

Economic Improvement, Environmental Sustainability, and Community Empowerment in Indonesia: Bibliometric Analysis (Smart City and Smart Tourism) Year 2013-2022

Rivaldi Alan Saputra^{1,*}

¹Department of Government Affairs and Administration, Universitas Muhammadiyah Yogyakarta, Indonesia

²Jusuf Kalla School of Government, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. This study **aims** to provide visualization of smart city and smart tourism trends using a database taken from Scopus from 2013 to 2022 using an **approach** with bibliometric and scientometric techniques. **The data collection** process goes through several steps, namely searching for literature through the Scopus database by entering keywords in the form of "smart city" and "smart tourism," which are limited from 2013-2023 so that 189 articles of data are produced. Then, the data was analyzed using Scopus analysis and the CiteSpace application. This study, it was **findings** that namely 1) The number of publications on smart cities and smart tourism has shown an overall increase in the eight years from the last 2013-2021 period and decreased to 31 articles in 2022; 2) China is the country that studies "smart city" and "smart tourism" the most; and, 3) Through this research, the trend of smart city and smart tourism has been widely studied and obtained the top three subtopics including information and technology, augmented reality, and sustainability. The **conclusion** of this study shows that smart cities and smart tourism are topics of interest from 2013 to 2022. In addition, this study resulted in fourteen (14) clusters that have been analyzed using CiteSpace and show that China is the country that researches smart cities and smart tourism the most. This finding proves that smart cities and smart tourism do not only focus on technology development but involve social aspects such as economic, environmental, and social. *Keywords: bibliometrics, smart city, smart tourism*

1 Introduction

The development of information technology today brings significant changes in human life (1) Humans create technology intending to improve the quality of life. The motivation for creating this technology was to assist in accomplishing tasks. Technology has been known for a long time by the public. Starting with handwriting and then developing with the help of machines to write. History records that the invention of the typewriter became the starting

* Corresponding author: rivaldi.alan.isip20@umy.ac.id

point for technological developments in making documents and sending messages to others (2). The design of electricity also contributed to facilitating human work. With a touch of technology, typewriters were replaced by computers that used electrical energy and had more complex functions. Computers function as document creation tools, data processing tools, and interactive communication media, especially with the internet. The impact of the internet is enormous in human life in all aspects. Information technology civilization has entered the era of digitalization (3). Various new products emerged, and "modern society" changed into a "digital society." Services that previously used paper and physical documents are now trying to become paperless and digital file-based so that bureaucratic and administrative services become more effective and efficient with digitalization (4).

The government manifests information technology through the concept of a *smart city*. The image of a *smart city* is an idea of a smart city that can help citizens manage resources efficiently, provide the right information for their activities or predict unexpected events (5) This concept develops along with the advancement of information technology that is increasingly widespread and can be accessed by anyone from various backgrounds, including young and old, rich or poor, as well as from villages or cities. With the advancement of information technology, people can more easily and quickly communicate, get the information needed, and do work more efficiently, quickly, and simply (6) A *smart city* aims to create an efficient, integrated, sustainable city based on smart data and technology. The smart city concept is divided into six categories: smart living, smart environment, smart governance, smart people, and smart economy (Kurniawan, 2020). (7) IMD World Competitiveness Center, through The Smart City Observatory, presents *Smart City Index* (SCI) data which describes 141 cities studied, including Indonesia, especially Jakarta, and Medan, which deserve to be considered as (8) (Purnomowati & Ismini, 2014).

Through this smart city concept, the Government of the Republic of Indonesia, through the Ministry of Communication and Information Technology of the Republic of Indonesia, fully supports the implementation of smart cities by developing a tourism-based digital ecosystem or smart tourism. Smart tourism is a tourism concept initiated in the form of collection through data analysis combined with the use of information technology to make the travel experience more valuable, efficient, and sustainable. In the application of a *smart city*, it is formed through four elements, namely technology, applications, and the Internet of Things (IoT). This *smart tourism application* has an impact on improving the experience and satisfaction of tourists to visit again to enjoy tourist destinations in Indonesia. However, the implementation of *smart tourism* in Indonesia is a big challenge because several things require attention, such as inadequate infrastructure, bureaucratic governance processes that tend to be complicated, human resources that are less technologically literate, and poor management of tourist destination management in Indonesia.

This *smart tourism concept* will be a breakthrough for tourism in Indonesia which has an impact on increasing people's income so that it has a positive impact on people's welfare (9). Of course, the implementation of the *smart city* concept in Indonesia requires Penta helix collaboration involving five stakeholders, such as the government, academia, the Industrial or Business World, the community, and the media (10–12) This Penta helix concept will accelerate the process of achieving smart tourism technology-based tourism that is sustainable, inclusive, and oriented to Indonesian citizens. In addition to the Penta helix concept, the application of the *smart tourism concept* is also influenced by the millennial generation as a generation that is able to change the behavior of the tourism market. This is evidenced by previous research that explains the relationship between millennials and *smart tourism*.

(13) explained that *smart tourism* through technology is a real step to expand the wings of target tourists, especially millennial tourists. Then, according to (14), the concept of *technology-based smart tourism* is a real problem-solving to bring a more optimal and

effective life experience in promoting tourism villages, especially for millennials. This is reinforced by (15), which emphasizes tourism strategy 4.0 according to *the concept of smart tourism* to increase the tourism market both at the local and foreign levels with the main target of millennial communities. Furthermore, (16) revealed that the millennial generation has a dependence on technology, so it has an impact on making tourist visits which are characterized by searching for information, assessments, and final decisions seen on social media. Some of these concepts are reinforced by (R. (17), who explained that the concept of *developing smart tourism* in Pangadaran is divided according to the demand of the millennial community to achieve a memorable experience in visiting tourism. (18) explained that the development of *the smart tourism* concept will go hand in hand with technological developments that can provide more effective tourism experiences and services. From several previous studies, it can be underlined that the millennial generation has involvement in encouraging *smart tourism* initiatives to be applied in *smart cities*.

However, this previous research needs to be followed up in depth, considering that tourism aspects will make a significant contribution to the development of *smart tourism* in Indonesia. Studies related to research in *smart cities* and *smart tourism* need to be explored more broadly, especially in research in Indonesia. This will certainly be a valuable source of reference and evaluation material related to developing and improving *smart city* areas and *smart tourism* in the future. Therefore, researchers will conduct a bibliometric analysis to explore scientific articles that have been published about *smart cities* and *smart tourism*. The bibliometric analysis method is used to examine bibliographic data obtained from various sources, such as articles, journals, and other literature (18) In this study, researchers used data obtained from Scopus by entering keywords in the form of "smart city" and "smart tourism." From the results of this search, researchers obtained 189 articles in the period from 2013 to 2022. Then, this data is processed using Citespace applications so that the results of the analysis of the keywords "smart city" and "smart tourism" will be seen. The results of this study are expected to be useful for authors and researchers in the field of *smart cities* or *smart tourism* by looking at the results of *co-occurrence (keywords)* and *co-authorization* (author collaboration). Therefore, this research is important to be carried out to be a bibliometric analysis and look at other aspects related to *smart cities* and *smart tourism* in the last nine (9) years (2013-2022).

2 Literature Study

This smart city concept innovation affects the efficiency and effectiveness of performance in a region. This aligns with research (19) stating that smart cities have advantages by offering security, smart services, environmental monitoring, and sustainable tourism. Then, (20) state that urban planning and tourism policy-making must consider certain spatial contexts, such as the city center being plundered. On the other hand, the development of *smart cities* is related to several factors explained by (21), who states that *smart city* concepts are closely related to determining factors, such as community training, company investment, and government. However, (22) stated that leaders influence smart tourism cities in developing smart city challenges for tourists or the wider community to enjoy. The implementation of the concept of smart city and smart tourism *requires synergy and collaboration in several fields, including the government and the community, so that the implementation of smart city and smart tourism runs smoothly*. This application also impacts the evolutionary process of smart city development (23)

In the development of *smart cities* and *smart tourism*, technology is a determining factor to support the creation of a smart area. As explained (24) said that new technological advances would affect tourism planning, and citizen involvement will impact sustainable urban development planning. In line (25) stated that advances in mobile technology are

expected to create innovative experiences for consumers, foster sustainable competitive advantages for tourist destinations, and create smart travel competencies. This technology can be manifested through the concept of the *Internet of Things* which is explained by (26), stating that IoT is one of the factors that influence the development of smart cities and smart tourism that has an impact on sustainable economic potential. (27) found that *virtual reality* has a positive impact on tourists, such as increased satisfaction and tourist visits, and there are experiences spread by word of mouth. According to (28) who researched the metaverse relationship, the satisfaction provided through content creates a much more interesting travel experience. This is reinforced by, (29), who stated the importance of adopting digital technology with various applications in providing sustainable management in tourist cities and transforming into digital tourism destinations to impact the development of the high-end tourism industry.

However, there is a gap in technological facilities in the application of *smart cities* and *smart tourism*. As explained by (30) states that there is a gap between the implementation of *smart tourism* and smart implementation related to sustainable technology. However, the application of this technology affects generation z travelers, as explained by (31), showing the influence of technological advances that have an impact on meeting the needs of generation z, who have instant characteristics in seeking technology-based travel experiences. This is also in line with (32), who researched cultural tourism solutions revealing that the use of *virtual reality* and applications brings new experiences for visitors to increase tourist participation in tourist visits. The application of this technology is also confirmed by (33), stating that algorithms related to Information Communication Technology (ICT) are closely related to satisfactory tourism service results with optimal performance. In line with (34), who researched smart cities and smart tourism in Dubai, the smart city concept aims to provide solutions for tourists to meet their travel needs through *a platform* involving various stakeholders.

The implementation of *smart cities* and *smart tourism* also differs from other cities, so it has a positive and negative impact. According to (35), examining the differences in the concept of smart cities through the perspective of waterfront cities with cities located elsewhere, it is known that mobility, environment, and life are three differentiating factors. On the other hand, (36) stated that the smart city paradigm is related to the consideration of sustainability aspects, such as reducing environmental impact, optimizing energy resource management, and designing innovative services and solutions for citizens. This is emphasized by (37), who saw the case in Tel Aviv-Yafo and stated that the *smart city development model* has an impact on several aspects, namely personal safety, transportation access, and accessibility of people with disabilities. Some of these previous studies prove that implementing *smart cities* and *smart tourism* has side effects in the environment, human resources, security, and technological accessibility.

Nevertheless, the application of *smart cities* and smart tourism are two blades of the sword, with both positive and negative impacts. According to (38), discussing the potential value of applications in line with tourism development and contributing to tourism globally will positively impact the sustainable development of society, economy, environment, and people. In line with that, (39), who researched the development of tourist sites and mobile applications, stated that there was a development to a positive Sarah as evidenced by the quantitative scale of users who operated it more. On the other hand, this implementation also has a negative impact. According to (40), who researched the use of modern technology in Polish museums, there is a low selection of *smart tourism* and an emerging technology gap. According to (41), the development of smart cities and smart tourism has an impact on economic development which affects environmental growth that reaches limits.

3 Research Methods

This research uses a type of qualitative research as a humanistic method through the point of view, way of life, or expression of feelings studied in line with the research problem (Fathani et al., 2022).(42) This method uses bibliometric and scientometric approaches. A bibliometric approach is an approach that involves mathematical and statistical functions in analyzing bibliographic data in the form of keywords, authors, and journals adopted as data sources (18). Meanwhile, the scientometrics approach is an approach to understanding the development of science through reliable quantitative testing and systematic qualitative views (43) The data source from this study was taken from the Scopus *database* with the keywords "smart city" and "smart tourism ."The number of documents successfully analyzed is 189 articles from 2013 to 2022. The process of data collection in this study can be seen as follows.

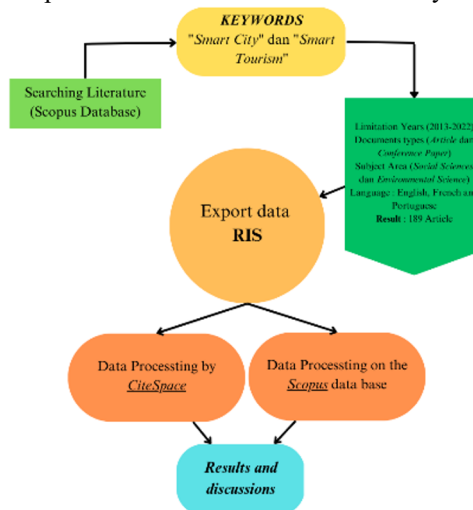


Figure 1. Data Collection Process

From Figure 1, it can be seen that the data collection process goes through several steps, namely 1) Search for literature through *the Scopus database*; 2) Enter keywords in the form of "smart city" and "smart tourism," which are limited from 2013 to 2023, document types in the form of articles and conference papers, subject areas of social sciences and environmental sciences, and languages of English, French, and Portuguese; 3) Data generated totaling 189 articles from Scopus; 4) The data obtained is exported in *Research Information Systems (RIS)* format; 5) Data is analyzed using Scopus analysis and CiteSpace applications. The CiteSpace application is important to analyze the relationship between scientific publications, identify patterns and trends, and visualize publication networks through the keyword "smart city and smart tourism" and; 6) Data was generated in the form of 189 articles that were successfully processed.

4. Finding dan Discussion

4.1 Finding

Figure 2 shows the main information of the data range and document type of the Scopus Data Base. There were 189 articles from 2013 to 2022 with the keywords smart city and smart tourism.

Year	Amount
2013	5
2014	4
2015	4
2016	9
2017	12
2018	18
2019	25
2020	39
2021	42
2022	31
Total	189

Figure 2. Number of articles from 2013-2022

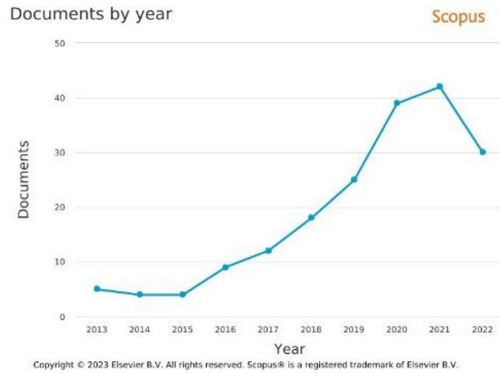


Figure 3. The Number of Published Papers on Smart City and Smart Tourism between 2013--2022

We present the number of articles per year showing that the number of publications related to *smart cities* and *smart tourism* increased from 2013 to 2021 at 42 but decreased to 31 articles in 2022, as shown in the figures. 2. Next, the author will visualize the data based on keywords through Figure 2 visualized through cite space.

CiteSpace v. 5.8.R3 (64-bit) Basic
 March 20, 2023 at 7:57:21 PM WIB
 Work: C:\Users\user\Documents\Big Data\Smart City dan Smart Mobility\Data 1
 Timespan: 2013-2023 (Slice Length=1)
 Selection Criteria: p index (k=25), LRF=2.0, LLN=HL, LBY=6, w=1.0
 Network: N=255, E=411 (Density=0.0054)
 Largest CC: 312 (57%)
 Nodes Labeled: 1.0%
 Pruning: MRF
 Modularity Q=0.7818
 Weighted Mean Silhouette S=0.8459
 Harmonic Mean(Q, S)=0.850

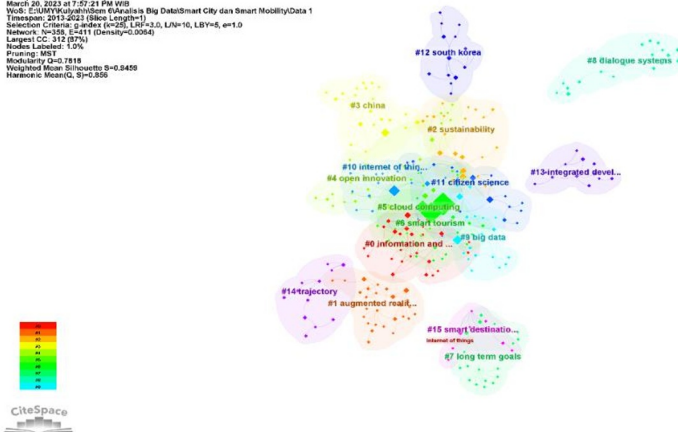


Figure 4. The Network of Clusters on Smart City and Smart Tourism

Based on the image above, you can see the network between keywords with the theme of *smart city* and *smart tourism*. First, the network with keywords with the kernel cluster is *information and technology*; the first cluster is augmented reality, the second cluster is sustainability, the third cluster is China, the fourth cluster is open innovation, the fifth cluster is cloud computing, the sixth cluster is smart tourism, the seventh cluster is long term goals, The eighth cluster is Dianoue Systems, the ninth cluster is Big Data, the tenth cluster is the Internet of Things, the eleventh cluster is Citizen Science, the twelfth cluster in South Korea, the thirteenth cluster is Integrated Development, the fourteenth cluster is Trajectory. This cluster overview can be seen through models with cluster timeline bases, such as in Figure 5 below.

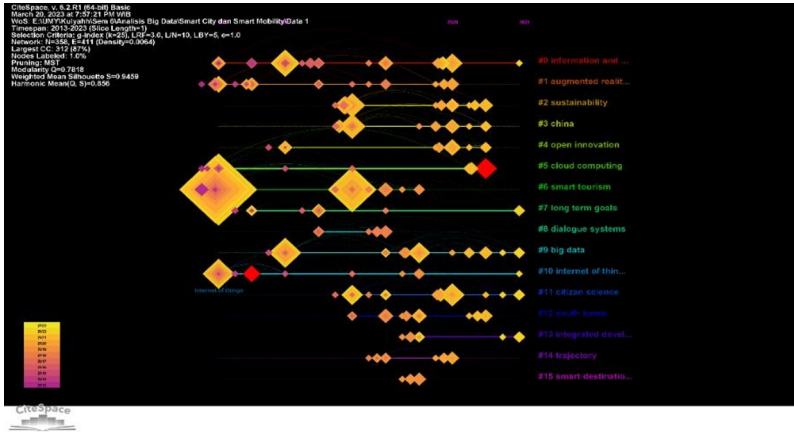


Figure 5. The Timeline of Clusters on Smart City and Smart Tourism

The 0th cluster, *or information and technology*, is one of the important factors related to the keywords "smart city" and "smart tourism," where this technology and information brings tourists to have a better experience, the welfare of the population increases business effectiveness and leads to holistic, comprehensive values (Hanum, 2020)(14). This technology and communication are closely related to the service results of the concept of *smart tourism* and *smart city* so that it will be more optimal (33) Then, we continued with the 1st cluster in the form of *augmented reality*. *Augmented reality* is a technology that combines elements of the real world with elements of the digital world through computer devices (44). *Augmented reality* plays an important role in the *smart tourism* and *smart city sectors* that can provide an additional impression that is active through innovation from this technology (45,46)

The 2nd cluster, *namely sustainability*, refers to efforts to maintain or improve the current quality of life without sacrificing the ability of future generations to meet needs that include environmental, social, and economic aspects (22) In the context of tourism, sustainability means maintaining the natural, cultural, and economic resources of a tourism destination while minimizing its negative impact on the environment and local communities (47). Then the 3rd cluster is China. China is a leader in research development with the keywords *smart city* and *smart tourism* as analysts from the Scopus database Figure 6 below.

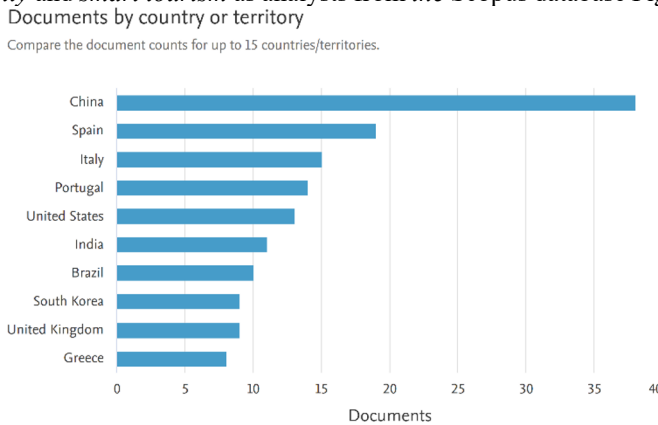


Figure 6. Documents by Country or Region

From Figure 6, it can be seen in the period 2013-2022 that, China led the research with the *keywords smart city* and *smart tourism* with a total of 38 documents. Kemduan, followed by Spain with a total of 19 documents; Italy with 15 documents; Portugal with 14 documents; the United States with 13 documents; India with 11 Documents; Brazil with 10 documents; the United Kingdom with 9 documents; South Korea with 9 documents; and, Greece with 8 documents. This is a sign of proof that the Chinese state has invested in the development and implementation of projects of *smart cities* and *smart tourism*.

Then, continued with the 4th cluster, namely *open innovation*, is an approach that adopts cooperation and collaboration with external parties, including individuals, companies, and institutions, to obtain new ideas, knowledge, and resources that can be used in the innovation process (48) *Open innovation* has a relationship with *smart cities* and *smart tourism* through diverse perspectives, new ideas, and collaboration with external parties to help improve the efficiency, quality, and sustainability of smart solutions to create smart tourism cities (49) Then the 5th cluster is *cloud computing*. *Cloud computing* is a computing model in which computing resources such as data storage, servers, applications, and related services are provided over the internet as on-demand services so that users can access and use those resources flexibly as per their needs, without the need to have their physical infrastructure (50). By utilizing *cloud computing*, *smart cities* and *smart tourism* can optimize computing resources, improve data accessibility, gain valuable insights from data analytics, and improve the security and reliability of the technology infrastructure used (Tsaih & Hsu, 2018).(51)

Next, the sixth cluster is about *smart tourism*. Smart tourism and smart cities are interrelated and can support each other in creating smart and sustainable tourism experiences (52) By integrating smart tourism in smart cities, tourist destinations can improve the quality of the tourist experience, improve operational efficiency, strengthen environmental sustainability, and provide broader economic benefits to local communities (53) Then, the seventh cluster is *long-term goals*. Long-term goals are to be achieved over a longer period, usually in the next few years or decades (49) By building integrated and mutually supportive long-term goals, smart cities and smart tourism can lead to holistic, sustainable, and innovative development, which creates long-term benefits for city dwellers, tourists, and the environment (54).

The eighth cluster is dialogue systems. A dialogue system is a computer system designed to interact with humans through conversation. The system uses voice recognition and synthesis technology, natural language processing, and artificial intelligence to understand user queries and commands and respond appropriately (55) Through the application of dialogue systems, smart cities and smart tourism can improve user interaction, provide a more personalized and efficient travel experience, provide real-time information, and obtain valuable data for better development and decision-making (51) The 9th cluster is big data. Big data refers to large and complex data sets that cannot be processed using traditional methods. Data in big data usually has a large volume, high speed, and complex diversity (56) By applying big data, smart cities and smart tourism can optimize big and complex data to gain valuable insights, improve operational efficiency, provide better services to users, and improve safety and security (57).

The tenth cluster is the *Internet of Things* which refers to a network of physical objects digitally connected and interacting with each other through the Internet equipped with sensors, software, and connectivity so that it is possible to collect and exchange data (19) IoT is important to use in the application of *smart cities* and *smart tourism* because it is the main key to smart tourist city accessibility (26) The eleventh cluster is *citizen science*. Citizen science refers to the practice of involving the community in the process of collecting data, observation, experimentation, or contribution to scientific activities involving non-scientific communities, or ordinary citizens, actively participating in the research process and

contributing valuable data or insights to scientific projects aimed at developing the conceptual framework of *smart cities* and *smart tourism* (58). Furthermore, the 12th cluster is *South Korea*. South Korea is one of the countries in the world that is massive in developing the concept of *smart city* and *smart tourism*, as evidenced by the Government of Indonesia visiting directly to see four smart cities in South Korea that will be used as a reference for application in the Capital City of the Archipelago (IKN) located in East Kalimantan ((59).

The 13th cluster is integrated development. Integrated development refers to an approach that brings together various sectors, aspects, and elements in a system or area to achieve balanced and sustainable development with the aim of integrating various components in a single entity so as to support each other and improve the quality of life (60). Through the integration of sectors, technology, infrastructure, and community participation, integrated development enables balanced, sustainable, and competitive development in the context of smart cities and smart tourism (61) The fourteenth cluster or the last cluster is the trajectory. In the context of smart cities and smart tourism, the trajectory can refer to the changes and evolutions that occur in the development and application of smart solutions within the city and tourism sector (62) Trajectory highlights the expected direction of development, change, and evolution in order to achieve smarter, more sustainable, and more efficient cities and tourist destinations by utilizing innovative technologies and solutions (63).

4.2 Discussion

In Indonesia, the implementation of *Smart City and Smart Tourism has become a priority to improve the quality of life of city dwellers and advance the tourism sector* (64). Governments and stakeholders continue to work together in adopting smart technologies, building strong ICT infrastructures, and encouraging public and private sector participation in developing smart solutions and innovations in the urban and tourism sectors. In this ever-changing and fast-paced context, the implications of *Smart City and Smart Tourism in shaping the urban future are the defining factors that impact smarter, sustainable, and attractive tourist cities* (A. S. Putra, 2019).(1)The concept of *smart city* and *smart tourism* itself aims to provide convenience for the community in terms of utilizing Information and Communication Technology (65) These two concepts are smart concepts for alternatives in solving problems involving the role of society (66)

The development of Smart Tourism correlates with the progress of Smart Cities where ICT solutions are increasingly being implemented with the aim of improving tourist comfort and utilizing data as a valuable source of information, but the adoption of this concept in various tourism sectors can take place at different speeds so that gaps may arise in development (39). Contrary to that, (1), who researched the concept of a smart city in DKI Jakarta, stated that this smart city concept would facilitate residents on all fronts through the palm or technology. The Indonesian government has tested *virtual reality* technology on Habibie tourist destinations, impacting the ease of service for tourists and the tourism provider community (67). Information assists this convenience and Communication Technology (ICT) manifested through *the Internet of Things*, virtual reality, augmented reality, and *digital platforms to facilitate the service of this tour*.

The use of this technology is needed to ensure the preservation of nature and culture so that it will have a positive impact on society in Indonesia. The application of *the technology-based smart tourism concept* is the best solution for all parties that brings a much more applicable tourism experience (14) The use of *tourism applications* is in line with the role of tourism in facing digital challenges, where this technology makes it easier for people to access tourist destination information (68). (69) stated that the development of the concept of *smart tourism will* always coexist with technological advances, so it requires innovations that

will have an impact on improving the experience of tourism services in Indonesia. According to (17), who researched the Pangandaran area, destinations have transformed using the internet, such as *websites*, social media, and applications that positively impact increasing tourist visits.

However, the implementation of *smart cities* and *smart tourism in Indonesia* has encountered challenges and obstacles that are in line with previous research. According (6) revealed that the implementation of the *smart city* in Bandung has experienced several obstacles, including 1) the government has not carried out massive socialization to the community; 2) inadequate infrastructure; 3) lack of apparatus in understanding *smart city*; and, 4) System Operating Procedures only refer to the *roadmap of the Mayor of Bandung*. In line with that, according to (2) states that the application of *smart cities* in an area, including 1) the availability of data and information; 2) security and privacy; 3) large investment; 4) adequate IT infrastructure; 5) social adaptation; and 6) application development. This is emphasized by (9) stated that the application of *smart cities* requires different approaches between one region and another related to the characteristics of an area. (70) also stated that the implementation of smart tourism in *Simalungun Regency experienced major obstacles in the form of inadequate Information and Communication Technology, thus hampering the design of smart tourism*.

Thus, implementing the concept of *smart city* and *smart tourism* is not only through the use of technology. However, it requires other aspects that support implementation in Indonesia. This has been proven by (71), who researched in Tanjung Lesung, West Java Province, and found that the application of *smart tourism* and smart cities is carried out gradually through increasing community capacity in the form of empowerment, digital marketing, and institutional development. Then (5), who researched in Malang City, said that strategies are needed in the form of environmental sustainability, fast service, and community readiness. In line with that, the long-term development of smart cities in Malang requires the readiness of superior Human Resources through community empowerment, including MSMEs and cooperatives (8). The tourism strategy in Indonesia involves millennials contributing to developing tourism *branding* to improve Indonesia's economy (15). Finally, the implementation of *smart cities* and *smart tourism* must also pay attention to environmental sustainability (72).

5 Conclusion

The conclusion of this study shows that *smart cities* and *smart tourism* as topics of interest in the period 2013 to 2022; although there was a decrease in the number of publications in 2022, overall, there was a significant increase in the last eight years. In addition, this study resulted in fourteen (14) clusters that have been analyzed using CiteSpace and show that China is the country that researches *smart cities* and *smart tourism* the most. This finding proves that *smart cities* and smart tourism *do not only focus on technology development but involve social aspects* of Economic Improvement, Environmental Sustainability, and Community Empowerment in Indonesia. *Smart cities* and *smart tourism* not only strive to improve efficiency and convenience by using advanced technology but also aim to have a positive impact socially, economically, and environmentally. These findings can be used as a reference for academics and government in developing the concept of *smart city* and *smart tourism*.

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