



**Asia-Pacific  
Economic Cooperation**

**Advancing** Free Trade  
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# **Implementation of Smart City Standards in Indonesia based on SNI ISO 37122 during the COVID-19 Pandemic**

**APEC Sub-Committee on Standards and Conformance**

June 2022





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Produced by

Biatna Dulbert Tampubolon, Ary Budi Mulyono, Febrian Isharyadi, Utari Ayuningtyas,  
Suhaimi A. Kasman

National Standardisation Agency of Indonesia

For

Asia-Pacific Economic Cooperation Secretariat

35 Heng Mui Keng Terrace

Singapore 119616

Tel: (65) 68919 600

Fax: (65) 68919 690

Email: [info@apec.org](mailto:info@apec.org)

Website: [www.apec.org](http://www.apec.org)

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## Executive Summary

Increasing urbanization causes urban overpopulation and contributes to various socio-economic problems including congestion, poverty, crime, climate change, and natural disasters. The projected number of people living in cities around the world continues to increase rapidly, which is evidence of the urgency of addressing the problems of urbanization. This trend leads to increased demand for energy, water services, and sewage treatment in cities. These problems arise because of the limitations of physical infrastructure that is no longer able to support the growth of the urban population. These concerns encourage the creation of smart, innovative, and integrated cities and communities through the smart city concept.

A smart city is a city development concept utilizing information technology. Smart cities will increase service quality, which has an impact on increasing productivity and economic competitiveness. Evaluation models for smart cities have been developed by many international experts and institutions. The development of different concept assessment models will result in differences in the indicators for fulfilling the smart city category; therefore, the results of smart city assessments carried out by each institution cannot be equated. This creates the need for a standard in assessing the fulfillment of smart city indicators.

The National Standardization Agency Indonesia has established SNI ISO 37122:2019 Sustainable cities and communities — Indicators for smart cities. The domestic standard is an identical adoption of ISO 37122:2019, consisting of 19 sectors and 80 indicators. Each indicator in a sector requires data to support its needs. A preliminary study has been conducted to analyze the readiness and ability to apply SNI ISO 37122:2019 in three cities in Indonesia. The implementation of the standard is expected to maximize the use of resources (human, government, and technology) in improving public services and maximize the potential of each city or region, especially during the COVID-19 pandemic. The smart city concept can be used to achieve improved urban planning management that can face difficult situations in the future.

This study uses a descriptive qualitative data analysis method. Data obtained from the questionnaires and the results of a focus group discussion (FGD) with all regional apparatus organizations (OPD) or regional apparatus work units (SKPD) are used to analyze the readiness and ability to apply SNI ISO 37122:2019. The respondents were from three cities: Bandung, Yogyakarta, and Jakarta.

The results of the study show that levels of understanding of smart city standards vary, so the interpretation of indicators for fulfilling the smart city category becomes the main obstacle in filling out the questionnaire. The results of mapping the understanding and application of smart city standards in cities in Indonesia show that 66.67% of respondents representing the city government stated that the city had participated in smart city assessment and received the title of smart city. Smart city status was obtained from non-governmental institutions such as the Citiasia Center for Smart Nation, Bandung Institute of Technology, PT. Telekomunikasi Indonesia, and the Eden Strategy Institute. Although the majority of respondents stated that they did not experience problems in implementing the smart city certification, they reported experiencing difficulties in filling out the project questionnaire. The general benefits they reported obtaining from the implementation of smart cities included the ability to provide better public services to the community. The results on the availability of 131 areas of supporting data for 80 indicators of SNI ISO 37122:2019 in the cities show that as many as 69 supporting data indicators (51.88%) are available in the city of Bandung and the city of Yogyakarta has 67 supporting data indicators (50.38%), while for the city of Jakarta, there are only 21 available supporting data indicators (16.03%) which have been provided in accordance with the accepted questionnaire for the application of SNI ISO 37122:2019.

This study shows that there is limited availability of valid data supporting the needs for implementation of smart city standards, so it is necessary to conduct more socialization about the understanding and benefits of implementing standards by technical ministries or authorized institutions. The socialization can involve the district/city officers (OPD or SKPD) in the regions in order to support the implementation of smart city standards by cities and districts. In addition, to facilitate understanding of indicators and supporting data for indicators, it is better if the explanation of the SNI uses language that is simple and easily understood by people in the city or district. It is because the SNI is an identical adoption of the ISO standard.

## 1. Introduction

In the last decade, the smart city concept has been developed by technologically advanced economies, especially the United States, Britain, Japan, Germany, Korea, and China. The domestic standardization bodies in these developed economies have developed smart city standards such as NIST, ANSI, ACR NEMA, BSI, JISC, DKE, DIN, KATS, and NITS. In addition, international and regional organizations have collaborated to develop the smart city standards and other supporting components such as the International Organization for Standardization (ISO), IEC, ITU-T, IEEE Standards, CEN/CENELEC, and ETSI.

Urban overpopulation in cities throughout the world due to increased urbanization contributes to various socio-economic problems such as congestion, poverty, crime, natural disasters, and climate change.<sup>1</sup> Increased population increases the need for energy, clean water, treatment of waste, and more. Problems meeting these needs arise due to the inability of the physical infrastructure to support the development of the urban population.<sup>2</sup> These conditions provide motivation for establishing smart, innovative, and integrated cities and communities through the smart city concept.

International and domestic standards organizations have developed smart city standards with consideration of environmental, social, and economic concerns and opportunities for future generations to access those resources. However, a standard cannot cover a complex smart city system. Smart city stakeholders collaborate to create a general model of the city and its systems. The smart city standard is expected to use an

integrated and connected system to manage city concerns including privacy, security, resilience, data flow, and information and communication technology (ICT). Interoperability of different city systems is needed to be able to master the complexities and address the interrelated ICT issues to realize a smarter city. All standards related to smart cities become measurable.

ISO has a technical committee related to sustainable cities and communities, ISO/TC Code 268. The scope of the technical committee includes the development of requirements, frameworks, guidelines, techniques, and supporting tools related to achieving sustainable development by considering intelligence and resilience, to help cities and communities and their stakeholders in both rural and urban areas become more sustainable. TC 268 also supports the United Nations Sustainable Development goal of developing and implementing a holistic and integrated approach to sustainable development and sustainability. The smart city standard includes definitions and methodologies for indicators to guide and measure service performance and quality of life in smart cities. The technical committee and sub-committee on urban and community sustainability developed the following standards:

- 1) ISO 37101 Sustainable development in communities — Management system for sustainable development — Requirements with guidance for use,
- 2) ISO 37120 Sustainable cities and communities — Indicators for city services and quality of life,
- 3) ISO 37122 Sustainable
- 4) cities and communities — Indicators for smart cities,

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<sup>1</sup> Hasibuan, A., & Sulaiman, O. K. (2019). Smart City, Konsep Kota Cerdas Sebagai Alternatif Penyelesaian Masalah Perkotaan Kabupaten/Kota, Di Kota-Kota Besar Provinsi Sumatera Utara. *Buletin Utama Teknik*, 14(2), 127–135.

<sup>2</sup> Supangkat, S. H., Arman, A. A., Nugraha, R. A., & Fatimah, Y. A. (2018). The implementation of Garuda Smart City framework for Smart City readiness mapping in Indonesia. *J. Asia-Pacific Stud*, 32(4), 169–176.

- 5) ISO/TR 37150 Smart community infrastructures — Review of existing activities relevant to metrics,
- 6) ISO 37151 Smart community infrastructures — Principles and requirements for performance metrics,
- 7) ISO 37153 Smart community infrastructures — Maturity model for assessment and improvement.

The standard principles must be measurable by comparison and verification, regardless of the size and location of the city. The standard covers activities relevant to smart community infrastructure, including energy, water, transportation, waste, and ICT. The concept of intelligence can support relevant performance to provide applicable technology solutions, following sustainable development and community resilience. Smart city standards can be applied to different types of community infrastructure and involve all levels of society.

## 2. Smart City Policy in Indonesia

The Master Plan for the Indonesian Smart City Development Program is prepared to support the potential and competitiveness of cities or regions in Indonesia. It will improve community services based on local wisdom and maximize the use of applied technology. Currently, Indonesia has 514 districts and cities, plus special cities, all of which have the potential to apply the smart city concept. The government and stakeholders will collaborate and synergize to create a smart city in accordance with Government

Regulation no. 28 of 2018 concerning Regional Cooperation through Smart Economy, Smart People, Smart Government, Smart Mobility, Smart Environment, and Improving the Quality of Smart Life.<sup>3</sup> The integration of all aspects is expected to have a positive impact on the effectiveness and efficiency of public services. Smart city includes the development of basic infrastructure, transportation systems, energy-efficient buildings, and environmentally friendly waste management. The application of the smart city concept in small cities is a challenge and a direction to encourage people's welfare.<sup>4</sup>

A smart city is an innovative program that is growing rapidly by utilizing information technology in city management.<sup>5</sup> Several studies have found four main obstacles in the development of smart city applications in general. First, there is no basic regulation of smart city development programs. Second, there are insufficient IT-based human resources to run the smart city program. Third, the smart city development budget is still limited. Finally, the active role of stakeholders including the private sector, academia, and the community is still not integrated into a sustainable smart city ecosystem.<sup>6</sup>

Smart city assessment models have also been developed in Indonesia, such as the Indonesia Smart City Framework (FKCI) and the Garuda Smart City Framework (GSCF).<sup>7</sup> However, these models have differences in the category compliance indicators. Due to this, the recognition of the results of the smart city assessment carried

<sup>3</sup> Sekretariat Negara Republik Indonesia. (2018). Peraturan Pemerintah Nomor 28 Tahun 2018.

<sup>4</sup> Abusaada, H., & Elshater, A. (2020). COVID-19 Challenge, Information Technologies, and Smart Cities: Considerations for Well-Being. *International Journal of Community Well-Being*, 3(3), 417–424. <https://doi.org/10.1007/s42413-020-00068-5>

<sup>5</sup> Syahbudin. (2016). Analisis penerapan smart city dan internet of things (IoT) di Indonesia. *ResearchGate*, 1, 1–5

<sup>6</sup> Kurnadi, M. (2015). Penggunaan Internet of Things (IoT) untuk pengembangan Smart City di

Indonesia. *Techinasia.Com*.

<sup>7</sup> Prabowo, O. M., Supangkat, S. H., & Mulyana, E. (2021). Anomaly Detection Techniques in Smart City: A Review from a Framework Perspective. 2021 International Conference on ICT for Smart Society (ICISS), 1–6.

<sup>8</sup> Tay, K.-C., Supangkat, S. H., Cornelius, G., & Arman, A. A. (2018). The SMART Initiative and the Garuda Smart City Framework for the development of smart cities. 2018 International Conference on ICT for Smart Society (ICISS), 1–10.

out by each institution is still weak. This creates a need for a standard reference in assessing the fulfillment of smart city indicators. BSN has adopted and established SNI ISO 37122:2019 Sustainable cities and communities — Indicators for Smart city. This standard is an identical adoption of ISO 37122:2019. This standard consists of 19 sectors and 80 indicators.<sup>9</sup> Each indicator requires data to support sector needs. Sources of supporting data may vary depending on city governance. Data for the indicator requirements can be sourced from information in reports belonging to local governments.

Smart cities play a role in improving effective, efficient, and quality public services to support local economic development.<sup>10,11</sup> For example, technology applications can be used to support information services for the community. The smart city concept includes the management of natural resources and the environment so that related community problems can be resolved appropriately and provide residents with a sense of comfort and security. This concept has integrated connectivity in various fields to provide practical impact and efficiency in management.<sup>12</sup> Goldsmith & Crawford<sup>13</sup> state that the efforts of local governments to use new technologies with breakthroughs in the use of big data analytics and stakeholder collaboration are a smart city concept. In urban planning, digital technology uses a revolution in sustainable environmental design planning. In addition,

smart cities include six dimensions, namely smart government, smart environment, smart people, smart economy, smart life, and smart mobility.<sup>14,15</sup>

### 3. The Role of Smart City in Dealing with the Pandemic

In the pandemic era, smart city standards are expected to play a role in overcoming pandemic-related problems that arise in society and the urban environment. The implementation of the current standard is expected to be capable of limiting the spread of COVID-19. Smart city standards and concepts can support the local government in managing cities. The preliminary study is expected to be able to analyze smart city indicators that are directly correlated with preventing the spread of COVID-19 in the ISO Sustainable city and community standard. With this approach, smart city development policies can be improved in the face of pandemics or other challenges that will occur in the future.<sup>16</sup>

The problems caused by the pandemic are not limited to health problems; the pandemic has disrupted the entire fabric of people's lives and caused social, economic, and cultural problems as well. Economic paralysis and social problems are increasing in the community, especially in some of the areas with the highest rates of spread and growth of COVID-19 cases, including Jakarta, Depok, Tangerang, Bogor, Bekasi, Bandung, and Surabaya. The government has set social restrictions

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<sup>9</sup>Badan Standardisasi Nasional. (2019). SNI ISO 37122:2019 Kota dan komunitas berkelanjutan-Indikator kota pintar.

<sup>10</sup> Cohen, B. (2012). The top 10 smart cities on the planet. *Fast Company*, 11.

<sup>11</sup> Dawes, S. S. (2008). The Evolution and Continuing Challenges of E-Governance. *Public Administration Review*, 68(SUPPL. 1), S86–S102.

<sup>12</sup> Utomo, C. E. W., & Hariadi, M. (2016). Strategi Pembangunan Smart City dan Tantangannya bagi Masyarakat Kota. *Jurnal Strategi Dan Bisnis*, 4(2).

<sup>13</sup> Goldsmith, S., & Crawford, S. (2014). *The responsive city: Engaging communities through data-smart governance*. John Wiley & Sons.

<sup>14</sup> Giffinger, R., Fertner, C., Kramar, H., & Meijers, E. (2007). City-ranking of European medium-sized cities. *Cent. Reg. Sci. Vienna UT*, 1–12

<sup>15</sup> Santana, E. da S., de Oliveira Nunes, É., & Santos, L. B. (2018). The use of ISO 37122 as standard for assessing the maturity level of a smart city. *Int. J. Adv. Eng. Res. Sci*, 5, 309–315.

<sup>16</sup> Kunzmann, K. R. (2020). Smart Cities After Covid-19: Ten Narratives. *Disp - The Planning Review*, 56(2), 20–31.

on community activities and small, medium, and large businesses to prevent and control the spread of COVID-19. This has led to the emergence of socio-economic problems such as scarcity of goods, increased crime, soaring poverty, and unemployment. However, the government has tried to impose social restrictions without compromising the people's freedom. Another policy consists of flexible social restrictions based on the pandemic status of each region, updated online.<sup>17</sup> Supervision is also carried out with the help of technology.

The government has also issued several policies to deal with the pandemic. In the context of controlling the COVID-19 virus, the 3M Health Protocol was established for public facilities based on the Decree of the Minister of Health Number HK.01.07/MENKES/382/2020. The 3M protocol includes wearing masks, washing hands, and maintaining social distance. As a guideline for prevention and control of COVID-19, the government has implemented a massive 3T (Testing, Tracing, Treatment) Policy based on the Regulation of the Minister of Health Number HK.01.07/Menkes/413/2020. In addition, the Ministry of Religion stipulates Instruction Number 1 of 2021 concerning the Socialization Movement for the Implementation of the 5M Health Protocol, which includes wearing masks, washing hands with soap, maintaining distance, avoiding crowds, and limiting movement and interactions. This protocol is expected to mitigate the spread of COVID-19 in Indonesia. The policy of travel restrictions and social distancing directs employees to work from home and students to study

online. The World Health Organization has shifted from using the term “social distancing” to using “physical distancing.” Smart cities are expected to create systems that can build significantly efficient cities that support better responses to COVID-19, to save lives during this pandemic.<sup>18</sup>

#### **4. Implementation of Smart City in Indonesia**

Smart city models and their definitions are still very diverse. The smart city concept currently focuses on public services using technology to accelerate regional or city development. The smart city concept must be able to overcome obstacles by utilizing technology in the activities of public organizations to provide effective, efficient, and high-quality public services to develop the local economy. The smart city concept includes providing information services for communities quickly and easily by using technology applications. With the smart city concept, it is hoped that community problems can be resolved appropriately to provide a sense of comfort, safety, and order. In addition, the smart city concept refers to three main elements: humans, technology, and institutions.<sup>19</sup> The smart city is a city concept that has integrated connectivity in various fields by making positive changes to the practice and efficiency of city management.

The smart city program is not easy to implement, so it requires strategic and creative thinking. This strategic program begins with problem identification, problem grouping, an abstraction process, determination of solutions and appropriate methods, and implementation planning.<sup>20</sup>

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<sup>17</sup> Sonn, J. W., Kang, M., & Choi, Y. (2020). Smart city technologies for pandemic control without lockdown. *International Journal of Urban Sciences*, 0(0), 1–3.

<sup>18</sup> Costa, D. G., Vasques, F., Portugal, P., & Aguiar, A. (2020). A distributed multi-tier emergency alerting system exploiting sensors-based event detection to support smart city applications. *Sensors (Switzerland)*, 20(1).

<sup>19</sup> Nurmandi, A., 2006. *Manajemen Perkotaan: Aktor, Organisasi, Pengelolaan Daerah Perkotaan dan Metropolitan di Indonesia*. Yogyakarta: Sinergi Publishing.

<sup>20</sup> Nugraha, M., 2014. *Manajemen Strategis Pemerintahan (Ketiga)*. Jakarta: Penerbit Universitas Terbuka.

Creativity produces useful and new works to introduce to the community and organizations.<sup>21</sup> Various organizational characteristics can be studied, such as leadership planning and human resource management. Innovation is one strategy that can improve the performance of public service organizations. The constraints in smart city implementation did not discourage steps to improve the various applications and various other innovations.<sup>22</sup>

Indonesia has established a Smart City Development Program Master Plan, which aims to improve services to the community by utilizing local knowledge and maximizing the application of technology. Currently, there are 514 districts and cities in Indonesia that have the potential to develop the smart city concept. The government and stakeholders must work together to create a smart city through Smart Economy, Smart People, Smart Government, Smart Mobility, Smart Environment, and Smart Living. The requirements include the development of basic infrastructure, energy-efficient buildings, transportation systems, waste management and environmentally friendly. The challenge of implementing smart cities in the future is how the smart city concept can be applied to small cities to encourage the welfare of people in urban areas. The Indonesian government projects that through the Movement Towards 100 Smart Cities, by 2024 there will be 100 cities with a smart city concept.

To ascertain the understanding and implementation of smart cities in cities and districts in Indonesia, a preliminary survey was conducted through field surveys. A questionnaire was completed by individual respondents or teams representing the provincial, district, or city government. The respondents are personnel who have

authority in each department or SKPD regarding the implementation of smart cities. Data were collected in three cities, namely Bandung, Yogyakarta, and Jakarta. The results of mapping the understanding and application of smart cities in Indonesia are as follows.

66.67% of the surveyed representatives from the city or district governments stated that they had received the title of "Smart City". Bandung stated that it had received the smart city title through smart city certification from the Eden Strategy Institute in 2021. Since 2018, the Eden Strategy Institute has provided a ranking of the Top 50 Smart City Governments. This ranking of smart cities is based on two categories: the role played by the city government in leading the smart city strategy and how the city governments perform in their work on the smart city program. The City of Bandung was ranked number 28 in the "2020/21 Top 50 Smart City Government Rankings" in the Smart City Government category. Bandung took part in this smart city certification because it received an invitation. Bandung stated that it experienced obstacles that hindered the implementation of smart city certification. The obstacles they encountered were the wide scope of the smart city concept and the complexity of the city conditions that have been built for a long time. Respondents reported that the benefits Bandung experienced from obtaining the smart city title included the recognition they received for being a pioneer in implementing the smart city model in Indonesia.

Meanwhile, respondents from Yogyakarta stated that Yogyakarta had never received a smart city award. Representatives from the Yogyakarta city government stated that Yogyakarta had not yet participated in the smart city certification because they were still following the

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<sup>21</sup> Lazuardi, A. L., 2015. *Manajemen Strategis Inovasi dan Teknologi*, terjemahan dari *Strategic Management of Technological Innovation*, Yogyakarta: Penerbit Pustaka Pelajar.

<sup>22</sup> Boyne, G., R., A., & Tom, E., 2010. *Public Service Improvement: Theories and Evidence*. New York: Oxford University Press.

guidance from the Ministry of Communication and Information of the Republic of Indonesia. Representatives from Jakarta stated that the city has been awarded the smart city title by the International Telecommunication Union (ITU) in 2021. The smart city ranking obtained by Jakarta was runner-up in the Smart City Government category. The respondents reported the obstacle they faced in smart city certification was the complexity of city conditions, which have been in existence for a long time and involve almost all regional organizations and regional work units.

## **5. Development of smart city standards in Indonesia**

In developing good urban governance and the smart city concept in Indonesia, standards are necessary to provide guidelines for developing the smart city concept. In an effort to support the development of smart city standards, the National Standardization Agency (BSN) has adopted two ISO standards to become SNI. The Guidelines for the National Standardization Body (PBSN) 02-2018 state that the formulated SNI is as harmonious as possible with existing international standards (through the adoption of relevant international standards). The technical committee is TC 13-11 Urban and Sustainable Communities. Domestic standards were established to support the development of smart cities in Indonesia. These are as follows:

- 1) SNI ISO 37120:2018 Sustainable Urban and Community Development — Indicators for Urban Services and Quality of Life.

This standard defines and establishes a methodology for a set of indicators to guide and measure urban service performance and quality of life. This standard follows the principles set out in ISO 37101 and can be used in conjunction with ISO 37101 and other strategic frameworks. This standard applies to any urban local government that measures its performance in a comparable and verifiable manner, regardless of size and location.

- 2) SNI ISO 37122:2019 Sustainable Cities and Communities — Indicator for smart cities.

This standard defines and establishes the definition of and methodology for a set of indicators for smart cities. Accelerating service improvement and quality of life is an important part of the definition of a smart city. This standard can be used in conjunction with SNI ISO 37120 to provide a comprehensive set of indicators to measure progress towards smart city status.

The main, supporting, and profile indicators for each standard are classified into themes according to the sector and the services provided by cities. Sustaining, enhancing, and accelerating progress towards improving urban services and quality of life is also critical to the definitions of both smart and resilient cities separately. SNI ISO 37120:2018 can be implemented together with SNI ISO 37122 and ISO 37123 to measure progress towards smart cities and resilient cities.

Fulfillment of SNI ISO 37122:2019 and SNI ISO 37122:2019 is identical to fulfillment of ISO 37122:2019. This standard consists of 19 sectors and 80 indicators. The 19 sectors and 80 indicators can be seen in the following table:

Table 1. Sectors and indicators in SNI ISO 37122:2019

No.	Sector	Number of indicators
1	Economy	4
2	Education	3
3	Energy	10
4	Environment and Climate Change	3
5	Finance	2
6	Government	4
7	Health	3
8	Housing area	2
9	Population and Social Condition	4
10	Recreation	1
11	Security	1
2	Solid waste	6
13	Sports and Culture	4
14	Telecommunication	3
15	Transportation	14
16	Urban/Local Agriculture and Food Security	3
17	City Planning	4
18	Wastewater	5
19	Water	4
<b>Total</b>		<b>80</b>

Source: Preliminary Research APEC results, 2022

In SNI ISO 37122:2019, there are 80 indicators and 131 areas of supporting data for these indicators. In this study, identification of the availability of supporting data was carried out. To determine the availability of supporting data for indicators in the context of readiness to implement SNI ISO 37122:2019 in the city or district, a survey was conducted using a questionnaire. Data collection was carried out in Bandung, Yogyakarta, and Jakarta. From the results of the identification of

the availability of the 131 supporting data indicators for SNI ISO 37122:2019, which was carried out for the three cities, it was found that 67 supporting data indicators (50.38%) were available in Yogyakarta city. For Bandung, 69 supporting data indicators (51.88%) were available to support the application of SNI ISO 37122:2019 in the city. For Jakarta, there have only been 21 supporting data indicators (16.03%) given in accordance with the accepted questionnaire for the application of SNI ISO 37122:2019.

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