Smart Environment Program's Traffic Management to Achieve Semarang City Resilience

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Abstract: This research aims to study the Semarang City Smart Environment-based traffic management during the COVID-19 pandemic. The pandemic that affected all sectors, including traffic management, is a critical issue to investigate. In addition, based on the analysis of the VOSViewer software, research on the Smart Environment program-based traffic management during a plague is still not much studied. The data analysis software NVIVO 12 Plus assisted in this descriptive qualitative study. Data were collected from several related agencies and also supported secondary data. The results indicated that the traffic management strategy through the Smart Environment during the COVID-19 pandemic is an inter-agency integration in its implementation regulated in the Government Regulation on the Traffic and Road Transport Forum. The regulation realization takes place vertically and horizontally. The Smart Environment implemented traffic governance to overcome traffic problems by coordinating ATCS with the Semarang City Police Department and providing opportunities for the community to complain through Lapor Hendi and Call Center 112. The traffic governance affected three Gatra, namely economic, sociocultural, and defense and security, to support Semarang City in achieving its resilience.

Keyword: City Resilience; Semarang City Traffic; Smart Environment.

INTRODUCTION

The Sars-Cov-2 virus has become a global problem since the first outbreak in Wuhan City, China, at the end of 2019. A zoonotic virus (transmitted between animals and humans) bat-caused virus where Wuhan City has an extreme food culture that eats non-consumable animals such as bats, dogs, and more. This infection from animals to humans triggers heavy hospital traffic because of diarrhea, coughs, and respiratory tract infections. Human-to-human transmission has made this city-level outbreak a global emergency (Putri, 2020). The virus infection rate in other countries is still increasing, rapidly spreading to 114 countries worldwide. An increase in the positive rate made the health emergency status of COVID-19. WHO officially declared COVID-19 a global pandemic on March 12, 2020. As of April 2021, there have been 135,646,617 confirmed cases, with a death toll of 2,930,732 (World Health Organization, 2021).

The Central Government imposed social restrictions under the supervision of the Regional COVID-19 Handling Task Force to optimize the prevention and control of the spread of COVID-19 in areas with high case rates. The implementation is guided by Government Regulation 21 of 2020 (Nuari Priambudi et al., 2022). Large-Scale Social Restrictions are restrictions on certain activities of residents in an area infected with COVID-19 to prevent the possibility of spreading the virus in the area. The implementation includes online learning and remote working. Other restrictions include religious activities, crowds, sociocultural activities, transportation, et cetera. To maintain it, the apparatus involve-supervision policy regulated in each region (Ismail, 2020).

Indonesia is one of the countries affected by COVID-19. The first transmission was found in Depok City on March 2, 2020, and spread to other provinces throughout Indonesia (Djalante et al., 2020). Since the first transmission entered Indonesia, as of April 2021, there have been 1,566,995 cases, with an average of 4,127 cases per day. The death rate in Indonesia also tends to be high at 42,530 deaths, equivalent to 2.7% of all cases (Gugus Tugas Percepatan Penanganan COVID-19, 2021). The strategy was generated by establishing the COVID-19 Handling Task Force as the executor of the task and formulator of policies to overcome the COVID-19 pandemic in Indonesia. The first policy formulation in breaking the chain of virus spread is the 3T (Test, Tracing, Treatment), the 3M (Wearing Masks, Keeping Distance, Washing Hands), and Economic Strengthening (Halim, A. D. et al., 2020).

Semarang is one of the cities which conduct Large-scale Restrictions based on the Regulation of the Mayor of Semarang City Number 28 of 2020. The rule's scope aims to prevent the spread through activity restrictions, increase the anticipation of the development of spread escalation, improve the quality of health services, and reduce survivors' negative characterization (stigma) for the community. Then, it reduces its impact on the economic, social, and security sectors to maintain Semarang City's resilience during COVID-19. However, the condition of Semarang City as the Capital of Central Java Province has become a migration magnet for the surrounding areas (Rahma Anggraini & Fafurida, 2018). It is becoming a challenge to Semarang City's mobilization reduction policy. Therefore, the Semarang City Government highlighted the arrangement of the road network system with a series of traffic management. This policy prevents and maintains logistic distribution, which is critical due to the plague.

The road network system in Semarang City uses a ring and radial pattern. The purpose is to separate traffic between and within the city, separate heavy, medium, and light traffic, city traffic control, and division roads based on their function. The road network in Semarang city is divided into three, namely the Inner Ring Line, Outer Ring Line, and Radial Line (Rakhmatulloh & Dewi, 2019). During the plague, Semarang city carried out a series of traffic management projects. In April 2020, protocol roads such as Pandanaran Street (from Tugu Muda to Simpang Lima), Pemuda Street (from Paragon Mall to Tugu Muda), Gajah Mada Street (from Simpang Lima to Simpang Gendingan), Pahlawan Street (from Air Mancur to Simpang Lima) and Ahmad Yani Street (from Simpang RRI to Simpang Lima). The Road closures are classified into semi-permanent closures and scheduled closures. Permanent closures mean the road is closed, so it is no longer used as a connecting road. The route that initially passed through this road was diverted to another road. Semi-permanent closures are closed at certain times. For example, closing is done at 6 pm - 6 am. Thus, outside these hours, the road can be used for driving.

In addition to road closures, other traffic threats also occur when bad weather occurs. Semarang, a maritime city, is located in a basin-like structure with a city center lower than sea level (Yoga et al., 2020). This condition allows inundation at several points. The inundation has damaged the road, creating several traffic issues. The chaotic traffic conditions potentially occurred during the pandemic peak. The Semarang City Government has to deal with traffic jams and the virus and maintain the continuity of supply distribution. In handling the traffic problem, the Semarang City Government uses the Smart City program to create traffic governance in Semarang City in collaboration with related stakeholders. Smart city programs are innovative efforts made by the city ecosystem to overcome various problems and improve the quality of human life and the local community (Hasibuan & Sulaiman, 2019). The initial stages of the Semarang Smart City began with the cyber government followed by cyber society.

The Smart City concept is divided into 6S (Smart Governance, Smart Branding, Smart Economy, Smart Living, Smart Society, and Smart Environment) and 4 Connection (Social Integration, Connectivity, Sustainability, and Creativity) (Satrio & Rochani, 2019).
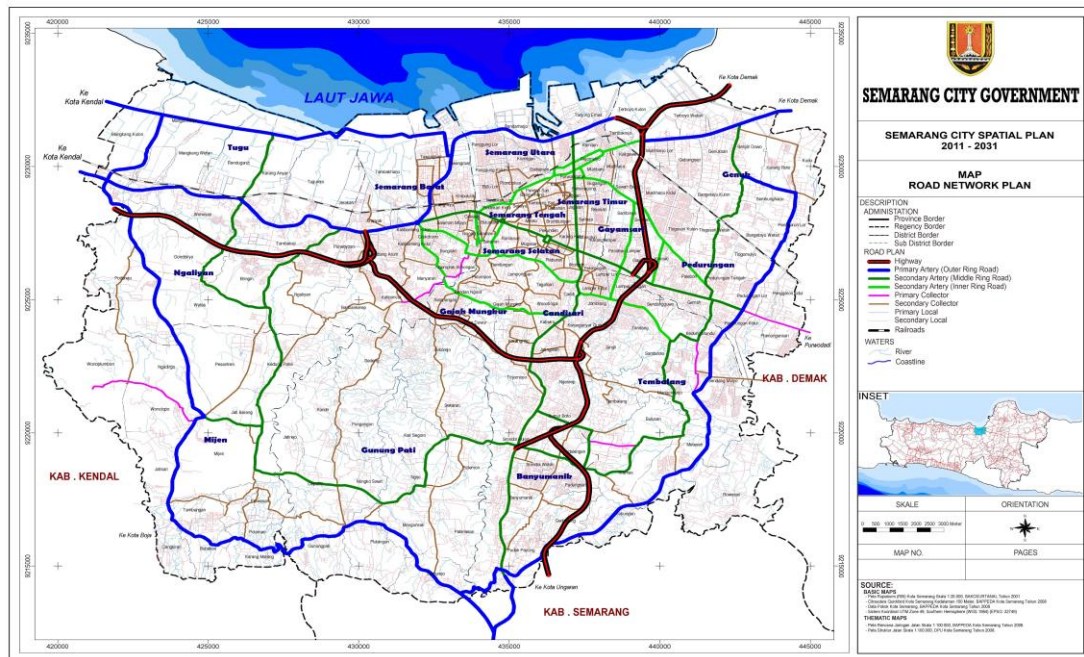

Figure 1. Semarang City's Road Network Plan Map
Source: Distaru Kota Semarang, 2021.

The Smart Environment menu focuses on dealing with traffic issues. The Smart Environment contains the Main Road Map, Outage Map, Leger Road, Pedestrian Road, Drainage, Road, Irrigation, River, Transportation, Tower, One Map Semarang, and Smart Infrastructure. Meanwhile, road information can be accessed through the Semarang Smart Transportation City application (Fitri et al., 2017). The application provides data access for ATCS, Smart Transit, Smart E-Keur, and Smart E-Report. This menu allows the public to see road conditions in Semarang through CCTV to estimate the density of roads and obstacles in a road segment. Research related to traffic management becomes urgent during a pandemic, especially for cities with connecting transportation routes between regions.

Both radial and circle roads must be maintained to prevent the spread of COVID-19. This traffic control and management also affect the city's resilience to face all threats and challenges during COVID-19. Semarang was chosen because it is Central Java's highest case city in 2021 second quartal. This city also could reduce its pandemic level from Level 4 to Level 1 in about three months. As a province capital, Semarang also has massive industry, services, and government mobility, which makes it vulnerable to COVID-19.

Based on the Figure 2. In terms of looking for research novelty in this study, researchers used VOSViewer software. Although there are many software programs for analyzing text units and matrix similarities, the advantages of VOSViewer are in the visualization aspect (Hamidah et al., 2020). The results of VOSViewer processing show that the research trend in Smart Environment-based traffic governance research is popularly related to governance and mechanically using technology in Smart Environment-based traffic governance. Meanwhile, research related to social aspects and city resilience is still rare. This gap attracts researchers to develop research in a social direction and see if using a Smart Environment based on traffic management can maintain Semarang City's resilience. Therefore, the researchers took research related to Smart Environment-based traffic management in Semarang City during the pandemic and the implication of its resilience.
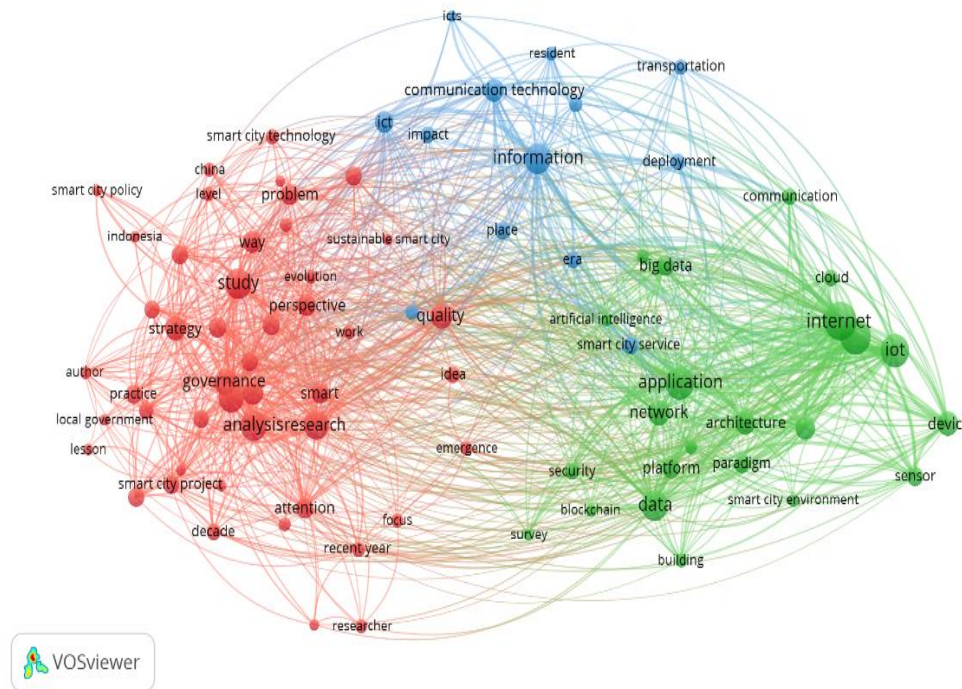
Figure 2. Research Trends related to Smart Environment-Based Traffic Management
seen Using VOSViewer Software
Source: Research Results, 2021

RESEARCH METHOD

The method used in this was qualitative research with descriptive exposure. Qualitative research intends to understand the phenomenon of what is experienced by the research subject (Mohajan, 2018). The data was collected through observation, interview, literature study, and documentation. Due to the restriction, both offline and online interviews were conducted. The depth interview technique was used while offline interviews, but online interviews were conducted through a group discussion. The data collected from traffic management institutions consist of Bappeda Kota Semarang, Distaru Semarang, Polrestabes Semarang, Dishub Kota Semarang, Diskominfo Kota Semarang, and Polda Jawa Tengah. Data analysis procedures included data reduction, data presentation, and conclusion drawing. This research was also assisted by NVIVO 12 Plus software to analyze existing problems (O'Neill et al., 2018). The features used in the NVIVO 12 Plus software used the crosstab feature. The crosstab feature describes the problem(Phillips & Lu, 2018). In this case, the crosstab feature was to find problems in implementing a Smart Environment in traffic management in Semarang City during the COVID-19 pandemic. In the crosstab table will be shown the value of each obtained.

RESULTS AND DISCUSSION
Semarang City Traffic Management Strategy During the Pandemic

The COVID-19 pandemic in Indonesia has experienced a significant increase since the Delta variant appeared. The number of positivity rates at the beginning of the pandemic entered in March 2020, which was initially only a matter of hundreds, has now grown to thousands of cases per day. The government's main program, as a follow-up to the directives of the World Health Organization, is to limit direct human contact. Various policies have also been implemented: Large-Scale Social Restrictions (PSBB), Enforcement of Restrictions on Community Activities(PPKM), Enforcement of Restrictions on Micro Community Activities (PPKM Mikro), Emergency Enforcement of Restrictions on Community Activities (PPKM Darurat), and Enforcement of Restrictions on Community Activities Levels 1-4 (PPKM Level 1-4) (Wahyudiyono et al., 2021).

In implementing social restrictions, there are essential points to prevent crowds so that the transmission of the virus can be suppressed. Considering Semarang Mayor's Instruction Number 2 of 2021, the types of programs carried out in activation limitation start from Remote Working, Distance Learning, and Health Protocol Policy (Aeni & Afrizal, 2022). Integrated traffic management is also implemented to minimize mass movement. The traffic management in question includes road closures, flow diversions, and insulation to the closure of highway access. Traffic management is a business or activity that regulates existing roads by making the best use of existing road infrastructure (Tilano & Suwitri, 2019).

Semarang City, the Capital of Central Java Province, causes a lot of street congestion. Apart from being an office and industrial destination, Semarang City is also located on the North Coast route (*Jalur Pantai Utara*), which is often used in logistics distribution (Husaini & Junoasmono, 2017). This restriction is relatively rigid, considering that only critical and essential sectors are allowed to travel during the PPKM period. Essential sectors include finance, banking, capital markets, payment systems, information and communication technology, non-COVID-19 handling hotels, and export-oriented industries. Meanwhile, the critical sectors include energy, health, security, logistics and transportation, food, beverage, supporting industries, petrochemicals, cement, vital national objects, disaster management, national strategic projects, construction, essential utilities, and basic needs fulfillment industries. So, management policies during the pandemic require many studies to achieve the goal of reducing road intensity and maintaining the continuity of logistics distribution.

The traffic management held by Semarang consists of policy planning, field implementation, and program supervision. Traffic policy planning in Semarang begins with a discussion of the district environment (District-scale Leader Communication Forum) by involving the community consisting of a district-scale chairperson, the village head, and the head of the RT/RW regarding environmental conditions in the community. Then, the result was reported to the Semarang City Government to be discussed again by the city-scale chairman (City-scale Leader Communication Forum). The proposals are assessed for the fulfillment of the criteria. This process is based on Government Regulation Number 37 of 2011 Article 12, which explains the working mechanism of the Road Traffic and Transportation Forum. If it meets the criteria, further coordination will be carried out related to its implementation (Gunawan & Utomo, 2017).

The traffic management program during the pandemic is carried out by agencies engaged in the technical field based on decisions from the Semarang City Traffic and Road Transport Forum. The technical services in managing traffic during the pandemic consist of Satlantas Polrestabes Kota Semarang, Dinas Perhubungan Kota Semarang, and assistance from the Tentara Nasional Indonesia and Satuan Polisi Pamong Praja. Before entering the field, each agency had previously selected personnel following the field's needs.

Table 1. PPKM Traffic Management Personnel in Semarang City

No	Origin of the Institution	The number of personnel	Explanation
1	Polri	576 Personnel	
	a. Polrestabes Semarang	486 Personnel	Satlantas
	b. BKO Polda	90 Personnel	
2	TNI	217 Personnel	
	a. Kodim	150 Personnel	
	b. Arhanudse	26 Personnel	
	c. Raider 400	21 Personnel	
	d. Lanal	10 Personnel	
	e. Lanumad	10 Personnel	
3	Dinas Perhubungan	90 Personnel	
4	Satpol PP	60 Personnel	

Source: Satlantas Polrestabes Semarang, 2021

Based on the division of personnel above, it is known that the police dominate traffic control. This composition is based on Law No. 22 of 2009, Article 22, paragraph (5) concerning

Road Traffic and Transportation. In the event of a sudden or situational change in traffic flow, the Indonesian National Police may carry out Traffic Management and Engineering policy. So in terms of the composition of the implementers, Polrestabes Semarang has the most significant involvement. Meanwhile, other institutions entitled to traffic management are agencies in charge of traffic infrastructure, namely Dinas Perhubungan Kota Semarang. The number of personnel deployed in traffic management during the Semarang City pandemic is as Table 1.

The Department of Transportation technically carries out traffic monitoring through the Semarang City CCTV (Area Traffic Control System / ATCS) as the basic operation strategy for Polrestabes Semarang. If there is a traffic issue, the ATCS operator will contact the Semarang Polrestabes Field Officer for follow-up. The coordinating relationship continues as long as traffic monitoring via CCTV lasts (about 16 operational hours).

Program supervision is carried out vertically and horizontally. Each agency carries out horizontal program supervision by placing one person as the Perwira Pengawasan dan Pengendalian / Pawasdal (Supervision and Control Officer). This personnel supervises the ongoing traffic regulation and evaluates the activities. The Pawasdal at each checkpoint is appointed in rotation so that all agencies have the same opportunity. The program supervision result will be followed up to formulate other related policies or policy improvements. Each institution's supervisory agency carries out vertical supervision. Within the scope of the police, Porestabes Semarang is assessed by the Polda Jateng's Inspectorate (Itwasda). KODAM IV Diponegoro's Inspectorate evaluated TNI personnel. Meanwhile, the Semarang City Regional Planning and Development Agency evaluated the Dinas Perhubungan Kota Semarang's ATCS and Satuan Polisi Pamong Praja (Bappeda), and the Semarang City Inspectorate.
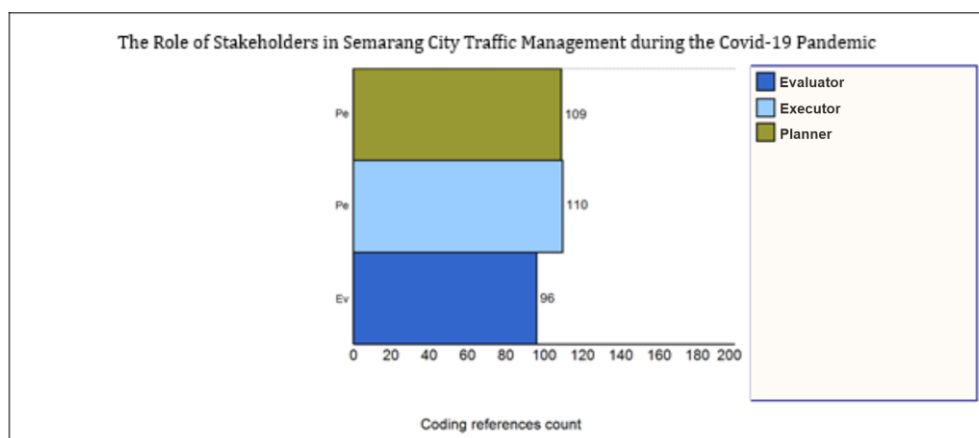

Figure 3. The Role of Stakeholders in Semarang City Traffic Management during the COVID-19 Pandemic
Source: Nvivo Analysis Results, 2021

Based on Figure 3. the Nvivo 12 Plus data processing, the most frequent role of relevant stakeholders in traffic management in Semarang during the pandemic is as technical executors (Pelaksana). Technical implementers have more working hours with various dynamics of field conditions. As a planner, although he has the burden of initial planning, the dynamics that occur in the field are not as many as technical implementers. Then supervision has few roles but is critical. It is because the results of the evaluation and supervision will be a reference for changes and adaptations of policies related to traffic management during the pandemic.

Semarang's mass mobilization restrictions are initiated in two references, field observation, and Forkopimcam Proposal. Determination of the point is carried out by studies conducted by the Semarang City Road Traffic and Transportation Forum. The main targets are roads and areas that have the potential to cause crowds. Semarang City Check Point locations based on potential crowds are divided into Culinary Areas, Kota Lama Areas, Simpang Lima Areas, Semarang City Highway Gates, and City Borders. The culinary area (highway) is one of the recreational targets for Semarang City residents. It is also a centralized location for street vendors. Thus Semarang can both manage and control the economic condition. However,

reminding the COVID-19 condition, the culinary area has become a potential transmission cluster, so it needs to be supervised. The culinary area's points/roads that trigger crowds were decided to be closed to limit the mobility of residents in the area.

Table 2. Roads Closed Due to Heavy Traffic (Culinary Area)

No	Name of the Street	Explanation
1	Ngesrep Timur (Patung Kuda) Street	Banyumanik Districts
2	Supriyadi Street	Pedurungan Districts
3	Lamper Tengah Raya Street	Semarang Selatan Districts
4	Sendangguwobaru Street	Tembalang Districts
5	Srikaton / Honggowongso Street	Ngaliyan Districts
6	BK – Suratmo Area	Semarang Barat Districts
7	Pemuda Street	
8	Gajah Street	
9	Kranggan Toko Mas Street	
10	Kauman (Perlengkapan ABRI) Street	
11	Tanjung Street	
12	Sampangan Street	
13	Dr. Sutomo Pasar Kembang (Hotel Siliwangi) Street	
14	Sugiyopranoto Street	

Source: Satlantas Polrestabes Semarang, 2021

The next point is Kota Lama and the Simpang Lima area. Road closures in Kota Lama are divided into two points: the Cendrawasih Crossroad and Ujung Cendrawasih Street. Meanwhile, Simpang Lima is divided into 5 closing points, Pandanaran 1 and Pandanaran 2, Pahlawan Street Fountain Circle, Airlangga (In Front of Berlian Store), Ahmad Yani Street, Near RRI and MH Thamrin Street (Satlantas Polrestabes Semarang, 2021). These two areas are the heart and landmarks, and gravity of Semarang City. The condition that occurs in this area is always crowded with tourists or Semarang residents themselves. Simpang Lima is also the central government area where the Provincial Government Office is located along Pahlawan Street.

Table 3. Proposed Blocking and Closing of Roads by Forkopimcam

No	Districts	Name of the Street
1	Pedurungan	Gemah Raya Street
		Malangsari Street
2	Banyumanik	Karangrejo Street
		Sukun Raya / Krimsus Street
3	Gajahmungkur	Tumpang Raya Street
4	Tembalang	Sendang Mulyo Reservoir
5	Tugu	Karanganyar Street
		Karangayam Street
6	Gunungpati	Jedung Raya Street
		Taman Siswa Street
7	Semarang Utara	Hasanudin Street
8	Semarang Barat	Pusponjolo Timur Street
		WR Supratman Street
9	Semarang Selatan	Wonodri Sendang raya Street
10	Semarang Timur	Kartini Street
		Widoharjo Street
11	Genuk	Woltermonginsidi Street
		Gorong-gorong Kaligawe Street
		Bogen / Bangetayu Street
12	Ngaliyan	Wisma Sari Street
13	Candisari	Wahidin Street
14	Mijen	RM Hadi Subeno Street
		Gunungpati Mijen Street

Source: Satlantas Polrestabes Semarang, 2021

The checkpoint also takes place at the border and the highway gate. It had conducted to maintain the flow of logistics and other critical needs. Border areas such as Mangkang and Genuksari have roads as Primary Arteries, which are used to distribute services and logistics in the Java Island area. The restrictions in border areas are also used for 3T efforts, namely Tracing, Testing, and Tracking (Pujaningsih & Sucitawathi, 2020). The spread of the virus begins with immigrants who have a high positivity rate. Thus, extra supervision is needed. Furthermore, the roads that are closed based on the Forkopimcam proposal are carried out through a planning process following the working mechanism of the Road Traffic and Transportation Forum. The list of roadblocks is based on Forkopimcam's proposal as Table 3.

Even though the checkpoints have been determined before, the dynamics of blocking, road closures, and flow diversions continue to occur. Insulation points include additional locations and openings as needed. These additions and subtractions are based on evaluations carried out by field officers. The worsening COVID-19 condition has led to additional road closures during the PPKM period. However, when the pandemic was gradually under control, the initially closed road was returned to its function during the PPKM Level 4 period in Semarang City. In addition, the highway which was initially blocked will also be reopened with strict checkpoints still being enforced. It also occurred on the proposed roads by Forkopimcam. Districts with a high number of confirmed cases continue to impose road restrictions. Then, if Forkopimcam declares that the location is safe and there is no need for insulation, the road divider will be dismantled, and the road will return to its original function.

The Smart Environment in Semarang City Traffic Management

According to Wahab et al. (2020), there are six dimensions to the smart city concept and several supporting indicators. A smart city is a comprehensive approach that can improve the city's operational efficiency, the population's quality of life, and the regional economy. Kozlowski and Suwar (2021) defined environmental weight as a smart city. Among others, smart cities use technology intelligently and effectively to use various resources to save costs and energy, improve services and quality of life, and reduce their environmental footprint, all of which support economic innovation and development.

The Semarang Smart City was designed under the Regulation of the Mayor of Semarang Number 26 of 2018 concerning the Semarang Smart City Master Plan. The smart city framework consists of structure, infrastructure, and superstructure. Apart from the Smart Environment, Semarang City's smart city also has other programs such as smart governance, smart branding, smart economy, smart living, and society. Smart City is designed to be a solution to public services in the city of Semarang. In the early stages of designing the Semarang Smart City, there was no element of pandemic prevention. However, along with the development of conditions, the Semarang smart city dashboard now also accommodates services related to handling the COVID-19 pandemic.

According to M. Luthfi Eko Nugroho, Head of the Research and Development Sub-Sector for Physical Infrastructure and the Environment, Semarang City Planning and Development Agency (Bappeda Kota Semarang), smart cities exist to be a solution. Nevertheless, a smart city is not only about technology development. A smart city is a city that can produce solutions. Vulnerable roads to transmission locations are arranged to limit the virus's spread. Since a road is complex, the movement of mass mobility due to road closures can be controlled by integrating smart city programs, especially Smart Environment. Public Street Lighting, Outage Map, Street Leger, Pedestrian Road, Drainage, Road, Irrigation, River, Transportation, Tower, One Map Semarang, and Smart Public Works Infrastructure. The integrative component of traffic governance and the smart city of Semarang City is located in the Transportation menu.

Smart transportation has several integrated systems that can mitigate the COVID-19 disaster, starting with bus management, Tcash BRT, Moovit, and CCTV. The Bus menu makes it easier for us to see the appearance of the Semarang City Trans Rapid Bus as an alternative to overcoming the road closures imposed during the pandemic. This Bus menu is supported by a Moovit menu that displays one's position with the nearest bus stop and Trans Rapid Bus. To prevent direct contact, Tcash BRT is also applied (limited to transit stops). Then CCTV is also a

critical component in traffic regulation. The CCTV in question is incorporated in the Semarang City ATCS, which Dinas Perhubungan Kota Semarang manages.

ATCS (Area Traffic Control System) Semarang City is a traffic control system that aligns red light times on the road network from a city intersection. Traffic regulation through this system requires the parameters of the number of vehicles and vehicle travel time. ATCS is used in flow control using the Traffic Signaling Device (Alat Pemberi Isyarat Lalu Lintas / APILL), which is connected to the ATCS application. This application can set the phase length of each intersection until the current draws. Through this application, traffic management can be done. APILLs integrated with ATCS are 53 APILLs spread across Semarang. Two of them are equipped with radio sensors to carry out traffic control automatically. The location of the sensor-based APILL is in an area with less heavy traffic, so determining the vehicle's mass is not as complicated as on a busy road.

The ATCS system is also equipped with CCTV as a traffic monitoring tool. The policy of blocking and closing the main roads in Semarang thus raises related issues. Congestion, traffic rule violations, and traffic accidents will be classified as general traffic issues. The displacement of vehicles causes traffic congestion during the pandemic flow from roads enforced by road closures to other alternative roads. It relates to the ratio of transportation infrastructure to the amount of land. The condition of the increasing number of vehicles must be supported by the availability of land in Semarang City. Based on its authority, roads in Semarang City consist of three types: National Roads, Provincial Roads, and City Roads. The distribution of the area of each road is as Table 4.

Table 4. Road Length by Level of Government Authority in Semarang City, 2018-2020

Level of Government Authority (1)	2018 (km) (2)	2019 (km) (3)	2020 (km) (4)
Negara2 / State	68,12	68,12	68,12
Provinsi / Province	27,16	27,16	27,16
Kota / Municipality	839,90	839,90	839,90

Source: BPS Kota Semarang, 2021

In terms of road authority, Semarang has 90% road authority. The province owns the other 3%, and 7% of the road authority is a national road. Thus, if there are traffic issues in Semarang due to a road ratio that is not proportional to the growth of vehicles, the Semarang City Government holds the responsibility. The growth of this vehicle does not come from the Semarang City population but also the increase in migrants to the capital city of Central Java province. The following figure shows the traffic density that has occurred since the enactment of the road closure policy.

Figure 3. Semarang City Traffic Density in the Pandemic Period
(Sources: Polrestabes Semarang, 2021)

Road closures lead to reduced roads available for transportation and can trigger crowds in other alternative streets around the closed road. If there is a traffic density in a highway area in Semarang City, this condition will be monitored through CCTV installed at 53 APILL points integrated with ATCS. APILL components include a controller, traffic light, APILL pole, luminaire, network cable installation, CCTV, and speakers. The distribution of APILL ATCS is shown in Table 5.

Table 5. Distribution of APILL ATCS

No	CCTV Point Name	No	CCTV Point Name	No	CCTV Point Name
1	Mangkang	19	Stasiun Tawang	37	Kelinci
2	Tambak Aji	20	Kyai Saleh Pandanaran	38	Lamper – Gajah
3	Jrakah	21	Thamrin Pandanaran	39	Pasar Gayamsari
4	Krapyak	22	Gajahmada	40	Supriyadi
5	Hanoman	23	Simpang Lima 1	41	Tlogosari
6	Kalibanteng 1	24	Simpang Lima 2	42	Soekarno-Hatta
7	Kalibanteng 2	25	Sam Poo Kong	43	Fatmawati
8	Abdul Rahman Saleh	26	Kaligarang	44	Terboyo
9	Karang Ayu	27	Kariadi	45	Pasar Kambing
10	Pasar Karang Ayu	28	Polda	46	Puri Anjasmoro
11	Tugu Muda 1	29	Kaliwiru	47	Madukoro
12	Tugu Muda 2	30	Peterongan	48	Pucang Gading
13	Tugu Muda 3	31	Sompok	49	Bundaran Madukoro
14	Kampung Pelangi	32	Hutama Karya	50	VMS Jalan Pemuda
15	Balaikota	33	Bangkong	51	Exit Bandara Lama
16	Paragon	34	Akpol	52	Tegal Sari Sriwijaya
17	Stasiun Poncol	35	Don Bosko	53	Menteri Supeno
18	Masjid Kauman	36	Milo		

Source: Dinas Perhubungan Kota Semarang, 2021

Traffic flow monitoring based on CCTV occurs in the CC Room of ATCS. If vehicles are overloaded on one of the roads, the ATCS operator will manage traffic using the ATCS application. However, they will coordinate with the Satlantas Polrestabes Semarang to overcome the congestion if a traffic jam cannot be controlled. Apart from ATCS, in fieldwork, the Satlantas Polrestabes Semarang also moves based on public reports of traffic-related issues where ATCS has the authority to regulate traffic with APILL. Thus the handling of traffic violations and accidents is carried out by the police.

Satlantas Polrestabes Semarang also placed several CCTVs using AI to assist in implementing E-Tickets (E-Tilang), making it easier to monitor traffic violations. In handling traffic problems, the Report Hendi facility can be utilized as a form of public participation. Lapor Hendi is a mobile application as a medium for citizens to convey their aspirations to the mayor. Every citizen of Semarang City can become an agent of change in their city by actively participating in reporting city problems, both criticism and suggestions, through the application. Semarang residents can also report their complaints to be followed up through Call Center 112. Complaints and calls from the people of Semarang City will be forwarded to the relevant agencies for a response. This kind of participation may support the lack of supervision due to fewer workforce so that the problem will be overcome immediately.

Implications of the Smart Environment on City Resilience

The term national resilience consists of two syllables, nation and resilience. "Resilience" means being able to withstand pain, control, maintain the situation, persevere, and be patient. Meanwhile, "national" summarizes an area population with a government and shows the interests of a nation that has become a state (Armawi, 2019). Resilience can also be referred to as a universal ability. Therefore, resilience is always a positive adaptive factor in facing a challenge internally and externally.

One of the coverages of national resilience is regional/city resilience. City resilience can be defined as a dynamic condition of an area that includes several aspects, including aspects of

life, identity formation, and the integrity of the territory. Analysis of city resilience is seen in the dimensions of the process and the dimensions of implications. The process dimension will review toughness and tenacity in facing threats, disturbances, obstacles, and challenges (Rhofita, 2022). Meanwhile, the implication dimension looks at resilience and tenacity, which will impact several aspects of national resilience (Bean, 2018). The implications of Traffic Management in the Smart Environment Program in Semarang City will certainly impact the region's resilience. The calculation index of city resilience can be measured in various ways in national resilience. Researchers found several synchronous patterns of the Smart Environment Program in Semarang City. The Gatra / Determinant includes three parts: (1) the economic determinant, (2) the sociocultural determinant, and (3) the defense and security determinant.

Adequate road access is an important mode of transportation to facilitate economic activities. More road construction projects will increase community mobility and allow the movement of products from one location to another. During the COVID-19 pandemic, roads in Semarang City were restricted. In addition, the North Semarang area, known as the trade zone, is technically the area with the least economic impact. Technical area for trading activities. Areas located on the outskirts of the city have an impact on traffic conditions. Undeniably, tourism, ports, and the North Coastal route seem its problems to arise. Besides, people do not want to obey existing traffic signs and do not pay attention to traffic safety.

The economy of Semarang City, Gross Regional Domestic Product, is calculated based on constant prices. This calculation is designed to see actual economic growth without being affected by changes in the prices of goods and services produced during economic activity. Based on the GRDP calculation in the commercial sector, based on 2010 constant prices for Semarang in 2020, the economic growth of Semarang decreased by 1.61% due to the COVID-19 pandemic sweeping the world. Transportation plays a critical role in urban areas. In addition to supporting mobility, transportation also plays a role in the lives of urban residents, one of which is a valuable economic distribution tool for the population (Sarjana et al., 2020).

This situation will also impact the regional economy, which can increase because all sectors are running well. The development of the ATCS Network is carried out optimally in every part of the region. Indirectly, traffic management helps develop the safety and comfort of visitors. For example, for Semarang, Kota Lama is a tremendous asset. However, the increasingly dense geographical conditions in the region will create problems and have a detrimental effect. Since many vehicle lanes in Kota Lama Area are planned to be pedestrianized sidewalks, a parking area is one of the most important facilities to be provided after the arrangement. Motorized vehicles are not allowed to pass.

Traffic flows are diverted to offer more space for tourists, especially when events are being held. However, parking spaces in the Kota Lama area are still insufficient. As a result, several illegal parking lots have sprung up around the area, disrupting activity and traffic flow on nearby lanes and roads. Applying the Smart Environment in traffic management in Semarang is a gradual and sustainable effort. This arrangement program has proven to create a new atmosphere that is considered more comfortable. Moreover, reviving tourism activities in the area has increased tourism-supporting economic activities. The arrangement of Semarang's Kota Lama can change and strengthen this area's image as a tourism icon for the city of Semarang.

Road transportation safety is closely related to traffic management and several other fields. There are at least five traffic management aspects related to safety issues: design, planning, implementation, operation, and maintenance. In addition, there are two other related fields, namely vehicle and material engineering, and several non-technical fields, including economics, psychology, health, law, education, and other social fields. Traffic factors include the size and speed of traffic flow and the composition of the types of vehicles available. The higher the traffic flow, the more diverse the speed and composition of the vehicle types, and the greater the chance of an accident. Traffic accidents are accidents and unintentional events that occur in vehicles with or without other road users, causing loss of life and property.

In traffic safety conditions in Semarang during the pandemic, the Smart Environment Program showed significant results. It can be seen in the data from the IT Division of Polda Jawa

Tengah. In 2021, traffic accidents decreased from 2019 to 2020 due to roads being closed during the pandemic. ATCS CCTV also significantly affects regulating traffic flow in the city of Semarang. In the Focus Group Discussion conducted by researchers, stakeholders consisting of Dinas Perhubungan Kota Semarang and Satlantas Polrestabes Semarang stated that during the pandemic, utilizing technology in its implementation, its members were also deployed for supervision and monitoring. This supervision provides services for the community so that traffic safety in Semarang is maintained.

CONCLUSION

Based on the discussion, the traffic management strategy through the Smart Environment during the COVID-19 pandemic is a form of integration between agencies that, in its implementation, has been regulated in the Government Regulation on the Traffic and Road Transport Forum. Implementation takes place vertically and horizontally. Sector agencies such as the Department of Transportation, Polri, Diskominfo, and others have their respective roles at each stage of the implementation of traffic governance. The implementation of traffic governance through the Smart Environment in overcoming traffic issues is by utilizing the coordination of ATCS in collaboration with the Indonesia National Police and providing opportunities for the community to carry out complaints through Lapor Hendi and Call Center 112. The report will be forwarded to the relevant agencies for follow-up. The challenges faced in implementing traffic governance through the Smart Environment are very diverse, both internally and externally. In implementing Smart Environment-based traffic governance, network, security, and vendor issues are considered. The impact of traffic management through the Smart Environment on city resilience can be seen in three aspects: economic, sociocultural, and defense and security. Semarang City's Smart Environment creates many product innovations. It can support alleviating problems experienced by the people of Semarang City, especially in terms of transportation and roads. In addition, there are suggestions for the Semarang City Government. It is necessary to pay more attention to network problems, especially in the northern and southern parts of Semarang, because the ATCS monitoring system has not yet reached these areas.

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