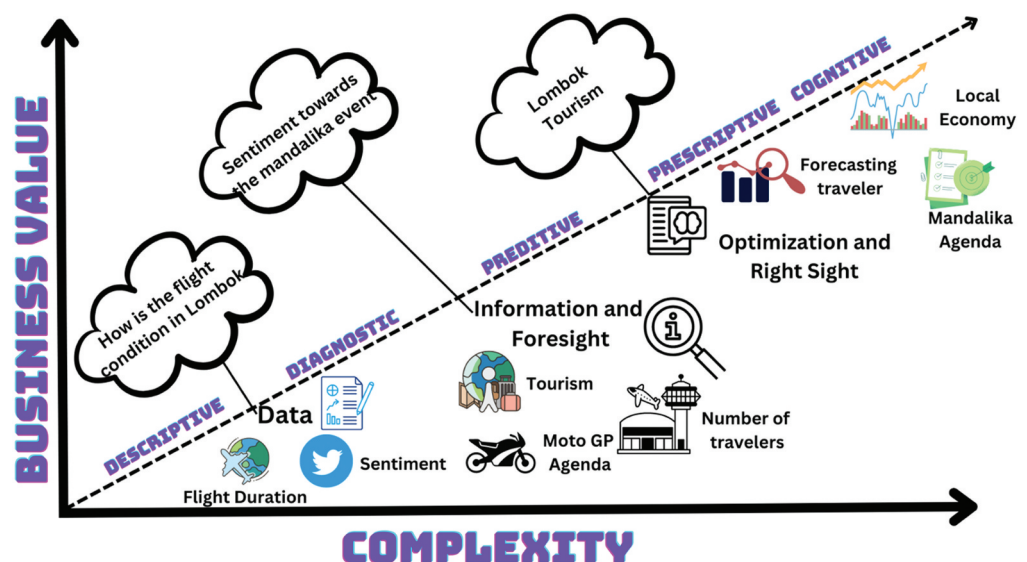
One of the tourism sectors currently being developed by the Government is Wellness Tourism. The shift in public behavior after the pandemic, which focuses on health, hygiene, safety, and security, is why Wellness Tourism is currently being loved and attract tourist intention (Caraka et al., 2022; Florido-Benítez, 2021; Higgins-Desbiolles, 2020; Jenkins & Romanos, 2014; Richards, 2018; C. L. Yang & Nair, 2014). With high public interest, the potential for Wellness Tourism in the global economy has been recorded to have increased from USD 4.2 trillion in 2017 to 4.5 trillion in 2019. Wellness Tourism is also projected to experience significant growth in 2022 to USD 919.4 billion with a growth rate of 7.5% per year and covering 18% of total global tourism. In this research we are employing cognitive analytics which involves three analyses: sentiment, (Hassan et al., 2021; Hudaefi et al., 2021; Li et al., 2017; Proellochs & Feuerriegel, 2021; Zhang et al., 2021), time series forecasting (Siagian et al., 2014; Suhartono, 2011; Suhartono & Subanar, 2009), and spatial network analysis (Okabe et al., 2006; Yao et al., 2022) as illustrated in Figure 1. Cognitive analytics is a process of data science which is performed by machine learning and also combined with expert systems to enrich the information needed for decision making, in particular towards the sustainable development goals (Nasution & Kurniawan, 2018; Nasution et al., 2020; Opoku, 2016; Sakti et al., 2021, 2023; Syahid et al., 2020). We further explain the methods and dataset in the Section materials and methods.

2. Materials and methods

2.1. Study area

West Nusa Tenggara (NTB) Province consists of eight regencies and two cities consisting of West Lombok and East Lombok. However, the Central Lombok, North Lombok, Bima, Dompu, Sumbawa Besar, West Sumbawa and two other cities, namely Mataram City and Bima City. In every district and city in the province of NTB, there are potential natural and human resources in every sub-district, including sub-districts in North Lombok Regency. West Nusa Tenggara lies between $8^{\circ}10' - 9^{\circ}5'$ south latitude and between $115^{\circ}46' - 119^{\circ}05'$ east longitude as shown in Figure 2. Also, NTB is known for its wide range of strategic commodities and potential for business sectors, including livestock, agriculture, fisheries, plantations, forestry, tourism, mining, and renewable energy. From the perspective of tourism, NTB is a leading province in Indonesia in the field of

Figure 1. Conceptual of this research. We addressing three type of analysis of time series analysis, network analysis, and sentiment analysis.



tourism by highlighting aspects of the scenery of the seaside, a group of small islands around the Lombok and Sumbawa coastlines.

2.2. Data utilized

The data used in this study consists of data on departures between domestic and international at Zainuddin Abdul Majid International Airport (Lombok International Airport) from 2017 to 2022. Then, we searched for sentiment data twitter with “#Mandalika” and “#VisitIndonesia” from 1 March 2022, to 1 September 2022, considering that during that period, moto-gp activities and local and international media published much news in the mass media about the phenomena that occurred during these events.

2.3. Cognitive analytics

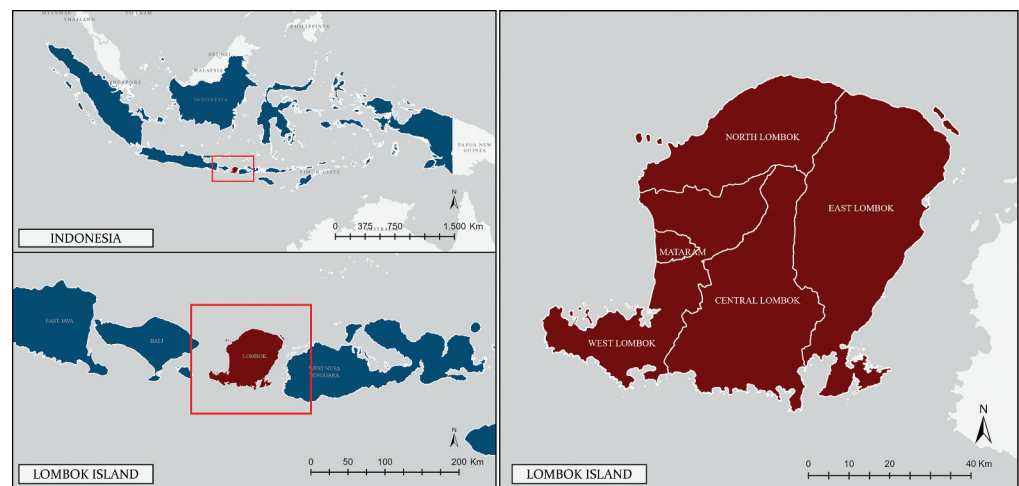
The rapid development of competitiveness data has transformed into artificial intelligence technology based on big data, which can be utilized for monitoring the achievements of the Sustainable Development Goals (SDGs) and their implications for transformational change. The sophistication of Big Data can accommodate data collection quickly and allows for covering extensive datasets with very diverse variables. The presence of cognitive analytics approaches can help analyze big data and artificial intelligence to produce more solid reasoning with the assistance of expert systems. In this paper, we use time series analysis to forecast tourist arrivals at domestic and international arrivals. After that, we use text mining sentiment analysis to see the netizen’s opinion on moto-gp activities in Lombok. We then used network analysis to observe the flight duration in Lombok from 2017 to 2022.

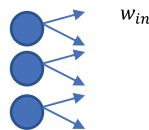
2.4. Time series analysis deep learning echo state network

Echo State Network (ESN) involves an architecture and learning principle based on Recurrent Neural Network (RNN). The principal idea is to drive a random, large, recurrent neural network, fixing the RNN with input signals so as to induce in each neuron in the network a “reservoir”. An important stage in creating ESN on time series is to normalize, each row of data will be input as a vector $u(n)$ which is an element of R^{N_u} . Then, the vector $u(n)$ is connected to the reservoir using the weight W described in equation 1.

$$u(n) = \begin{bmatrix} u_1(n) \\ u_2(n) \\ \vdots \\ u_k(n) \end{bmatrix} \quad (1)$$

Figure 2. Research location, Lombok West Nusa Tenggara, Indonesia.



$$u(n) = \begin{bmatrix} u_1(n) \\ u_2(n) \\ \vdots \\ u_k(n) \end{bmatrix}$$


After accomplishing the stages at the reservoir layer, it continues to calculate the output at the readout layer. We have a weight W that connects the reservoir layer and the readout and generates w_{out} and generates the output value $y(t)$.

$$y(n) = w^{out}[1; u(n); x(n)] \quad (2)$$

2.5. Network connectivity

On sets, we enforced locality by transforming every node in isolation graphs, giving us a broader context: a node's neighborhood (Serviansky et al., 2020) is commonly defined as Equation 3.

$$Neighborhood_i = j : (i, j) \in a, v(j, i) \in a \quad (3)$$

Equation 3 describes i as the origin airport and j as the destination airport and a as the departure duration. We can extract neighborhood features in Equation 4 like so:

$$X_{Neighbourhood_i} = x_j : j \in Neighbourhood_i \quad (4)$$

The network analysis is also the basis of graph theory. We can also be used for complex domains, including knowledge, text, and images, and have a rich relational structure, which can be represented as a relational graph. The distance measure, including the shortest path, can be described as a pair of nodes specified as the number of edges along the shortest path connecting the nodes. In directed graphs, the paths need to follow the direction with distance not symmetric $h_{B,C} \neq h_{C,B}$. The maximum shortest path distance between any pair of nodes in a graph can be measured by diameter in Equation 5.

$$h = \frac{1}{2E_{Max}} \sum_{i,j \neq i} h_{ij} \quad (5)$$

Then, we can construct a Clustering coefficient for undirected graphs with conditions $C_i \in [0, 1]$ and number of edges between the neighbors of nodes i can be measured by $C_i = \frac{2e_i}{k_i(1-k_i)}$. The clustering coefficient is undefined (or defined as 0) for nodes. We can measure the average clustering coefficient in Equation 6.

$$C = \frac{1}{N} \sum_i C_i \quad (6)$$

The advantage of this network analysis is we will observe the flight conditions for the last 5 years including domestic and international gates in Lombok, West Nusa Tenggara.

2.6. Sentiment analysis

Qualitative research has its limitations in exploring the available information. However, text mining is also a considerable solution for knowledge management and reasoning (Justicia et al., 2018; Lee et al., 2010). As cognition implies, text mining is the process of discovering new information that has not been previously autonomously discovered by computers. In order to develop new facts or hypotheses that more conventional experimental approaches can test, the retrieved information must be related to one another. Currently, text mining is essential for both visualizing or evaluating knowledge from extensive sets of text files and is becoming increasingly popular. As an outcome of text mining, we can extract high-quality information by looking at patterns and trends very

intently, especially in researching statistical studies. This is usually the best way; for example, word weighting can be used in text mining to give meaning to phrases present in documents if the terms are given more or fewer significance (Hudaefi et al., 2021; Oza & Naik, 2016). A text mining approach called document clustering groups similar documents into a single group (Justicia et al., 2018). As a result of its ability to summarize very large data collections, document clustering is one of the most commonly used tasks in data mining, information retrieval, knowledge discovery, pattern recognition, and so on. As a result of document clustering, it is possible to find the corresponding documents in a huge document repository. To analyze the sentiment, we use latent Dirichlet allocation, which represents in Equation 7.

$$\epsilon(u, v) = \epsilon^0(u, v) \int_E u N v d$$

Where $(\epsilon^0, D(\epsilon^0))$ is a sectorial Dirichlet form on satisfying strong sector condition on $L^2(E, \mu)$ that is dominated by ϵ on a subspace of the diagonal of $D(\epsilon^0)$ and $(N, D(N))$ is a linear operator on $L^2(E, \mu)$.

3. Results

The results of using a cognitive analytics approach can explain the phenomenon in the Lombok Special Economic Zone. We look at the condition of flights in the last five years, and it is clear that COVID-19 has made several countries close tourist access; therefore, the duration of departures also decreased. We use the echo state network model and get the best model to forecast travelers at domestic and international gates.

The Indonesian government launched the Mandalika Tourism Special Economic Zone (SEZ) in Central Lombok, West Nusa Tenggara (NTB). Mandalika SEZ is a special economic zone for tourism with an area of 1,035 hectares. Mandalika SEZ's natural potential is Kuta Beach, Serenting Beach, Tanjung Aan, Kelieuw Beach, and Gerupuk Beach, which can be new destinations for foreign and domestic tourists.

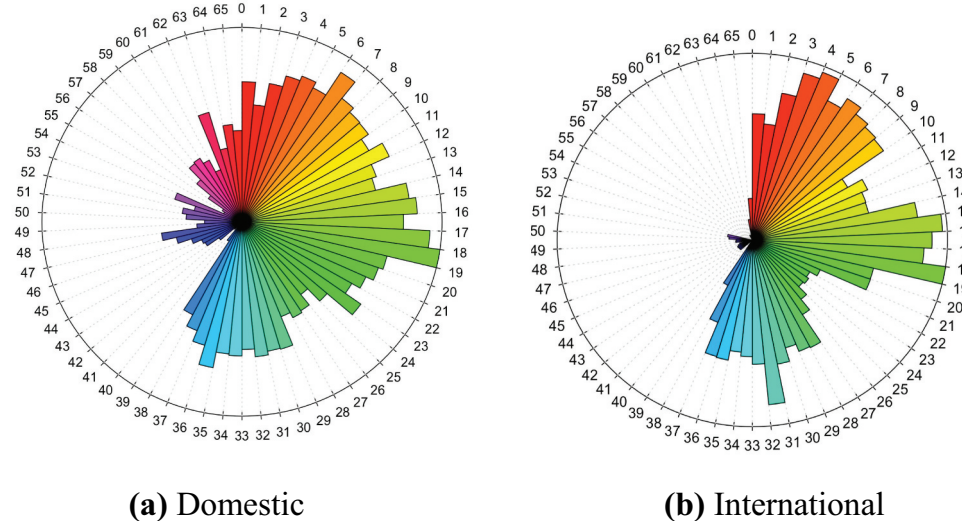
Between 2021 and 2022, Mandalika became one of Indonesia's most hyped-up destinations. The reason is the existence of an international standard circuit used for the prestigious MotoGP race event. The Mandalika International Street Circuit was built in the Mandalika Special Economic Zone in Kuta Village, Central Lombok, West Nusa Tenggara (NTB), with over 130 hectares. The characteristics of tourism in the Lombok area are shaped by the historical, cultural and traditional heritage that takes place in traditional villages. The visitor not only gets an adventurous experience during the tour but also new cultural values from the local community.

3.1. Time series analysis

Figure 3 shows the number of departures between domestic and international at Zainuddin Abdul Madjid International Airport (Lombok International Airport). However, Figure 3a explains that domestic departure conditions during the pandemic have drastically decreased, and Figure 3b explains that during COVID-19, the lockdown policy made by the Indonesian Government made during May 2021 to January 2022, the Lombok immigration gate was closed. So there is no flight activity at the airport. Domestic flights since May 2020 have decreased from 20,801 departures to 575 departures. Since the implementation of the vaccine and booster program, the Government has implemented a new policy so that people can visit the area when they have completed the second dose of the vaccine. The changing trend during the COVID-19 pandemic is the number of workers who work from Bali and Lombok.

This trend emerged recently amid a feeling of saturation that began to peak, and many office workers took the initiative to shift their respective work locations from home to hotels. Then driven by more competitive hotel prices, many workers are looking for tourist destinations as a place to

Figure 3. Time Series Plot of Departure at Zainuddin Abdul Madjid International Airport, Lombok, Indonesia. We use R Posit software (<https://posit.co>) and use R package plotly (<https://plot.ly/r/polar-chart/>) to generate polar time series plot.

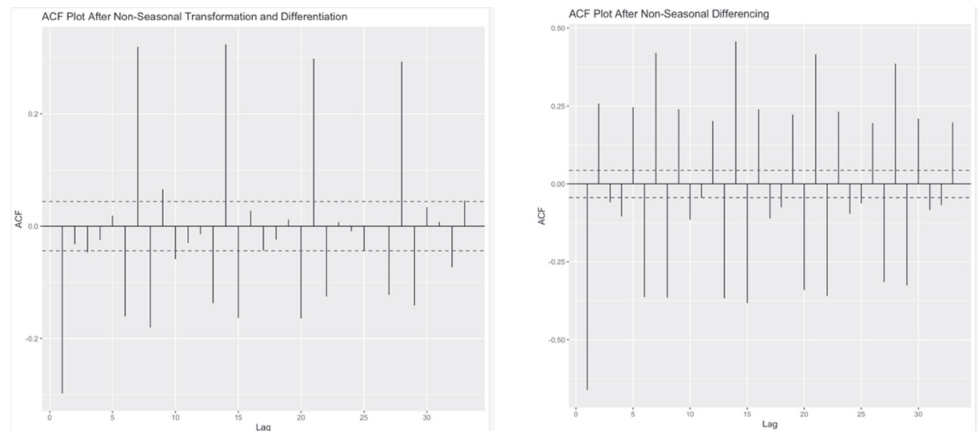


work and vacation simultaneously. The goal is that work can be completed and quality time with family lost during the pandemic can be enjoyed again. On that basis, wrapped with the spirit of encouraging the country's tourism industry, the 'Work From Bali' and 'Work From Lombok' campaigns were started. This activity has become a trendsetter for urbanites who want to work and can travel to one of the world's best destinations. In addition to working in a new, calm atmosphere, working from Bali and Lombok can be a momentum for workers to refresh and unwind from the hustle and bustle of the capital city. Meanwhile, the Work From Bali and Work from Lombok programs that have been running and have had a positive impact on the tourism sector, hotel management or accommodation providers welcome them by providing a variety of attractive offers.

Data on the number of passenger arrivals in Lombok Airport in the new era shows that the average arrival of passengers at domestic gates is 2789.6 passengers, where the minimum arrival is 1953 passengers and the maximum arrival is 3405 passengers. At the same time, the average arrival of passengers at international gates was 93.7. Also, the minimum arrival of passengers was 0, and the maximum arrival was 178. During this period, data were divided into three categories based on COVID status: before COVID, during COVID, and New Normal. Based on the plot above, the plot of data at an interval between 0 and 1200 is passenger arrival data before COVID, which shows that the data tends to be stationary and does not fluctuate too much. Then, the plot of data between 1200 and 1900 is the passenger arrival data during the COVID outbreak, where it is clear that the number of passenger arrivals experienced a very drastic decrease at the start of the COVID outbreak. This issue was also related to government policies limiting people's mobility. After experiencing a drastic decline, the data fluctuates (up and down) or is not stationary. Meanwhile, data plots at intervals > 1900 are passenger arrival data in the New Normal era, where it can be seen that the number of passenger arrivals has increased very drastically at the end of the pandemic and the beginning of the New Normal era, which related to people's mobility which has started to loosen up due to the end of the pandemic. In general, the data pattern for passenger arrivals at Lombok Airport at the domestic gate from 2017 to 2022 was not stationary and experienced significant fluctuations related to the occurrence of the COVID pandemic, which represents in Figure 4.

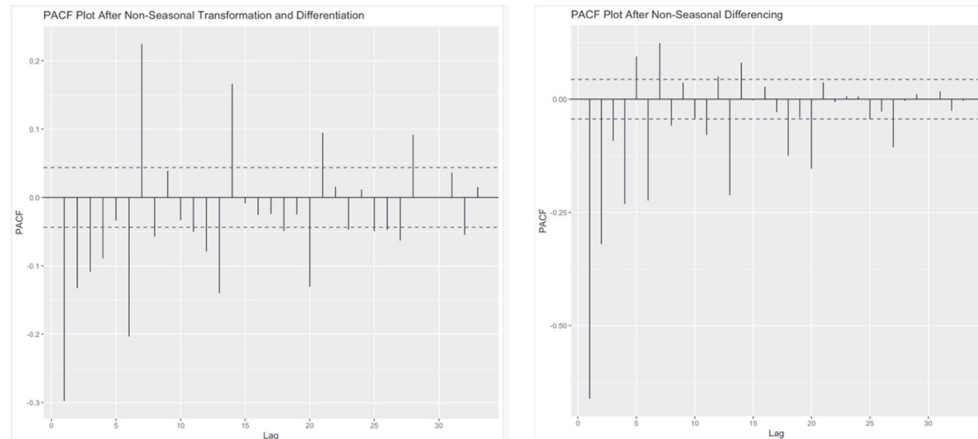
We perform the time series analysis using the ARIMA model and train the parameter using Echo State Networks (ESNs). Recurrent Neural Networks (RNN) is a condition of Artificial Neural Networks (ANN) architecture specifically designed to process sequential data. However, one of the

Figure 4. Time Series Plot of Autocorrelation Function and Partial Autocorrelation Function. We use R Package forecast (<https://cran.r-project.org/web/packages/forecast/index.html>), and tseries (<https://cran.r-project.org/web/packages/tseries/index.html>).



(a) Autocorrelation Function Domestic

(b) Autocorrelation Function International



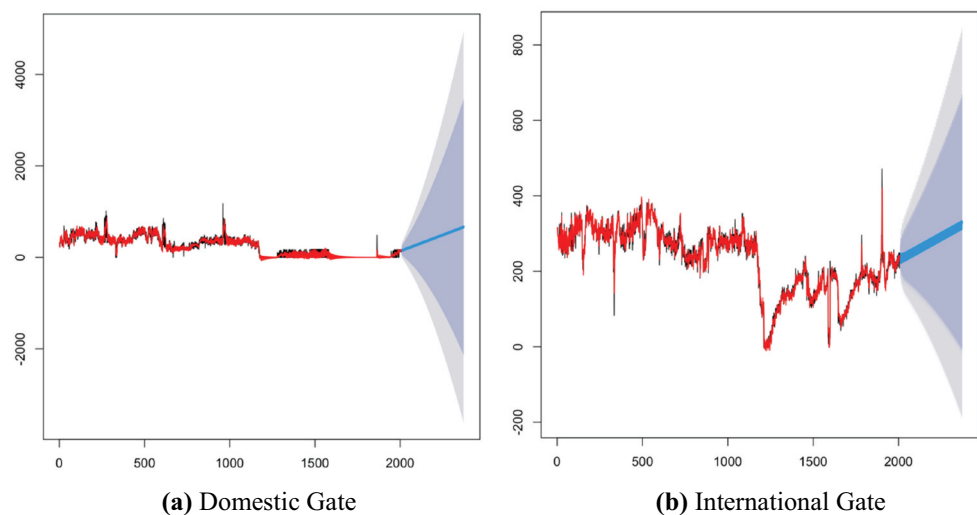
(c) Partial Autocorrelation Domestic

(d) Partial Autocorrelation International

weaknesses of RNN is that long-term learning with gradient descent can result in problems vanishing or an Explosion of gradients. Hence, the Echo state network approach is a reasonably powerful computational reservoir technique for sequential data (Mallya, 2021; Trierweiler Ribeiro et al., 2021). Then the results of forecasting passenger arrivals at Lombok airport at the domestic gate are obtained as $ARIMA(1, 1, 2)(2, 1, 1)^7$ with echo state network, which has a data forecasting pattern close to the actual data pattern of passenger arrivals at Lombok airport at the domestic gate which represents in Figure 5.

This model is suitable for predicting data on passenger arrivals at Lombok airport at the domestic gate for the next year, from July 2022 to June 2023. Our $ARIMA(1, 1, 2)(2, 1, 1)^7$ with echo state network model has parameters that are all statistically significant and a Root Mean Squared Error (RMSE) value of 18.65805. Also, the time series model for forecasting international passengers is the $ARIMA(2, 1, 2)(1, 1, 1)^7$ with echo state network, which has a data forecasting pattern that is close to the actual data pattern of passenger arrivals at Lombok Airport at the international gate, so that the model is suitable for predicts passenger arrival data at Lombok Airport at the international gate for the next year, namely the period July 2022 to June 2023. The $ARIMA(2, 1, 2)(1, 1, 1)^7$ with echo state network model has parameters that are all statistically significant, and the Root Mean Squared Error (RMSE) value is 72.02318. The results of forecasting passenger arrivals at Lombok Airport at the international gate show that arrival forecasting

Figure 5. Time Series Forecasting using Echo State Network. We use R Package *echos* (<https://cran.r-project.org/web/packages/echo.find/vignettes/echo-vignette.html>), *tidyverse* (<https://www.tidyverse.org>), *tsibble* (<https://cran.r-project.org/web/packages/tsibble/index.html>), *fabletools* (<https://cran.r-project.org/web/packages/fabletools/index.html>), and *fable* (<https://fable.tidyverts.org>).



experiences a decreasing and increasing pattern, almost following the previous pattern of actual arrivals, which also has a decreasing and increasing pattern. It is expected that this knowledge can be used as a reference for related parties to determine strategic policies so that the number of passenger arrivals at Lombok airport at the international gate can continue to be increased while still following the health protocols that are still in effect by intensively promoting tourism and culture in the province where Lombok airport is located.

3.2. Airport connectivity

The world of tourism on the island of Lombok is getting special attention from tourists (Bastaman, 2018; Fallon, 2001; Pribadi et al., 2020). The construction of various tourism support facilities in Lombok makes tourists no longer worry about various needs related to tourist travel. The government in each district in Lombok City is also aware of the importance of these supporting facilities to increase the number of tourist visits each year. One of the most critical infrastructures is the road connecting tourist objects in Lombok. More proper road conditions also make traveling easier and faster. Access to more specific tourist sites is a significant consideration for tourists. Lombok International Airport also significantly impacts development of tourism in Lombok. The presence of Lombok International Airport attracts tourists from various countries who no longer need to transit at other international airports in Lombok, generally in Jakarta, Bali, or Surabaya. The development of inter-regional connectivity is an important thing to be a top priority, especially with the fast growth of air transportation and the need to improve airport service standards which require the Indonesian aviation sector to always improve the quality of all its facilities and infrastructure. Infrastructure development in the transportation sector is a development activity that is oriented and serves to support all development activities in the region or region itself. Infrastructure development is one of the essential and strategic aspects of accelerating the regional development process.

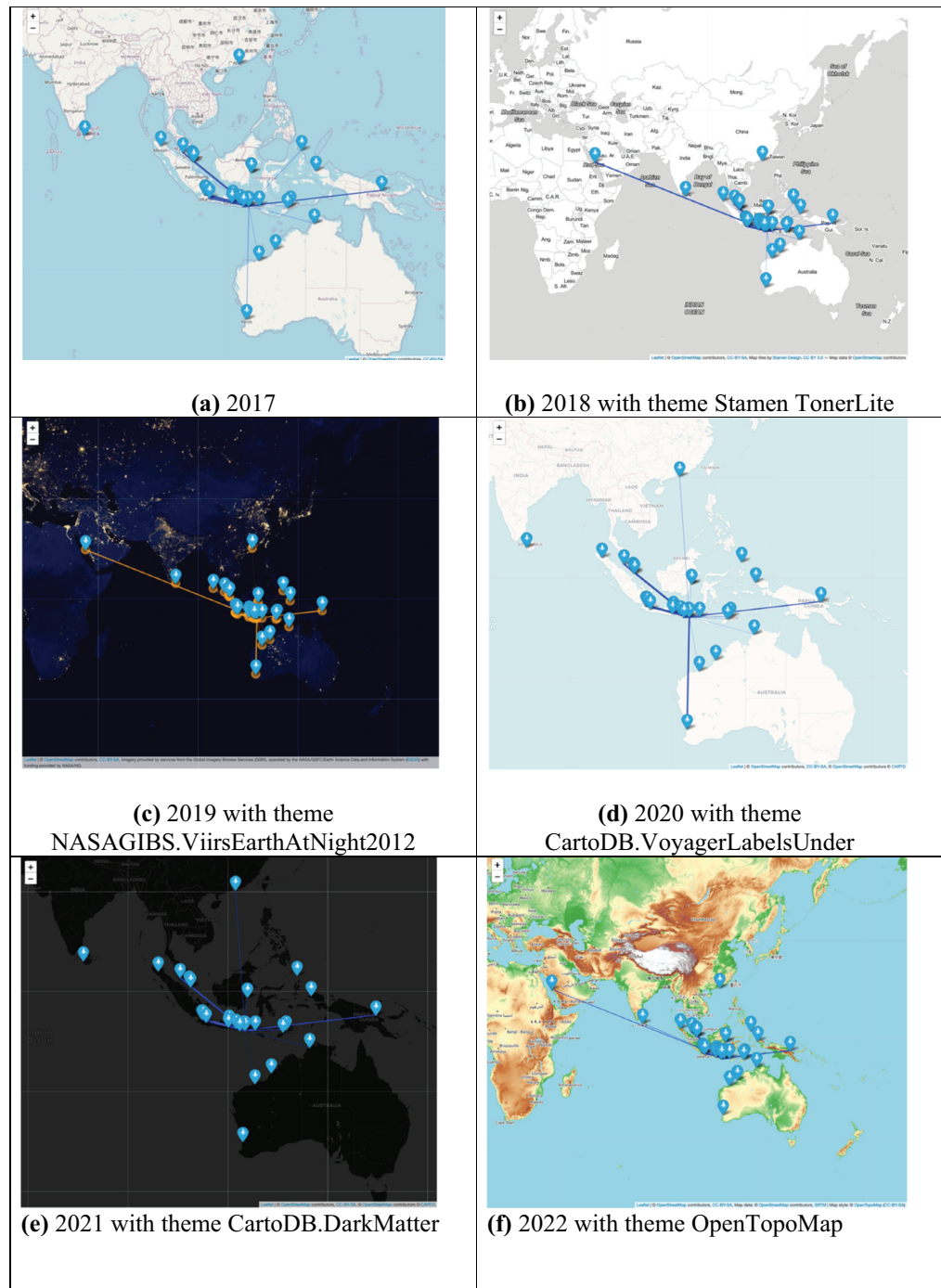
As airport activity rapidly increases, it will indirectly impact the socio-economic positively and negatively. The positive impact is an increase in income, while the negative impact is that some communities can lose agricultural land as a source of livelihood and residence, which causes the land to be converted into development. In contrast, the perceived economic impact is the increasing number of community activities such as offices, banking, and shops. Hence, the presence of an airport in Lombok impacts the socio-economic community. From a Meso-economics perspective, investment or expansion of an airport, including its facilities, both for passengers and cargo, can have some potential implications for economic development in the area around the airport. The implications of investing in airport infrastructure development can then be divided into four types

with different effects over time. The availability of airports will provide short benefits for an area from the construction or development of airports in the region because of the opening of employment opportunities and increased income associated with airport work, namely facility design, runway construction, terminal and hangar construction, and installation of air traffic navigation systems. These short-term effects have a limited impact on the long-term performance of the regional economy. Then, there is a stimulus to the local economy due to companies and individuals with air transportation services. The hub has the advantage of more direct flight options preferred by business people who will travel. However, these advantages become less important for cargo transportation, prioritizing on-time delivery. In addition, hubs can also benefit air transportation services on spokes because without a hub-and-spoke structure; long-distance travel will be difficult, considering that hubs allow route interconnectivity. The COVID-19 pandemic has hit the international aviation industries, including Indonesia. It is in line with the undertaking of health protocols which result in restrictions on the number of aviation operations, coupled with large-scale Activity Restrictions, so it affects additional provisions for passengers who desire to travel domestically and internationally. Passenger access can also cause financial losses for airlines. Figures 6a, 6b, 6c are shows the flight pattern from Lombok Airport to domestic and international in 2017–2019. However, Figures 6d, 6e are shows that COVID-19 in 2019–2021 experienced significant changes compared to Figure 6f new normal era.

During the pandemic, downward coordination must be carried out by the Ministry of Transportation with local governments, terminal operators, airline businesses, and all helix unions. Furthermore, horizontal coordination must be carried out with diverse stakeholders to guarantee policy alignment between ministries, establishments, and bureaus responsible for handling the COVID-19 seizure. Horizontal coordination includes the COVID-19 handling task force in each region and center, the Ministry of Home Affairs, and the Ministry of Health. The infrastructure and facilities can provide services following the health protocol. For example, they ensured the availability of health checkpoints and human resources to implement them. Health checkpoints ensure that passengers traveling on flights are in good health. Large airports can apply checkpoints before entering the area. Small airports can combine flight time slot deals and checkpoints outside the area to loosen passenger expansion during pre-flight services.

With the prohibition on passenger travel and reduced airport operating hours, on the one hand, cargo transportation is running normally, undoubtedly impacting cargo handling and transport. In addition, almost all aircraft operating in Indonesia are passenger aircraft whose number of activities has declined extensively, while the number of cargo aircraft freighter is tiniest. Thus, cargo accumulation can transpire at several airports. By these problems, an inter-regional logistics plan is ought so that cargo distribution operates smoothly. It is vital to determine the needs and capabilities of the separate region corresponding to supply and demand, which can be confirmed with the appropriate Ministry for cargo transportation so that the air transportation business can endure amidst the consequence of the pandemic. The stimulating thing is that several studies explain that the level of online transactions during COVID-19 has decreased. Indonesia encloses a Muslim majority population (Effendi et al., 2021; Juliana et al., 2021; Nurjaya et al., 2021). Meanwhile, COVID-19 has also enforced the 2020 Hajj and Umrah travel in a restricted form by implementing health protocols (Atique & Itumalla, 2020; Goni et al., 2021; Muneeza & Mustapha, 2021). Figure 6b and Figure 6c are show that the connectivity of Lombok departures to Saudi Arabia in 2018–2019 still has a frequency, but not during COVID-19 2020–2021. The undertaking of Umrah has also faced barriers where the Saudi Arabia governance has locked entrance to Muslims outside Saudi Arabia for Umrah since 27 February 2020. This entrance closure is an effort by Saudi Arabia's governance to control the spread of COVID-19. However, on 1 November 2020, Saudi governance reopened the entrance to several Muslim countries to perform Umrah (Khan et al., 2020; Memish et al., 2020). The implementation of Umrah today varies from the undertaking of Umrah in non-pandemic periods. During the pandemic, Umrah pilgrims are limited in age; only those aged 18–50 years can obtain an Umrah visa, and only those with hold PCR with a negative result can continue flights to Saudi Arabia. The implementation of Umrah during the pandemic is

Figure 6. Network Connectivity from Lombok to Domestic and International Airport. We use R Package flextable (<https://ardata-fr.github.io/flextable-book/>), GGally (<https://ggobi.github.io/ggally/>), ggraph (<https://cran.r-project.org/web/packages/ggraph/index.html>), gutenbergr (<https://cran.r-project.org/web/packages/gutenbergr/index.html>), igraph (<https://igraph.org>), and network (<https://cran.r-project.org/web/packages/network/index.html>).



a series of Umrah worship regulated through health protocols (Khan et al., 2020; Memish et al., 2020). Saudi Arabia's governance firmly commits to implementing strict health protocols for Umrah pilgrims. The implementation of Tawaf and Sai is arranged in an orderly manner, and the congregation maintains a distance, often washes hands using soap and running water, and uses masks. The use of masks is very useful in preventing the transmission of infectious diseases. Therefore, masks are allowed in the Hajj-Umrah procession, especially during Ihram.

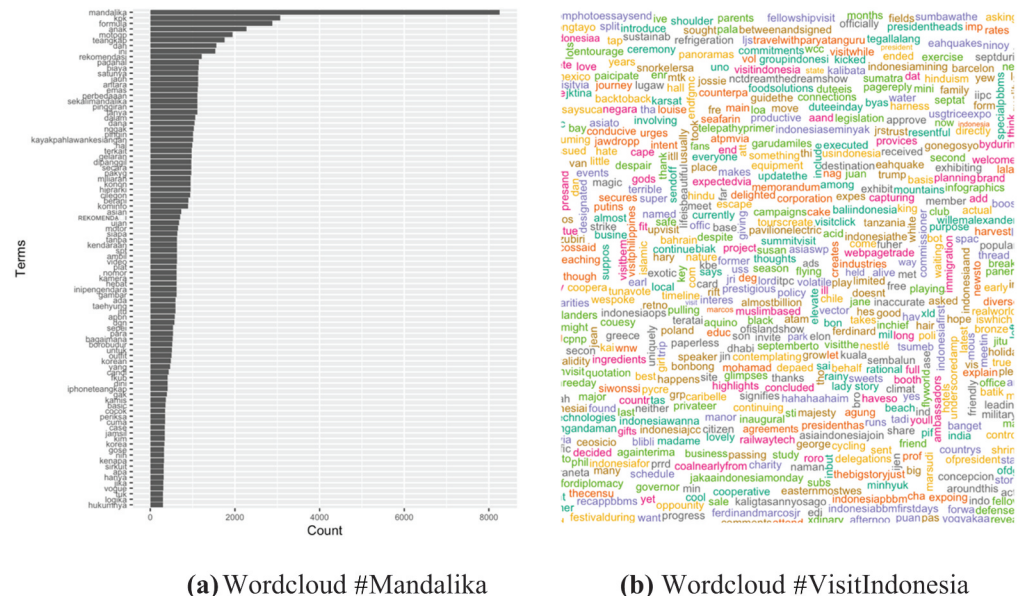
3.3. Sentiment analysis towards lombok MotoGP agenda

The Lombok government and Penta-Helix (Cabrera-Flores et al., 2020; Calzada, 2020; Caraka, Noh et al., 2021; Purnomo et al., 2021; Sjögren Forss et al., 2021) contributors work concurrently to maximize the economic prospect in Lombok one of which is to attract travelers to visit Lombok by hosting World Superbike (WSBK) and MotoGP activities. In addition to enhancing infrastructure, this plan is expected to expand MSMEs and the people's economy. The construction of the Pertamina Mandalika Circuit is quick. The construction of the Mandalika Circuit continues to be accelerated during the Coronavirus pandemic, starting at the end of 2019 until it can finally be operated to hold the inaugural FIM Superbike World Championship and Asia Talent Cup (ATC) races in 2021 and 2022. The MotoGP agenda in Lombok has been pleasingly organized. However, more essential modifications still need to be constructed so that upcoming activities will attract more additional visitors from domestic and international. The Mandalika Circuit contains many local accents on the track surface. One that is seeable is the Subahnale mark on the track is a woven pattern deriving from the Sasak Tribe on the island of Lombok. Then, the Mandalika Circuit bears a street circuit which refers to a more substantial racing function. So, the circuit can be used for different agendas if there is no race competition. The location of the Mandalika Circuit is near the beach. Visitors have other alternatives to spending moments at the beach. Mandalika circuit offers a beautiful panoramic view of the hills surrounded by the sea. However, at the peak of the undertaking, specifically along with the MotoGP class race, heavy rain poured down on the circuit area, causing the race to be delayed. During the MotoGP agenda, the presence of a rain charmer attracted the attention of national and international media. This phenomenon can also be expressed that Indonesia, with its ethnic and cultural diversity, has a promising opportunity to take advantage of tourism based on local culture.

Indonesia is one of the countries with the most extensive Twitter users in the world. Established on the We Are Social report, the number of Twitter users in Indonesia reached 18.45 million in 2022. This number is comparable to 4.23% of the total Twitter users worldwide, reaching 436 million. Twitter is one of the social media that has many active users worldwide, one of which is in Indonesia. Social media has become a means of communication in interaction and sharing thoughts, emotions, and opinions that a person feels. Communication that ensues on Twitter is indirect, so the feelings or emotions felt by a person can only be seen in the form of text on posted tweets. Hence, the following analysis was used to get information concerning the sentiment of MotoGP activities in Lombok from 1 March 2022 to 1 September 2022. Behind filtering, the number of tweets is 15,000 using the hashtag 'Mandalika' as shown in Figure 7a. It is interesting to find that there is the word 'KPK'. Regardless, the Corruption Eradication Commission, abbreviated as KPK, is an Indonesian government agency established to prevent and fight corruption in the country. Several tweets discussed issues regarding Mandalika Circuit Asphalt assumed to spend an unreasonable budget. Thus, this issue loses the number of other texts that need to be used to capture tourism information in Lombok. Indonesian account users on Twitter and other social media tend to be excessively expressive in giving statements about an event. The second step is to use the hashtag Lombok to catch how the sentiment towards information in Lombok is, and we get 9347 tweets.

Lombok offers an exciting and diverse experience on the cultural tourism potential side. Visitors can see the typical life of the Sasak tribe, The Lombok weaving village, and the Beleq drum dance. Otherwise, the local wisdom seen in the Sade village is that the people still maintain the way of life from the legacy of their ancestors. At the same time, visitors can enjoy the unique Lombok traditional house (Sujarwo, 2019). Or in another way, the government can maximize the potential of international culture overseas, attracting the attention of Indonesian people nowadays, like the Korean culture. Korean culture has overgrown and expanded globally in the last two decades. Its existence tends to be accepted by the public from various levels of society, resulting in a phenomenon of the "Korean Wave," called Hallyu. This phenomenon can be found in Indonesia, and its impact is sensed daily, especially in the millennial generation, which can be seen in Figure 7b. The massive development of information technology due to globalization is the

Figure 7. Text Mining Analysis.
 We use R package
 SentimentAnalysis (<https://cran.r-project.org/web/packages/SentimentAnalysis/SentimentAnalysis.pdf>) and tm
 R Package (<https://cran.r-project.org/web/packages/tm/index.html>).



main factor causing the public enthusiasm for the Korean Wave in Indonesia. The Korean wave began and is interchangeable with the era of entertainment, including the k-music, k-drama, and variety shows that are packaged to portray Korean culture. Over time, Korean culture has been widely implemented in the daily lives of Korean culture lovers, from fashion, make-up, Korean skincare, food and beverages, and communication styles. At the same time, increased Korean native speakers for Indonesian Millennial and Z Generation (Caraka et al., 2022; Dash et al., 2021; Jonas-Dwyer & Pospisil, 2004; Keeling, 2003; Ng et al., 2010). The government can maximize the organization of K-pop artist concerts. At certain times on Twitter, there are often trending topics about k-pop artists discussed by Indonesian netizens. This situation also proves that if the Indonesian government can maximize the potential of K-pop concerts in Indonesia will have promising opportunities for tourism.

4. Conclusion

This paper concerns on policy mix consist of infrastructure provisions (air connectivity and sport facilities, and amenities), sport events, and fiscal policies to support tourism development in Mandalika to boost the economic possibility in West Nusa Tenggara and Lombok as part of Indonesia's exclusive economic zone. Lombok has a tremendous prospect in the tourism industry and local-based economizing. The construction of the airport in West Nusa Tenggara is also one of the goals of assembling the 11.2 SDGs targets, which is to provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by growing public transport, with precise attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. In this target, it is hoped that there will be a proper transportation design in terms of transportation facilities and infrastructure. The transportation system must also ensure the safety of all people. The most basic application of this target that is certain is to find problems that occur in the transportation plan. The position of Lombok Island as a travel destination is entirely strategic. Lombok is located close to Bali, which is beneficial for fetching in a tourism hub and forming a travel pattern quickly. The existence of accessibility infrastructures such as Lombok International Airport and ferry ports is a strategic choice to increase accessibility support, for example, the integration of tourist travel patterns with the Labuan Bajo destination. The globally recognized sport events such as MotoGP has been utilized to promote tourism development in the Special Economic Zone and its surrounding hinterland areas. Most importantly, lessons learned from the Indonesian experience could help other

developing countries that are devising policies and strategies to develop tourism industry by employing proper instruments such as infrastructure, events, and fiscal policies.

5. Policy recommendation

Based on the study findings, there are three policy recommendations. Firstly, the government could play a pivotal role in championing a specific industrial development. From the case of Mandalika, the Government of Indonesia has endorsed the tourism sector as the main driver of economic growth in the area. In maximizing economic prospects, the Central Government should allow a wider participation from the Provincial Government of West Nusa Tenggara (NTB) and the government of Lombok. They must lead to structural adjustments to achieve the long-term work program related to Sustainable Development Goals (SDGs). In addition, monitoring, management, and evaluation of the implementation so far can be used as a reference and additional expansion in the tourism development.

Secondly, the government must develop the data integration and optimum utilization in the tourism sector and the whole industry's ecosystem. Nowadays, data is an essential commodity and big data planning is inevitable to development (Hirsch, 2013; Perrons & Jensen, 2015; Tang et al., 2020) and decision-making will be more precise when governance performs the research based on data. Currently, Penta-Helix collaboration in Indonesia is working to improve the quality of government data in Indonesia. One of the policies of the Indonesian government to improve the quality of Data is by issuing Presidential Regulation no. 39 of 2019 concerning 'Satu Data Indonesia (One Indonesian Data).' One Data Indonesia principles are Data Standards, Metadata, Interoperability (easy to share), and reference codes. Hopefully, with these four principles, the government data constructed can be accurate and high-quality. With data concerns that often occur sameness between government agencies, the presence of data standards resolves to annihilate data redundancy generated by the government. In addition, data published by the government is always escorted by metadata to overcome misunderstandings from data users. At the same time, the principle of interoperability supports data integration between sectors or agencies. With the achievement of the principles of Governance, data governance will be integrated so that government data will not be challenging to obtain anymore. However, the issue is on the utilization of the available data that is still need upgrading and consistent program to do so.

Thirdly, the government should offer policy incentives to the affected players within the championed sectors. Fiscal incentives should be offered properly to companies to compensate their efforts to building infrastructures, otherwise, the Special Economic Zones will not effectively be attracting investors in the long run (Wardhana, 2019). Obviously, COVID-19 pandemic has had an negative effect on the economy in Indonesia, and several provinces experienced a significant impact. The COVID-19 pandemic is more affected in large provinces or those with higher Gross Domestic Product (GDP) per capita because one policy to overcome the pandemic's impact was travel restrictions. With travel restrictions, they can only carry out economic activities locally. It was considered that the Provinces of West Nusa Tenggara and Lombok hold promising tourism prospects. In addition to the fiscal policy, the government must secure the implementation of agrarian reform policies—the problem is currently the source of the conflict of interest over the selection of land. The Non-governmental organizations (NGOs) pointed out in the field that the conflict was always unresolved and led to the recurrence of the conflict in the future. This situation is quite unfortunate because it has been going on for a long time, and its haunting nature has hindered the achievement of sustainable programs on this aspect of land ownership. In *de jure*, it may indeed have been redistributed to the individuals. However, individuals who are less able to manage it are not unattainable to be problematized again in land tenure practices by other parties. For the long run, this conflicting situation will ruin the tourism development.

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contribution

R.E.C., conceived the research and constructed the experimental design. R.E.C., I.W.W., Y.K., M.N., and B.P managed the project. R.E.C., analyzed the data. R.E.C participated in the verification and interpretation of data. R.E.C., A.D.S., and P.U.G. created spatial visualization. R. E. C wrote the manuscript. R.E.C., I.W.W., Y.K. and A.D. S. revised the manuscript. All the authors read and approved the final manuscript

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