



Heriot-Watt University
Research Gateway

Open Government Data for Urban Management in Indonesia's Smart Cities

Citation for published version:

Rahmah, C, Rilansari, V, Ulhaq, WD & Satyartha, J 2024, 'Open Government Data for Urban Management in Indonesia's Smart Cities', *IOP Conference Series: Earth and Environmental Science*, vol. 1353, 012035. <https://doi.org/10.1088/1755-1315/1353/1/012035>

Digital Object Identifier (DOI):

[10.1088/1755-1315/1353/1/012035](https://doi.org/10.1088/1755-1315/1353/1/012035)

Link:

[Link to publication record in Heriot-Watt Research Portal](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

IOP Conference Series: Earth and Environmental Science

General rights

Copyright for the publications made accessible via Heriot-Watt Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

Heriot-Watt University has made every reasonable effort to ensure that the content in Heriot-Watt Research Portal complies with UK legislation. If you believe that the public display of this file breaches copyright please contact open.access@hw.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Open Government Data for Urban Management in Indonesia's Smart Cities

C Rahmah¹, V Rilansari¹, W D Ulhaq¹, and J Satyartha²

¹ Urban and Regional Planning, ITERA, Lampung, Indonesia. South Lampung. 35365

²Sustainable Water Management & Soundscapes, Heriot Watt University, Edinburgh, United Kingdom. EH14 4AS

E-mail: chania.mr@pwk.itera.ac.id

Abstract. Rapid implementation of Open Government Data (OGD) across the world comes as the result of the advancement of Information, and Communication Technology in the government sectors to support decision making process including for urban planning. In one side, countries such as European countries, UK, and US has been implementing OGD while developing the framework and the maturity standard to ensure its quality. In the other side, Indonesia had just begun to develop several OGD portals which some of the practices could be found in its smart city namely Jakarta, Bandung, and Surabaya. The established OGD portals goals are to achieve transparency, government accountability, support innovation and development. This data-rich portals have potential roles for creating data-driven urban management. However, very least research observed implication of OGD practices in Indonesia for urban management. Therefore, this study aims to answer the question on how OGD portal could support urban management in Indonesia smart cities. The study identifies the implication of three open government data portals operated by smart cities in Indonesia by extracting and analysing the available data for urban management. The identification will be conducted with descriptive qualitative method based on open data principles and data-driven urban management dimensions. The study finding will explore the OGD practice level for urban management in Indonesia and recommend the improvement if needed.

1. Introduction

Rapid implementation of Open Government Data (OGD) across the world comes as the result of the advancement of Information, and Communication Technology in the government sectors to support decision making process including for urban planning. Various countries have been developing open data portals and it has been observed and assessed by numerous studies [1], [2]. European Commission [3] describes OGD as public sector information or the information collected, produced, or paid for by the public bodies and accessible freely for any purpose. These OGD contain public dataset which posted on an open web data. It considers as a valuable new data stream in policy-making processes if it combines with digitalization and the new analytical tools and capacities [4]. OGD also often related to two common terms: Open Government and Open Data[5]. Open government is achieved by openness and transparency in the governance activity or also referring to E-government [6]. Meanwhile, open data promotes innovative, evidence-based policy solutions and boost economic and social development for society [7]. In term of urban development, OGD found to be an important step for improving quality of life, service efficiency, access information, while reducing data transaction costs to enhance performance of activity and build new business opportunities [8].



As a lower-income country, Indonesia applied Open Data effort late in 2011 following the Open Data Partnership. In one side, countries such as European countries, UK, and US has been implementing OGD while developing the framework and the maturity standard to ensure its quality[9] [10]. In the other side, less developed countries tend to have less data openness. A project from Open Knowledge Foundation called the Global Open Data Index or GODI [2] conduct a ranking for Open Data Level globally. Taiwan is in the first position with 90% open data index followed by Australia (79%), Great Britain (79%), and France (70%) while Indonesia (25%) is on number 61 from total 94 countries in the list. The open data in this index refer to government budget, national statistics, procurement, national laws, administrative boundaries, draft legislation, air quality, national maps, weather forecasts, company register, election results, locations, water quality, government spending, and land ownership.

Currently Indonesia government expanding the development of open data in national and local scale. The commitment was strengthened by the support of national policy about One Data written in Presidential Regulation number 39 of 2019 about One Data Indonesia. OGD application in local level could be found in some cities which incorporate smart city concept in its development such as Jakarta (<https://data.jakarta.go.id/>), Bandung (<http://data.bandung.go.id/>), and Surabaya (<https://opendata.surabaya.go.id/>). It was the cities government commitment to implement national regulation. For Jakarta specifically, local government launched Governor Regulation number 181 of 2014 about Systems and Procedures for Development Data and Information Management. Moreover, Surabaya also has Mayor Regulation Number 126 Year 2021 about One Data Indonesia in Surabaya Level. From each existing OGD portal vision and goals, those three cities claimed the role of OGD portal is to achieve transparency, government accountability, support innovation and development.

OGD existence directly and indirectly benefits urban management activity. Thus, the agenda and commitment of three smart cities in Indonesia for realizing OGD potentially contribute to improve urban management. It is because urban management requires data driven analysis to untangle rapid urbanization and its challenges. Current urban management is facing complex systems regarding economic, social, environmental, and transportation issues in the city [11]. In Indonesia, challenges of urban management are about effectiveness of the city planning, coordination between government bodies, limited service of ICT, also lack of public participation system [12]. OGD as a data-rich concept could provide urban data to explore and portray the real problems in urban areas and lead to a more effective decision making also expected to rise participation. Furthermore, a smart city which powered by data could achieve sustainable urbanism and innovative establishment of sustainable cities [13]. Accordingly, the available data-rich portals may have advantage to data-driven urban management process. However, some of OGD operation around the world found to be limited for data provision platform without further benefit for collaboration or research [10]. Very limited research and evidence about OGD implementation in Indonesia and to what extend the existing OGD potential for urban management. Therefore, this paper explores the OGD implementation and usability for urban management practice in smart cities in Indonesia.

2. Literature Review

The literature review in this paper explores the relationship between OGD and urban management and its principles. From literature evidence we would see the role of OGD for urban management. Moreover, this section also unpacks the basis of OGD including its implementation principles. The principle in this paper is a guideline to build a credible and well-performed OGD which later used for the analysis of this paper as variables to assess OGD implementation and usability.

OGD for Data-driven Urban Management

OGD usefulness related to various field such as building and planning, economy, or public policy[14], [15], [16]. From various perspectives OGD often correlated with the efficiency, transparency, and

openness in government and decision-making process [15]. Yet very least literature discuss about direct or indirect relation between OGD and urban management. Hence, this paper tries to identify how OGD would benefit urban management. OGD is highly valuable in supporting data-driven urban management. It is expected to provide a public data infrastructure which are freely available, accurate, complete, and timely. Data in data-driven urban management is closely correlated with big data [13], [17]. Big data in the urban context has four roles. First, big data become a source of information and knowledge. Second, big data relate to the development of new tools, and practices to process the big data. The process of utilizing big data will require specific method and tools to capturing, cleaning, storing, sharing, analysing, visualizing, and interpreting the data. Third, the use of big data and the emerging interest has made a new community. This issue drives a huge sift in society about the use big data, data source is becoming more decentralized and analytical tools is more accessible to the wider public.

Thus, to define data-driven management, Wu [18] specify urban management into 10 dimensions which could be intervened by big data. Key dimension of data-driven urban management is including the dimension of smart planning, smart transport, smart traffic, smart waste management, smart energy, smart environment, smart infrastructure, smart safety, smart healthcare, and citizen participation [18]. Those key dimensions are the indicators of OGD implementation for urban management. Hence, this paper will further analyze whether the OGD in Indonesia correlated to data-driven urban management by assessing the contribution for each dimension.

Open Government Data Principles

Open Government Data implementation has never been ideal both in developed or lower-income countries. Barriers in OGD adoption found in every implementation phase. Thus, principles have been established to ensure and guide the development of OGD. In general, there are six steps of open data process including creating data, publishing data, finding data, using data, discussing data, and providing feedback on them [19]. Additionally, problems regarding OGD found in several issues such as OGD Portal operation, engagement with the public, data quality, data utilization, organization data privacy, and data interoperability [20]. It could be categorized into few aspects such as economics, legal and privacy, government culture, technical, and social [21]. Therefore, several institutions and researchers build fundamental principles as OGD framework to minimize the barrier and guide the OGD creation process.

Since the beginning of Open Data movement, principles have been conducted and adjusted by several institutions and researchers. First, Tauberer [5] in his book titled *“Open Government Data: The Book”*, he mentioned the 8 principles of OGD which set by a working group lead by Carl Mamud in 2007. This is the earliest principles of OGD, and it remains relevant until now. The principles explain that government data shall be considered open if the data is available publicly and following principles such as 1) Complete, 2) Primary, 3) Timely, 4) Accessible, 5) Machine Processable, 6) Non-Discriminatory, 7) Non-Proprietary, and 8) Licence-Free and additionally it must be reviewable. Furthermore, Open Data Charter (2015) as a collaborative forum of 170 governments and organisations set Open Data Principles namely: 1) Open by Default, 2) Timely and Comprehensive, 3) Accessible and Usable, 4) Comparable and Interoperable, 5) Improved Governance and Citizen Engagement. The two prior Open Government Data Principles have something in common. However, Open Data Charter added a more social principles about improving governance and citizen engagement. Although, current condition of OGD portals is far from ideal. OECD report explains that open government data version 3.0 is not user-driver [10]. The OGD 3.0 only facilitates access to data instead of becoming a collaborative platform. It could be found in OECD Countries where OGD data portal’s main goal is the provision of government data while the collaborative tools are hardly available.

The existing principles also developed by other researchers from diverse background such as computer engineering. Previous mentioned principles were arranged by two different institutions upon group discussions and agreements. Meanwhile Vetro [22] define a set of quality attributes of Open Government Data based on Square-Aligned Portal Data Quality Model (SPDQM) which specifically addressing the OGD implementation problems. Data quality is crucial to strengthen the value of data as infrastructure, and its overall potential as a platform for collaboration [10]. Thus, the set of quality attributes by Vetro consist of 1) traceability, 2) currentness, 3) expiration, 4) completeness, 5) compliance, 6) understandability, and 7) accuracy. Accuracy considers as OGD principle that ensure data quality contain in the dataset. It divided into two metrics namely percentage of accurate cells and accuracy in aggregation. This principle indicates the accuracy level of data by indicating the proportion of correct value cells in the dataset according to its domain and type of information.

Other principles developed by governmental institutions of Federal Enterprise Data Resources of USA. It defines the principles of OGD namely: 1) Public, 2) Accessible, 3) Described, 4) Reusable, 5) Complete, 6) Timely, 7) Managed Post-Release. The OGD principles by USA government explain that accessible is the ability of data to be conveniently modifiable and easily opened, retrieved, downloaded, indexed, and searched. Hence, the data format should be machine-readable and reasonably structured to allow automated processing. The data should be described clearly so that the user understand the strengths and weaknesses, analytical limitations, and security requirements to decide the applicable analysis.

The above-mentioned principles are very diverse but by careful identification could be extracted into similar intended meaning. Principles would guide this paper identify the extend of OGD implementation in Indonesia.

3. Method

This paper will examine the existing OGD portals owned by three smart cities in Indonesia and seek the condition of current implementation for Urban Management in Indonesia's smart cities. Descriptive qualitative method is the main analysis of this paper because it enables the paper to explore deeper about OGD implementation such as the quality and weakness. This Study analyzes three OGD portals with Web Content Analysis outlining the status of OGD initiatives and framework for Urban Management in Indonesia's smart cities namely Jakarta, Bandung, Surabaya. Three smart cities were chosen because it considered to be three biggest smart cities in Indonesia in terms of population and economy and considered very representative as ideal precedents. The principles of web content analysis are to unpack objective, systematic, and quantitative description of the content of the web [23].

To conduct the web content analysis to three open data portals, we define the principles of Open Government Data (OGD) as a guidance for assessing functionality of the existing OGD in three smart cities.

Table 1. Open Government Data Principles

Principles	Tauberer, 2014	Open Data Charter, 2015	Vetro et.al, 2017	Sunlight Foundation, 2018	Resources.data.gov 2020
Completeness, Compliance	v	v	v	v	v
Primacy, primary	v			v	

Principles	Tauberer, 2014	Open Data Charter, 2015	Vetro et.al, 2017	Sunlight Foundation, 2018	Resources.data.gov 2020
Timly and Comprehensive, Timeliness, currentness, Expiration, Permanence	v	v	v	v	v
Machine readability and Processable, Comparable and Interoperable	v			v	
Accessible, Ease of Physical and Electronic Access, usable		v		v	v
Licensing free, Licensing, Reusable	v			v	
Traceability, Managed Post-Release, Reviewable	v		v		v
Public, Open By Default, Non-Discrimination. Non-Proprietary, Use of Commonly owned standard, Usage costs	v			v	
Described, Understandability			v		v
Citizen Engagement		v			
Inclusive Development and Innovation		v			
Accuracy		v			

We applied Web content analysis to explore the OGD portals content hosted by three smart cities in Indonesia. These web content analyses insist the secondary data collection from the existing OGD portal. Web content analysis in this study is built upon the previous framework: OGD principles and Data-driven urban management dimensions. From literature review in previous section, we can utilize the dimension of data-driven urban management from [13]. Wu [13] describes data-driven urban management into ten dimensions: 1) Smart Planning, 2) Smart Transport, 3) Smart Traffic, 4) Smart Waste Management, 5) Smart Energy, 6) Smart Environment, 7) Smart Infrastructure, 8) Smart Safety, 9) Smart healthcare, 10) people's participation.

4. Results and Discussion

Open Government Data in Indonesia

Before further analyzing the content of OGD portal in Indonesia, we will specifically discuss an overview about OGD in Indonesia. Open Government Data (OGD) truly launched in 2009 when Sunlight Foundation run Transparency Camp Conference and develop numerous apps outside of government [5]. Following the technology advancement and the new open data movement, Indonesia created an Open Data Portal called One Data Indonesia (data.go.id) which established in 2019 following the presidential regulation about one data. Although, the digital open data started a bit late, the conventional open data in Indonesia had been launched online long time ago through National Statistics Office (BPS) and freely accessible on bps.go.id. Indeed, government institutions is the biggest producer of public data including statistics, map, and satellite data. However, this conventional open data was facing many problems such as non-machine-readable and do not support non-proprietary format because data was posted in Pdf document or excel tables [24]. Whilst the most proper format that support machine-readability and non-proprietary is CSV or Coma Separated Value.

Nowadays, the spread of OGD adoption reaching to local governments level both in regencies and cities across Indonesia along with smart city concepts. Smart Government is one of the Smart City Dimensions

in Smart City concepts. Thus, cities considered having an Open Data Portal is a way to apply smart government to promote transparency and participation as stated in their OGD Portals (see Table 2). In addition, participatory and engagement capability are seen to be the reflection of Open Government primary characteristic in OGD Portals [1].

Table 2. General Information of OGD Portals

General Information	Jakarta	Bandung	Surabaya
Web URL	https://data.jakarta.go.id/	http://data.bandung.go.id/	https://opendata.surabaya.go.id/
Dataset Amount	2.270 Dataset	3.108 Dataset	1.066 Dataset
Organizations source	53 Organization	78 Organization	68 Organization
Categories	27 Topics	8 Topics	16 Topics
Format	csv	csv, xlsx	csv
Goals	Data.jakarta.go.id is an Integrated Data Portal to become an accurate, up-to-date Data Portal also open, integrated, complete, accountable, dynamic, reliable, valid, easily accessible and sustainable, and can provide data and information needed by the public and fulfill public rights as a form of implementing e-government in the context of realizing transparent and accountable governance.	The presence of open data in the City of Bandung basically aims to support the realization of the vision and mission of the City of Bandung. Based on the vision of the City of Bandung, the open data vision of the City of Bandung is as follows: Through Open Data, we will make Bandung a transparent, accountable, and innovative city.	The implementation of One Data for the City of Surabaya is regulated in Surabaya Mayor Regulation Number 126 of 2021 concerning One Indonesian Data at the Surabaya City Level. Through Satu Data, the Surabaya City government is trying to build good data governance to realize government transparency and accountability, as well as support national development.

Local governments across Indonesia produce enormous open data website. However, from the exploration those three cities have the most proper OGD portals. Bandung, Jakarta, and Surabaya are also classified as biggest city in Indonesia in term of population and its economic activity or GRDP. By exploring the OGD portal of these three cities we can identify the most advanced implementation of OGD in Indonesia.

Overall, finding in this paper will be discussed into two focuses; first finding is about is about examine the roles or how the available open government data published in OGD portal potentially contribute to data-driven urban management. Second one is about the overall OGD implementation in Indonesia based on the OGD principles.

Role of OGD for Urban Management

The exploration on the three OGD portals show that the portals have been provided data about all of data driven urban management dimensions. We can see from the data example below:

Table 3. Open Government Data Example in Smart City's Open Government Data Portals

Data Driven Urban Management Dimensions	Data Example		
	Jakarta	Bandung	Surabaya
Smart planning	Data on the Number of Tourists in the Thousand Islands Region in 2017 (every month), Regional Innovation Data for DKI Jakarta Province (2019-2021)	Data on requests for City Plan Information (2013-2017), TPU Land Use Data (2017), Number of Building Units and Regularity of Residential Buildings Based on RT/RW Level (2017)	Number of locations where slum prevention is implemented (2022-2023), Number of flats and landed houses capacity provided (2022-2023)
Smart transport	Data on Parking Types and Locations (2017-2019), Data on the List of Collector Roads in DKI Jakarta (2014), Data on the List of Secondary Primary Arterial Roads in DKI Jakarta (2014)	Road conditions in the city of Bandung (2017-2021), data on the number of fleets and transport routes for the city of Bandung (2017-2022)	Data on Parking Types and Locations (2017-2019), Number of road construction / reconstruction locations (DAK Physical) (2022-2023)
Smart traffic	Average Speed in 41 Main Road Corridors during Rush Hours (2019-2020), ATCS Development Data in DKI Jakarta, Data on Causes of Congestion in DKI Jakarta Province (2011)	Data on Damri Bus Routes for Bandung City (2014-2021), Routes and Number of School Bus Fleets for Bandung City (2017-2021),	Number of Motor Vehicles that Pass the KIR Test (2022-2023), Number of Motor Vehicles Required to Test that Carry Out the KIR Test at Motor Vehicle Testing Locations (2022-2023)
Smart waste management	DKI Jakarta Waste Filter Location Data (2014), Household B3 Waste Management Service Data (2021)	Achievements in Waste Handling in Bandung City (2017-2021), Data on Garbage Truck Transportation Vehicles Resulting from Assistance (2015)	Amount of waste entering TPS 3R (2022-2023), Amount of waste processed at TPS 3R (2022-2023), Number of waste transport locations \leq 1 day (2022-2023)
Smart energy	Data on the number of gas customers according to the administrative city of DKI Jakarta (2012-2013), data on the amount of power (KwH) ready to sell, sold and lost according to the month of DKI Jakarta (2012 2014)	Supply and Loss of Electrical Energy in the Bandung City State Electricity Company (2016), Number of Connected Power Customers and Energy Sold by the State Electricity Company in Bandung City (2017)	Number of environmental entities participating in the development and/or utilization of alternative energy (2022)
Smart environment	DKI Jakarta Green Belt Data, List of RPTRA Construction Locations in DKI Jakarta Province, Park Data in DKI Jakarta, Air Pollution Standard Index (ISPU) 2010-2021 (every month)	Data on the realization of RW parks in Bandung City based on sub-districts (2017-2018), number and area of parks based on sub-districts in Bandung City sub-regions (2019)	Number of City Parks and Their Area Managed by the Government in 2023, Number of City Parks and Their Area Managed by the Government in 2023
Smart infrastructure	Drilling Well and Well Customer Data According to DKI Jakarta Admin City (2012), PAM Customer Data According to DKI Jakarta Customer Type (2015)	List of applications in the city of Bandung with operational status (2018-2019), List of applications in the City of Bandung with trial status (2018-2019)	Number of new and/or upgraded sports facilities (2022-2023)
Smart safety	Ratio Data on the Number of Satpol PP Officers Per 10,000 Population in 2021, Data on the Coverage of Community Protection Officers	Bandung City Diskominfo CCTV Data (2016-2020), Bandung City Hydrant Data (location in the form of a road) (2014-2017)	Well and Fire Tank Data (2022), Protection System Data (2022), Number of natural disasters with response time \leq 24 hours (2022)

Data Urban Management Dimensions	Driven	Data Example		
		Jakarta	Bandung	Surabaya
art healthcare		(LINMAS) for DKI Jakarta Province in 2020		
		Posyandu Data (2020-2021), Data on the Number of Health Workers for DKI Jakarta Province (2007-2020)	Number of Patients Based on Clinics at RSKGM (2017-2022), Posyandu in Sukasari District etc. Bandung City (2017-2020)	Number of Community Health Centers that provide maintenance and procurement of medical equipment (2022-2023), Number of Community Health Centers that provide health services for the elderly (2022-2023)
Citizen participation		Data on Community Complaints submitted via the CRM Application in 2021 (every month), Community Satisfaction Index Data for KJP Plus Recipients (2019)	Number of Mail Services in Cicendo District, Bandung City (2018-2020), Superior RW Program in Cicendo District, Bandung City (2019-2020)	Number of people participating in cleanliness management (2022), Number of institutions/organizations/heroic groups participating in heroic activities (2022)

As we can see from the table above, the data collected and published in three smart cities mostly are about administrative data. Those administrative data indeed useful as a transparency effort to society about the government programs such as data about Community Satisfaction Index about KJP Plus (Jakarta Smart Card Plus), or data about Achievements in Waste Handling in Bandung City, and Number of locations where slum prevention is implemented in Surabaya. In contrary, there is no data collected from IoT or sensor in all three cities. Nikiforova [25] argue that nowadays Society 5.0 require ‘smarter’ OGD which consist of real-time data and sensor-generated data to drive sustainable economy and enhance ICT innovation in smart cities. It shows that data generated not only with conventional way but it also insists a more advance data collection such as sensor or IoT. Consequently, it is a mandatory for government not only generate and publish Big-Data in OGD portal but also establish the system architecture regarding data generation process for smart urban’s big data including data aggregation, data computation, and decision management [26].

Additionally, although all the data-driven urban management has been full filled, we cannot explore more the usability of the data because there is very little evidence about the data being used in certain study or policy making processes. Therefore, it is important for the portals need to have a publication page to publish all the result of studies and policy paper based on the data collected in OGD portals.

OGD Implementation in Indonesia

Furthermore, we also examine the quality of OGD by the ideal principles of OGD. First principles to examine is the completeness of open government data in Indonesia’s smart cities. Completeness of the open government data depicts the ability of data to reflect the entirety of what is recorded about specific subject. The data should be stored completely including but not limited to documents, databases, transcripts, and audio/visual recording depending on its type. Data for urban management are usually consist of qualitative data and spatial data. Hence, the data commonly stored as a number which have spatial references. The OGD that we found in three Indonesia’s smart cities show that that the data is segmented into several dataset based on location and region scale such as district and sub district. It will be difficult for researchers or policy makers to analyze the data because they need to collect the data

one by one and compile it into one city dataset. Moreover, the OGD which contain location information and distribution are rarely have spatial references (latitude, longitude).

The principles about primacy of the data portals, some of the data come from secondary providers for example in health dataset came from healthcare apps called `aplikasi.bkkbn.go.id` or the public hospitals in the city. Some of the data about healthcare has been analyzed and published in aggregate value with limited information to explore.

The principle about timeliness is related to how actual the data being updated and contain information about the time and expiration. In the OGD portals we found that some data publication is discontinued several years ago. Some of the old dataset could not be accessed. The portals provide publishing time information including time of data creation, and time of data evaluation but it is inaccurate. Meanwhile, the principle about machine readability and processable, comparable, and interoperable explain about how easy the data being operated and processed. In the three data portals, data provided in csv format which makes it easier to be read and analysed by machine/computer and enable interoperability. In addition, two data portals provide API for more sophisticated machine analysis.

Next, the principle about Accessible, Ease of Physical and Electronic Access, usable, are about the ability of data being easily accessed or downloaded. The three data portals let user to download the data easily without registering or submitting any form. The portal also offer option for bulk download or download from API. For principle about Licensing free, Licensing, Reusable, there is no license applied for the data which mean data could be reuse for any purpose.

Other principle about Traceability, Managed Post-Release, Reviewable, Information explain about how the data could be trace so the user can utilize it regarding the data information. This principle also intends to let user give feedback about the data. In the three portals, the data is available for every dataset because the general information provides the latest data evaluation and latest data update. However, some dataset time tracer seems invalid. Data could be reviewed by the user by sending suggestion message in the portal web page, but it is only applied for the data that couldn't be open.

For principles about Public, Open by Default, Non-Discrimination. Non-Proprietary, Use of Commonly owned standard, Usage costs, the use of data in Bandung, Jakarta and Surabaya Data Portal is free, publicly accessible, and open for anyone. Furthermore, the principles about Described, Understandability, Information about data description is available in the metadata. However, some datasets have an incomplete metadata. The portal also provides brief explanation for every variable in the dataset to help user to understand the data. However, numerous data dictionary is empty.

The other principle about Citizen Engagement, data published about government projects and development programs is posted in the data portal. However, the real citizen engagement in open government data (OGD) mean that the user could actively involve in data analysis or at least data visualization process that could be achieved by providing interactive dashboard. For, Inclusive Development and Innovation, data portal role is for data provision only. Very limited publication about the result of data use in development and innovation. Last, principle about Accuracy, Data consider to be accurate because it produces by government entities and the verification process should be done before data publication. However, the data collection and processing should be transparent written in the data portals to ensure the data accuracy.

5. Conclusion and Future Works

OGD portals in Indonesia provides the public data which freely accessible online. This paper found that OGD portals in Indonesia has tried to full fill the needs of data for urban management aspect including planning, transport, traffic, waste management, energy, environment, infrastructure, smart safety, smart healthcare, and people's participation even though it performs limited function as data provision portal. However, the usage of the available OGD portals should not be limited in data provision but also could benefit wider society and stakeholder and drive collaborative works. Currently, OGD in Indonesia Smart Cities only focus as the data portal to published administrative and public data. This condition could be improved by embedding ICT to data generation and data processing such as using IoT or sensor-generated data. Moreover, based on the OGD Principals analysis on the available OGD have some weakness. The data provision in the OGD portals have not fulfill some of the Open Data principles which resulting limited information of the data. It might affect the usability of OGD for data-driven urban management. Example: the completeness of OGD have not been achieved because some data only exist in certain years which cannot support up-to date analysis. Therefore, to maximize the usability of the existing OGD portals in Indonesia Smart Cities, a comprehensive planning should be established in data generation until data processing and decision-making processes to conduct an OGD portal which support data-driven urban management.

The limitation of this paper is that it could not unpack the practical potential use of the urban management related data available in the OGD Portal so further research could be focusing on that aspect. Moreover, Stakeholders' role in OGD planning is ultimately important, especially to discover data citizens and urban planning practitioners need and what government institutions have [21]. This is to ensure the utilization and usability of the data.

References:

- [1] D. S. Sayogo, T. A. Pardo, and M. Cook, 'A framework for benchmarking open government data efforts', in *Proceedings of the Annual Hawaii International Conference on System Sciences*, IEEE Computer Society, 2014, pp. 1896–1905. doi: 10.1109/HICSS.2014.240.
- [2] Open Knowledge, 'Global Open Data Index', <http://index.okfn.org/>.
- [3] European Commission, 'Open Data Maturity Report 2022', 2022. [Online]. Available: <https://digital-strategy.ec.europa.eu/en/policies/psi-open-data>
- [4] T. Elmqvist, N. Frantzeskaki, D. Maddox, S. Parnell, D. Simon, and X. Bai, *Urban Planet*. Cambridge University Press, 2018. doi: 10.1017/9781316647554.
- [5] Joshua Tauberer, *Open Government Data : The Book*, 2nd Edition. 2014.
- [6] A. Jansen, 'The Understanding of ICTs in Public Sector and Its Impact on Governance', *LNCS*, vol. 7443, pp. 174–186, 2012.
- [7] Open Data Charter, 'International Open Data Charter', Sep. 2015. Accessed: Sep. 01, 2023. [Online]. Available: <https://opendatacharter.net/>
- [8] L. Batagan, 'The Role of Open Government Data in Urban Areas Development', *Informatica Economica*, vol. 18, no. 2/2014, pp. 80–87, Jun. 2014, doi: 10.12948/issn14531305/18.2.2014.08.
- [9] European Union, 'Open Data Maturity Report', 2022. [Online]. Available: <https://digital-strategy.ec.europa.eu/en/policies/psi-open-data>
- [10] OECD, 'Open Government Data Report : Enhancing Policy Maturity for Sustainable Impact', Paris, 2018.
- [11] C. Ding and S. K. Lai, 'Challenges in Urban Management', *Journal of Urban Management*, vol. 1, no. 2. Elsevier B.V., pp. 1–2, Jan. 01, 2012. doi: 10.1016/S2226-5856(18)30056-6.
- [12] E. Syaodih, 'The Challenges of Urban Management in Indonesia', *Advances in Social Science, Education and Humanities Research*, vol. 307, 2019.
- [13] M. Wu, B. Yan, Y. Huang, and M. N. I. Sarker, 'Big Data-Driven Urban Management: Potential for Urban Sustainability', *Land*, vol. 11, no. 5. MDPI, May 01, 2022. doi: 10.3390/land11050680.

- [14] F. Biljecki, L. Z. X. Chew, N. Milojevic-Dupont, and F. Creutzig, 'Open government geospatial data on buildings for planning sustainable and resilient cities', Jun. 2021, [Online]. Available: <http://arxiv.org/abs/2107.04023>
- [15] L. Batagan, 'The Role of Open Government Data in Urban Areas Development', *Informatica Economica*, vol. 18, no. 2/2014, pp. 80–87, Jun. 2014, doi: 10.12948/issn14531305/18.2.2014.08.
- [16] B. W. Wirtz, J. C. Weyerer, M. Becker, and W. M. Müller, 'Open government data: A systematic literature review of empirical research', *Electronic Markets*, vol. 32, no. 4, pp. 2381–2404, Dec. 2022, doi: 10.1007/s12525-022-00582-8.
- [17] U. Mans, S. Giest, and T. Baar, 'Can Big Data Make a Difference for Urban Management?', in *Urban Planet*, Cambridge University Press, 2018, pp. 218–238. doi: 10.1017/9781316647554.013.
- [18] M. Wu, B. Yan, Y. Huang, and M. N. I. Sarker, 'Big Data-Driven Urban Management: Potential for Urban Sustainability', *Land*, vol. 11, no. 5. MDPI, May 01, 2022. doi: 10.3390/land11050680.
- [19] A. Zuiderwijk and M. Janssen, 'Barriers and development directions for the publication and usage of open data: A socio-technical view', in *Public Administration and Information Technology*, vol. 4, Springer, 2014, pp. 115–135. doi: 10.1007/978-1-4614-9563-5_8.
- [20] A. Bachtiar, Suhardi, and W. Muhamad, 'Literature review of open government data', in *2020 International Conference on Information Technology Systems and Innovation, ICITSI 2020 - Proceedings*, Institute of Electrical and Electronics Engineers Inc., Oct. 2020, pp. 329–334. doi: 10.1109/ICITSI50517.2020.9264960.
- [21] G. A. Parung, A. N. Hidayanto, P. I. Sandhyaduhita, K. L. M. Ulo, and K. Phusavat, 'Barriers and strategies of open government data adoption using fuzzy AHP-TOPSIS: A case of Indonesia', *Transforming Government: People, Process and Policy*, vol. 12, no. 3–4, pp. 210–243, Oct. 2018, doi: 10.1108/TG-09-2017-0055.
- [22] A. Vetrò, L. Canova, M. Torchiano, C. O. Minotas, R. Iemma, and F. Morando, 'Open data quality measurement framework: Definition and application to Open Government Data', *Gov Inf Q*, vol. 33, no. 2, pp. 325–337, Apr. 2016, doi: 10.1016/j.giq.2016.02.001.
- [23] S. C. Herring, 'Web Content Analysis: Expanding the Paradigm', in *International Handbook of Internet Research*, Springer Netherlands, 2009, pp. 233–249. doi: 10.1007/978-1-4020-9789-8_14.
- [24] D. Gunawan and A. Amalia, 'The Implementation of Open Data in Indonesia', in *International Conference on Data and Software Engineering (ICoDSE)*, Denpasar, Indonesia, 2016, pp. 1–6. doi: 10.1109/ICODSE.2016.7936164.
- [25] A. Nikiforova, 'Smarter open government data for society 5.0: Are your open data smart enough?', *Sensors*, vol. 21, no. 15, Aug. 2021, doi: 10.3390/s21155204.
- [26] M. Babar and F. Arif, 'Smart urban planning using Big Data analytics to contend with the interoperability in Internet of Things', *Future Generation Computer Systems*, vol. 77, pp. 65–76, Dec. 2017, doi: 10.1016/j.future.2017.07.029.