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THE DEVELOPMENT OF SMART CITIES AND ENVIRONMENT-RELATED DOMAIN: A CASE STUDY IN INDONESIA AND FRANCE

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Abstract

In Indonesia, and so is France, there is a growing concern about smart city development. However, empirical evidence is still lacking in Indonesia and so is the comparison between cities in Indonesia and France. Therefore, this paper is to elucidate the smart city development in Indonesia and France in terms of the environment-related domain. This current study is qualitative in nature, focusing on two cities, Lyon in France and Bandar Lampung in Indonesia. The data collection was carried out using two types of instruments. First, we collected data to measure indicators of the environment-related domain of smart cities through interviews with government officials who were in charge of city development. Second, the data collection also involved a five-point Likert scale survey. The findings indicate that the smart city development in Lyon in terms of the environment-related domain is more developed compared to Bandar Lampung. Lyon has enlisted additional private sector support for the concept of smart city development, while everything necessary for the development of a smart city is now being prepared in Bandar Lampung. The recommendations from the findings and suggestions for further research are also discussed.

Keywords: Smart city, socio-engineering, Indonesia, France

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INTRODUCTION

There has been wide interest in smart city development, with several disciplines contributing to the literature on smart cities recently (Wahyuddin, 2019). Smart cities assure to add economic, social, and environmental benefit by connecting infrastructure and urban services with technological innovations (Hollands, 2008; Viitanen & Kingston, 2014) and promise a perfect society (utopia) in this so-called twenty-first century (Datta, 2015). Today, therefore, there is an increasing interest to comprehend how to make smart city discourse affect and change ordinary cities and societies (Evans et al., 2019; Luque-Ayala & Marvin, 2016; Wiig & Wyly, 2016).

There is now much evidence in the literature to support the discourse that smart cities development is making a huge and positive impact on societies. Smart city programs help cities in the United States, among others, directly and indirectly promote their economic growth (Musa, 2017). However, it is also reported that it has negative impacts on relations among people (Dhere & Bendale, 2019). In Indonesia, there is now a growing concern towards smart city development (see, for example, (Hasibuan & Sulaiman, 2019; Lee, 2019; McKinsey & Company, 2018; Salamah & Yananda, 2019; Sanjaya et al., 2018; Suartika & Cuthbert, 2020; Susanti et al., 2016) and so is in France (see, for example, (Jeannot, 2019). However, empirical evidence that has appeared in the literature on smart city development is still lacking in Indonesia (Sanjaya et al., 2018) and so is the comparison between cities in Indonesia and France. Therefore, this aim of this paper is to elucidate the smart city development in Indonesia and France in terms of environment-related domain in particular.

LITERATURE REVIEW

Smart City Definitions

There are several definitions of smart cities that can be found in the literature (Albino et al., 2015; Sánchez-Corcuera et al., 2019). There is no one-size-fits-all concept of this concept, nor is there a single template for framing one (O'Grady & O'Hare, 2012). A smart city is described as a city with high and sophisticated technology that uses modern technology to connect people, information, and city elements. It creates sustainable, environmentally friendly cities, competitive and creative commerce, and improves the quality of life (Bakıcı et al., 2013). It puts an emphasis on three main areas including the use of technology as a key driver of smart cities, services everywhere, and a wide range of urban functions (Kim et al., 2021). Moreover, the ideas about potential urban planning are inextricably linked with debates about the profound effects that information and communication technologies will continue to have on our lives in the twenty-first century, and nothing is clearer than the concept of a smart city (Hollands, 2015). The aim of this future urban projects is sustainability (Adnan et al., 2016).

Application Domains of Smart Cities

Scholars have proposed a plethora of smart city application domains, subdomains, and attributes (see, among others, (Albino et al., 2015; Gharaibeh et al., 2017; Giffinger & Gudrun, 2010; Harrison & Donnelly, 2011; Liu & Peng, 2014; Lombardi et al., 2012; Neirotti et al., 2014). However, in this current study we adopted the smart city application domains proposed by (Yin et al., 2015), which are divided into four major domain including domains relating to business, citizens, government, and environment, with a focused look at the environment-related domain with its subdomains (Zurinah & Jalaluddin, 2016). The environment-related domain is divided into the following subdomains including public space, building, housing, pollution control, renewable energy, smart grid, water management, and waste management (Yin et al., 2015).

In terms of public space, green zones should be developed in cities since they help both citizens and the environment (Sánchez-Corcuera et al., 2019). Vitoria-Gasteiz, the capital of the Basque Country in northern Spain, received the award for its green areas for its friendlier environment. The city is surrounded by a park system known as the Green Belt which connects the city centre and significantly reduces environmental impact (Cömertler, 2017). In addition, for developing urban development and design of smart cities, (Rathore et al., 2016) propose an Internet of things and Big Data based architecture through the utilization of a network of linked devices for data collection from the city that can be beneficial to future urban planning decision-making. A smart house, for example, is a house utilizing applications of pervasive technology/computing in a home context (Alam et al., 2012).

In terms of pollution control, a video analytics-based architecture sensor for measuring traffic emissions (Mehta et al., 2016) and sensors for air and humidity (Dutta et al., 2017; Peng et al., 2017) are of importance to adopt in smart cities. As widely accepted, energy generation is quickly expanding, with renewable energy now accounting for 29% of all power produced in the European Union. Since cities consume 75% of all energy produced, it is necessary to incorporate renewable energy into the components that build cities to make them sustainable (Kammen & Sunter, 2016).

The need for improving more economical grids has emerged as cities grow in size (Sánchez-Corcuera et al., 2019). As a result, the advancement of the smart grids will provide numerous advantages to smart cities (Farhangi, 2010). Smart grids can be adopted to integrate the current existing services into modern platforms to create new services for citizens and energy consumers (Fadel et al., 2015). In addition, water has indeed one of the most valuable resources for cities, which is why so many have built up alongside streams or coastlines (Sánchez-Corcuera et al., 2019). In order to make maintain the quality and sustainability of water, several efforts should be made, for example, developing a sensor to control the aquifer salinization (Parra et al., 2015), to monitor heavy metals in fresh water

(Lin et al., 2017), and to regulate water distribution so that polluted drinking water can be minimized (Zhao et al., 2016). Finally, issues on waste management should be also taken into account in smart cities (Anagnostopoulos et al., 2017), for example, creating smart containers with the ability of recognizing when they are filling up and alerting garbage collectors when they are almost filled (Aazam et al., 2016), use of genetic algorithms, establishing more effective waste collection routes as well (Król et al., 2016).

Smart Cities in France and Indonesia

(Jeannot, 2019) investigated whether smart cities founded in France were able to reflect consistency or break with the current national socio-technical regime of French cities. This indicates a continuation of the break with the urban socio-technical regime that has been developed by the smart city project. Moreover, (Azlal et al., 2020) suggested it should address three areas including smart community and services, smart infrastructure, and smart buildings. The collaboration of various stakeholders, i.e., governments, corporate sectors, civil society, academicians, technological experts, and citizens, to support smart city projects in Indonesia play a significant role (Hasibuan & Sulaiman, 2019; Mayangsari & Novani, 2015). All parties, including government with their relevant regulations, should work hand in hand to develop a well-organised smart city (Hasibuan & Sulaiman, 2019). In other words, both technology and social factor should be balanced to enable people's participation (Salamah & Yananda, 2019). Finally, there is a growing need for research, either interdisciplinary or multidisciplinary, on smart city to make continued improvements and gain more holistic overview on the smart city development in the Indonesian context.

THE STUDY

This current study is qualitative in nature, focusing on two cities, Lyon in France and Bandar Lampung in Indonesia, that are key drivers of the area's socioeconomic development, aiming to have a closer look at how each smart city domain, particularly environment-related domain with its subdomains, has evolved in each city. It is publicly accepted that smart cities' role is to connect cities, industry, and inhabitants in attempt to optimise urban living through leveraging innovative potential and more sustainable effective services (Alibegović et al., 2018).

INSTRUMENTS AND DATA COLLECTION

The data collection in the current study was carried out using two types of instruments. First, we collected data to measure indicators of the environment-related domain of smart cities including public space, building, housing, pollution control, renewable energy, smart grid, water management, and waste management (Yin et al., 2015) through interviews with government officials who

were in charge of city development. Second, the data collection activity also involved distributing a five-point Likert scale survey for each city administration and the public to obtain additional information for measuring the indicators of the environment-related domain. To see if the questionnaire's design was appropriate for achieving the study's objective, it was pilot tested (McQuirk & O'Neill, 2016) to ensure that the instructions and questions of the questionnaire were clearly expressed in a comprehensible manner and were of a fair length (Schleef, 2014). Finally, we confirmed the data obtained by triangulating and reporting back to the key informants to ensure the authenticity and accuracy of the information. Triangulation is a strategy for validating findings that is almost mandatory (Miles et al., 2014). In addition, we also made use of secondary data, e.g., official websites, documents, and other related information for data collection.

DATA ANALYSIS

The data collected from interviews were descriptively analysed through coding categorization and pattern classification (Hsieh & Shannon, 2005) based on the indicators or subdomains of the environment-related domain of smart cities (Yin et al., 2015), with the goal of providing comprehensive explanatory a social phenomenon interpretations (Tesch 1991 as cited in (Dey, 2005). The data obtained from the questionnaire were quantitatively analysed using SPSS 23 for Windows through a descriptive statistics procedure. This analysis was undertaken to look at the participants' views of smart cities, especially the environment-related domain.

RESULTS

Numerous cities have attempted to transition from traditional metropolitan areas to smart cities over the last decade. However, in many cases, despite significant private and public investment, those efforts have been fruitless (Sánchez-Corcuera et al., 2019). As a result, we intend to shed light on the development of smart cities in Indonesia and France, particularly in Bandar Lampung and Lyon cities in terms of the environment. Regarding participants' perception of an environment-related domain, we focused on eight constructs as follows. The first construct is the building-related aspect in Table 1 below.

Building

Table 1: Participants' perception of smart city development in terms of environment-related aspect of building in Bandar Lampung City, Indonesia

Statement	Response				
	SD	**D**	**N**	**A**	**SA**
Building					
Existing buildings are constructed in accordance with sustainable development principles.	0 (0%)	7 (3.7%)	56 (29.6%)	84 (44.4%)	42 (22.2%)
Existing structures have incorporated the concept of zero-energy buildings.	0 (0%)	21 (11.1%)	77 (40.7%)	63 (33.3%)	28 (14.8%)
Each building is capable of meeting its own energy requirements.	0 (0%)	14 (7.4%)	70 (37%)	56 (29.6%)	49 (25.9%)
The existing building network takes sustainability into account.	0 (0%)	7 (3.7%)	63 (33.3%)	77 (40.7%)	42 (22.2%)
The building's network is well-organized and distributed.	0 (0%)	7 (3.7%)	63 (33.3%)	77 (40.7%)	42 (22.2%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 1 illustrates participants' perceptions of smart city development in terms of environmental-related building aspects in Bandar Lampung City, Indonesia. It is clear that more than half agreed and strongly agreed that the existing buildings were built according to the principles of sustainable development, taking into account sustainability with a well-organized and distributed network of buildings. They also see that each building is capable of meeting its own energy needs. However, only less than half of them believe that existing buildings have incorporated the concept of a zero-energy building.

Housing

Table 2. Participants' perception of smart city development in terms of environment-related aspect of housing in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Housing					
The concept of smart home has been implemented.	0 (0%)	21 (11.1%)	70 (37%)	63 (33.3%)	35 (18.5%)
Renewable energy is used to power the household furniture.	0 (0%)	7 (3.7%)	35 (18.5%)	112 (59.3%)	35 (18.5%)
Existing community houses have incorporated disability-accessible features.	0 (0%)	49 (25.9%)	49 (25.9%)	56 (29.6%)	35 (18.5%)
The use of green plants as an entertainment medium.	0 (0%)	7 (3.7%)	28 (14.8%)	77 (40.7%)	77 (40.7%)
The creation of a home environment that creates a favourable impression.	0 (0%)	7 (3.7%)	35 (18.5%)	70 (37%)	77 (40.7%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 2 informs about participants' smart city development perception in terms of environment-related aspect of housing in Bandar Lampung City, Indonesia. It is apparent that nearly 100% of them said agree that housing has used green plants as an entertainment medium, followed by the creation of a home environment that creates a favourable impression. The majority of them also believe that renewable energy has been used to power household furniture. However, less than half of them agree and strongly agree that the concept of smart home has been well implemented. In addition, they also show similar disagreement that existing houses have not incorporated disability-accessible features.

Pollution Control

Table 3. Participants' perception of smart city development in terms of environment-related aspect of pollution control in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Pollution control					
Pollution control is governed by rules and regulations.	7 (3.7%)	0 (0%)	42 (22.2%)	77 (40.7%)	63 (33.3%)
Numerous attempts to monitor and manage pollution have been made.	7 (3.7%)	0 (0%)	70 (37%)	77 (40.7%)	35 (18.5%)
The technology is used to determine whether there is excessive pollution in the environment.	14 (7.4%)	14 (7.4%)	56 (29.6%)	70 (37%)	35 (18.5%)
The community utilises and manages the technology used to evaluate and collect data on air quality.	7 (3.7%)	14 (7.4%)	63 (33.3%)	70 (37%)	35 (18.5%)
Environmental management is well-implemented through an integrated system.	0 (0%)	21 (11.1%)	42 (22.2%)	70 (37%)	56 (29.6%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 3 informs about participants' smart city development perception in terms of environment-related aspect of pollution control in Bandar Lampung City, Indonesia. It is clear that the participants believe that pollution control is governed by rules and regulations, with numerous attempts being made to monitor and manage pollution. More than half of them also agree and strongly agree that environmental management is well-implemented through an integrated system. In addition, more than half of them also view that technology is used to determine whether there is excessive pollution in their environment, with

community utilizing and managing technology to evaluate and collect data on air quality.

Public Space

Table 4. Participants' perception of smart city development in terms of environment-related aspect of public space in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Public space					
In a public area, there is a green space.	0 (0%)	14 (7.4%)	21 (11.1%)	49 (25.9%)	105 (55.6%)
In certain areas, there are awards for reforestation efforts and environmental stewardship.	0 (0%)	14 (7.4%)	28 (14.1%)	56 (29.6%)	91 (48.1%)
Areas that are not currently being used for green open spaces are repurposed.	0 (0%)	14 (7.4%)	35 (18.5%)	49 (25.9%)	84 (44.4%)
Control and supervision of public spaces are accomplished through the use of technology.	0 (0%)	21 (11.1%)	28 (14.8%)	63 (33.3%)	77 (40.7%)
The development of public spaces is transparent to the general public.	0 (0%)	7 (3.7%)	35 (18.5%)	63 (33.3%)	84 (44.4%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 4 above informs about participants' smart city development perception in terms of environment-related aspect of public space in Bandar Lampung City, Indonesia. It is evident that more than 75% of them agree and strongly agree that the city has a green space in public areas. The majority of them (more than 70%) also show their agreement that there are awards for reforestation efforts and environmental stewardship, areas not currently being used for green open spaces are repurposed, supervision of public spaces are accomplished through the use of technology, and the development of public spaces is transparent to the general public.

Renewable Energy

Table 5. Participants' perception of smart city development in terms of environment-related aspect of renewable energy in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Renewable energy					
There has been a noticeable increase in the use of renewable energy.	0 (0%)	7 (3.7%)	21 (11.1%)	84 (44.4%)	77 (40.7%)

The use of potentially harmful nuclear energy is significantly reduced.	0 (0%)	14 (7.4%)	21 (11.1%)	70 (37%)	84 (44.4%)
Renewable energy is used in every aspect of life.	0 (0%)	7 (3.7%)	42 (22.2%)	84 (44.4%)	56 (29.6%)
There are efforts being made to reduce our reliance on fossil fuels.	7 (3.7%)	7 (3.7%)	35 (18.5%)	84 (44.4%)	56 (29.6%)
Regulations govern the use of sustainable energy sources.	0 (0%)	14 (7.4%)	35 (18.5%)	63 (33.3%)	77 (40.7%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 5 above informs about participants' smart city development perception in terms of environment-related aspect of renewable energy in Bandar Lampung City, Indonesia. It is apparent that nearly 100% of the participants believe that there has been a noticeable increase in the renewable energy use in the city. Moreover, more than 70% of them also show agreement that use of harmful energy has been significantly reduced, renewable energy is used in every aspect of life, efforts are made to reduce reliance on fossil fuels, and sustainable energy sources are governed by regulations.

Smart Grid

Table 6. Participants' perception of smart city development in terms of environment-related aspect of smart grid in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Smart grid					
There is a commendable effort being made to develop the infrastructure network.	0 (0%)	28 (14.8%)	70 (37%)	84 (44.4%)	84 (44.4%)
There are parties and regulations that govern the infrastructure's layout.	0 (0%)	0 (0%)	35 (18.5%)	63 (33.3%)	91 (48.1%)
There is a commitment to implementing an energy-efficient infrastructure layout.	0 (0%)	7 (3.7%)	28 (14.8%)	49 (25.9%)	105 (55.6%)
The use of renewable energy is becoming more integrated into society.	0 (0%)	21 (11.1%)	14 (7.4%)	84 (44.4%)	70 (37%)
Advanced models for infrastructure management are being used to reduce energy consumption.	0 (0%)	14 (7.4%)	49 (25.9%)	56 (29.6%)	70 (37%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 6 above informs about participants' smart city development perception in terms of environment-related aspect of smart grid in Bandar Lampung City, Indonesia. Nearly 100% of the participants believe that a commendable effort is being made to develop the infrastructure network, with

parties and regulations governing the infrastructure's layout and commitment to implementing an energy-efficient infrastructure layout. In addition, nearly all of them also view that the use of renewable energy is becoming more integrated into society, with advanced models for infrastructure management are being used to reduce energy consumption.

Waste Management

Table 7. Participants' perception of smart city development in terms of environment-related aspect of waste management in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Waste management					
Special regulations and rules govern the responsibility to manage waste.	0 (0%)	7 (3.7%)	42 (22.2%)	49 (25.9%)	91 (48.1%)
There is an environmentally hazardous waste management facility.	7 (3.7%)	21 (11.1%)	42 (22.2%)	56 (29.6%)	63 (33.3%)
Waste management is accomplished through the implementation of a technological system.	0 (0%)	7 (3.7%)	42 (22.2%)	70 (37%)	70 (37%)
The procedure for managing large amounts of household waste is streamlined.	0 (0%)	14 (7.4%)	49 (25.9%)	56 (29.6%)	70 (37%)
There is socialisation regarding waste management.	0 (0%)	14 (7.4%)	35 (18.5%)	42 (22.2%)	98 (51.9%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 7 above informs about participants' smart city development perception in terms of environment-related aspect of waste management in Bandar Lampung City, Indonesia. The majority of the participants agree that the city has special regulations and rules governing the responsibility to manage waste, with the existence of environmentally hazardous waste management facility. They also show agreement that waste management is accomplished through the implementation of a technological system, with procedure for managing large amounts of household waste being streamlined. They also agree that there is socialisation regarding waste management.

Water Management

Table 8. Participants' perception of smart city development in terms of environment-related aspect of water management in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Water management					
There are natural springs nearby.	0 (0%)	7 (3.7%)	21 (11.1%)	91 (48.1%)	70 (37%)

The regulator exerts control over the use of naturally clean water.	7 (3.7%)	14 (7.4%)	28 (14.8%)	56 (29.6%)	84 (44.4%)
There is the application of technology in determining the feasibility of utilising water.	7 (3.7%)	14 (7.4%)	28 (14.8%)	49 (25.9%)	91 (48.1%)
Efforts are being made to prevent and detect water pollution.	14 (7.4%)	7 (3.7%)	28 (14.8%)	42 (22.2%)	98 (51.9%)
Industrial waste disposed of in water sources is governed by rules and regulations.	7 (3.7%)	0 (0%)	35 (18.5%)	63 (33.3%)	84 (44.4%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 8 above informs about participants' smart city development perception in terms of environment-related aspect of water management in Bandar Lampung City, Indonesia. More than 70% of the participants agree that the city has natural springs, with regulator exerting control over the use of clean water. They also believe that technology is utilized to determine the feasibility of water for use, with efforts being made to prevent and detect water pollution. Finally, the majority of the participants also show agreement that industrial waste disposed of in water sources is governed by rules and regulations.

In addition to the results of the questionnaire as presented above, we also collected data through interviews with key actors in Bandar Lampung and Lyon cities. Here are the excerpts of the interviews.

> Bandar Lampung's Department of Communication and Information continues to support the realisation of the smart city programme, which was launched in mid-2019. Later, everything will be integrated (Key Actor 1, Bandar Lampung).
>
> Additionally, the Smart City concept promotes a more sustainable environment through the use of advanced waste and water management concepts (Key Actor 2, Bandar Lampung).
>
> We are currently expanding the network of internet infrastructure in 20 sub-districts and 126 urban villages. Additionally, we will develop an infrastructure network at the Bandar Lampung City Secretariat, consisting of approximately 1,000 metres of fibre optic cable, in order to establish a command centre and data centre (Key Actor 3, Bandar Lampung).
>
> In order to be more integrated, we've tightened housing developer regulations (Key Actor 3, Bandar Lampung).
>
> Our green open space is more than adequate and contributes to a sustainable environment (Key Actor 3, Bandar Lampung).

> We recognise that there are still gaps in renewable energy, waste management, and pollution control, but this is not an impediment, but rather our challenges to create a smart environment (Key Actor 1, Bandar Lampung).

> Lyon Smart City project began ten years ago. The first step on the path to a smart city was partnering with large companies. The implementation of self-service bicycles laid the groundwork for this city's smart city journey. Vélo'v. Since then, we have developed a lot of innovations (Key Actor 1, Lyon).

> The following are some examples of Lyon's smart city projects: The Optimod project aims to transform an individual's relationship with urban travel by incorporating a variety of modes of transportation, including the Navya Project, which features a driverless bus, and the Sunmoov Project, which features a solar-powered car sharing service (Key Actor 2, Lyon).

> In terms of smart environment, we have taken several actions to address environmental concerns, including pollution control, energy consumption, and solar/renewable energy use (Key Actor 3, Lyon).

DISCUSSION

Findings above illustrate that the participants perceive Bandar Lampung to be a city with a smart environment concept, showing agreement that buildings have been constructed according to sustainable development principles although they also believe that the existing buildings have not fully incorporated a concept of zero-energy buildings. Housing in Bandar Lampung has implemented green plants as entertainment medium, creating a favourable impression. However, the so-called smart home concept has not been fully implemented. In terms of pollution control, Bandar Lampung administration has controlled it with a number of attempts being made to monitor and manage pollution. The city also has green public areas, with technology being used to monitor them. Cities should develop green zones because they benefit both citizens and the environment. (Sánchez-Corcuera et al., 2019), Vitoria-Gasteiz, the capital of northern Spain's Basque Country, for example, received an award for its green spaces as a result of its friendlier environment (Cömertler, 2017). In addition, it is also believed that there has been a noticeable increase in the use of renewable energy in the city. It is also found that a commendable effort is being made to develop the infrastructure network of the city, involving parties and regulations governing the infrastructure's layout and commitment to implementing an energy-efficient infrastructure layout. Likewise, this is true for waste management. Bandar Lampung has an environmentally hazardous waste management facility where waste is managed using a technological system that streamlines the process of managing large amounts of household waste. In terms of water management, the city has natural springs, and technology is being used to determine the feasibility of using the water, as well as efforts to prevent and detect water pollution.

However, the findings of the interviews indicate that the municipality of Bandar Lampung has not completely implemented the so-called smart environment related domain for smart city, but their green open space. To create a complete smart environment, the municipality is facing challenges in terms of renewable energy, waste management, and pollution control. Moreover, they are at the present expanding the Internet infrastructure for a command and data center. This indicates that the municipality is not yet well-prepared for a smart city development, especially smart environment related domain.

Lyon Metropolis, on the contrary, seems to be smarter compared to Bandar Lampung. Lyon pursued a policy of facilitation in order to attract private innovation under the banner of smart cities to their territory, making it the first city to implement smart grid infrastructures. As stated in the literature, a smart city development has always been linked to IBM, Cisco, and Microsoft announced in the early 2000 (Portmann, 2015). Thus, to enable city actors to implement smart city solutions, the project could be completed in collaboration with the IT industry (Glasmeier & Christopherson, 2015). Since the launch of the Smart Metropolis strategy in 2012, approximately twenty operations within the programme have generated investment flows totalling approximately 350 million euros from both public and private actors (consolidated data between 2012 and 2017) (Wahyuddin, 2019). Lyon is a pioneer in the field of smart cities (Belot, 2017). In France, smart cities represent a continuation rather than a urban socio-technical regime rupture with smart city projects have developed (Jeannot, 2019). Additionally, a smart city should focus on three areas: intelligent communities and services, intelligent infrastructure, and intelligent buildings (Azlal et al., 2020; Lim et al., 2019). Therefore, Lyon is a more developed smart city than Bandar Lampung, having enlisted the support of numerous private sectors for their smart city initiatives.

CONCLUSION

Based on our findings, the smart city development in Lyon, France in terms of environment-related domain is more developed compared to Bandar Lampung, Indonesia. Lyon has enlisted additional private sector supporting for the development concept, while everything necessary for smart city development is now being prepared in Bandar Lampung. Therefore, the findings of the current study have implications. To support smart city projects, collaboration among various stakeholders is required. All stakeholders, including the government and its relevant regulations, should collaborate to create a well-organized smart city (Boon et al., 2020). In other words, both technology and social factors must be balanced in order to allow for citizen participation. Additionally, a socio-political dimension should be considered when developing a smart city. There is an increasing need for interdisciplinary or multidisciplinary research in order to

make continuous improvements and gain a more holistic perspective on the development of smart cities in the Indonesian context.

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