International Journal of Technology

http://ijtech.eng.ui.ac.id

Research Article

Understanding a Smart Sustainable City Theme: A Case of Urban Innovation Performance in Bandung City, Indonesia

Ridwan Sutriadi [1,*], Davin Azhari Hadicahyono [1,2], Naya Cinantya Drestalita [1,3]

[1]Urban and Regional Planning Department, School of Architecture, Planning, and Policy Development (SAPPD), Bandung Institute of Technology, Bandung 40132 Indonesia
[2]Graduate School of Policy Science, Ritsumeikan University, Ibaraki, Osaka 567-8570 Japan
[3]School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham, B15 2TT United Kingdom
[*]Corresponding author: readone@office.itb.ac.id; Tel.: +622622504735; Fax: +622622501263

Abstract: Innovation is typically associated with breakthroughs that address problems and frequently discussed in the context of personal and corporate business development. Discussing innovation at the urban level from an urban planner's perspective is intriguing particularly because it includes not only the achievement of direct economic returns but also the deliverance of widespread benefits to city residents. Therefore, this study aims to presents Regional Development and Empowerment Innovation Program (PIPPK) as a solution to address urban planning challenges. PIPPK was selected primarily because unlike many other urban innovation and smart sustainable cities concepts, it does not rely on Information and Communication Technology (ICT). Instead, it focuses on public participation from both the community and private sector to optimize solutions to basic urban problems. In 2015, the city government of Bandung launched this initiative, which came before the smart cities' movement in Indonesia. Because of this, it can be seen as an early example of urban innovation that has the potential to support the smart sustainable cities idea. This initiative aims to foster the effective implementation of developmental programs. Accordingly, this approach to urban planning comprises detailed spatial planning at both the district and sub-district levels, with an apt consideration of financial capacity, complementing the sub-area planning method generally used in Indonesia. It is also important to state that the emphasis on community empowerment within the initiative typically leads to the effective integration of regional strategic issues into planning and the provision of valuable inputs. In this study, in-depth interviews were carried out and technical documents were analyzed regarding the implementation of PIPPK. The results showed that the PIPPK approach minimized discrepancies between general city-level development plans and local needs. In turn, this correspondence promotes equitable development and supports detailed spatial planning at the sub-regional level.

Keywords: Participatory planning; Smart sustainable cities; Urban innovation; Urban planning

1. Introduction

The field of urban and regional planning, originating from Ebenezer Howard's influential work in the United Kingdom (Howard, 2010), has consistently featured extensive debates among urban

This work was supported by the Bandung Institute of Technology funded by Directorate orate of Community Services and Expertise Services, CRCS Building 7th Floor – Jalan Ganesha No. 10, Bandung 40132

https://doi.org/10.14716/ijtech.v16i4.5531
Received February 2022; Revised November 2022; Accepted August 2023

planners regarding urban challenges and the proposal of various innovative solutions. Specifically, attention has been directed toward challenges surrounding fundamental urban infrastructure (Steele and Legacy, 2017), and the intricate roles of community engagement in fostering innovation within the creative industry (Aldianto et al., 2020; Tricahyono et al., 2018). As documented in a previous study, various theoretical frameworks have been developed, each offering diverse perspectives on Urban Innovation, positing the subject matter as a catalyst for cities and local governments to enhance the well-being of inhabitants (Duxbury et al., 2012). In the urban context, innovation necessitates different engagements with stakeholders, with a particular emphasis on the roles of governmental entities, the relationship between academic institutions and industry, and the participation of citizens (Berawi, 2016). At its core, urban innovation aims to devise novel approaches to address the social, economic, environmental, and governance challenges confronting contemporary cities (Gallotti et al., 2021). It is important to acknowledge that innovation may comprise efforts tailored towards either the reconfiguration of institutional frameworks, exploration of models for democratic governance and decision-making processes, fostering novel forms of community engagement and participation, or devising managerial and organizational solutions, all of which leads to the achievement of smart sustainable cities (Sutriadi, 2015).

When discussing smart sustainable cities, it is crucial to comprehend the constituent elements within. As stated by Höjer and Wangel (2015), the concept of smart sustainable cities comprises the intersecting domains of 'smart', 'sustainable', and 'city'. A city is considered "sustainable" if it focuses on sustainability without integrating ICT, while a city that uses technology without sustainability efforts is merely a "smart city". Therefore, a smart sustainable city advocates for the utilization of ICT to advance sustainability objectives (Shah, 2023). In line with this, Berawi (2022a) argued that digital technology plays an important role in fostering community engagement for urban issue resolution by involving citizens, experts, and stakeholders through mechanisms such as crowdsourcing, open platforms, and collaborative democracy models (Sankowska, 2018). Accordingly, the development of urban technology and innovation can significantly contribute to building smart cities as a solution to various urban challenges (Berawi, 2022b). The study further underscored the contribution of advancements in science and technology to sustainable development, in line with (Berawi, 2023).

On the contrary, the utilization of ICT represents just one aspect among many dimensions that contribute to the complexity of smart cities (Ahad et al., 2020). Considering this concept, Sutriadi (2018) asserted that a smart city transcends the narrow confines of ICT implementation. Within the field of community participation techniques and governance, this concept is synonymous with leveraging ICT as a tool to foster community engagement mechanisms and increase social capital in facilitating pragmatic urban governance. However, in the broader societal dimension, it embodies communal knowledge advancement as a method to cultivate an improved environment through active participation in realizing infrastructure networks that underpin regular societal activities (Kamal et al., 2023). In concurrence, UNECE (2018) emphasized in its Guidelines for the Development of Smart Sustainable City Action Plans, the crucial role of community engagement as an integral facet of smart sustainable cities. This form of engagement was observed to serve as a channel for proactive communication among governments, communities, and the private sector.

The discourse surrounding innovation has become significantly intriguing within the framework of Asian cities, and this is primarily because of the distinct characteristics possessed by the areas (Green et al., 2021). In line with this, Hamnett and Forbes (2011) reported that approximately two-thirds of the global population resides in Asia, which comprises the world's most populous countries, including Indonesia's urban centers. Moreover, Southeast Asian populations are renowned for proactive responses to environmental challenges and threats (Islam and Khan, 2020).

This study presents a distinctive form of urban innovation known as the *Program Inovasi Pembangunan dan Pemberdayaan Kewilayahan* (Regional Development and Empowerment on Innovation Program), abbreviated as *PIPPK*. Pioneered by the Bandung City Government, PIPPK aims to enhance community participation opportunities based on local needs and priorities, as

outlined in the current development plans such as the Regional Mid-Term Development Plan (*Rencana Pembangunan Jangka Menengah Daerah – RPJMD*) and Regional Spatial Plan (*Rencana Tata Ruang Wilayah – RTRW*). This initiative seeks to optimize stakeholder participation in providing essential infrastructural services. As evidenced by PIPPK, the implementation of smart sustainable cities through urban innovation is not solely reliant on Information and Communication Technology (ICT). As a result, this study aims to examine the efficacy of PIPPK as an urban innovation initiative in the realm of urban planning, with minimal emphasis on the utilization of ICT.

2. Methods

The present study was conducted during a period of movement restrictions at the height of the COVID-19 pandemic, therefore, it necessitated the adoption of a unique methodological approach compared to standard qualitative investigations. The study utilized a hybrid methodology consisting of both literature review and content analysis to assess the implementation of urban innovation within PIPPK in the context of urban planning in Indonesia. To examine urban innovation, the literature review traced its origins and categorized papers on urban innovation into various perspectives. Subsequently, content analysis (Kilonzo and Ojebode, 2023) was applied to explore the information obtained from interview results and regulatory documents related to urban innovation.

Interviews were conducted with government stakeholders who were participants in planning, implementing, and controlling PIPPK, as well as those responsible for spatial planning in Bandung City. Additional interviewees included representatives from district (*kecamatan*) and sub-district offices (*kelurahan*), all of which were included to reflect the citizen perspective. Given the hierarchical relationship between district and sub-district offices and the city government, a multistage purposive sampling approach (Rai and Thapa, 2024; Sedgwick, 2015) was adopted.

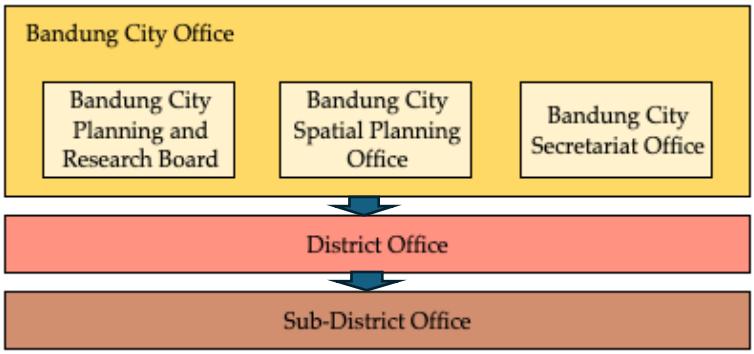

Figure 1 Multistage Purposive Sampling

Based on the sampling results (Figure 1), the interviewees representing the government included the Bandung City Secretariat as the program initiator, the Development Planning and Research Board as the city-level planning agency, and the Spatial Planning Office serving as the authority in urban spatial planning. Accordingly, to represent the communities, interviewees were selected from the Rancasari District and Bandung Kulon District Offices. The selected sub-district offices included Cipamokolan, Mekarjaya, Manjahlega, Gempolsari, and Warung Muncang. It is important to establish that this selection was based on an evaluation of previous PIPPK performance by the city government.

To conduct the analysis, qualitative research tools were adopted to serve as the primary methodology. Atlas.ti (Hwang, 2008) was used to distill the interview results and technical documents on the implementation of PIPPK into sets of coding, which were subsequently interpreted descriptively.

3. Results and Discussion

3.1. Urban Innovation Perspective in PIPPK

Drawing from interviews and technical documents related to the implementation of PIPPK (Bandung Mayor Regulation, 2020), data were systematically reduced and organized into open codes. These codes were then categorized into inputs, processes, outputs, and outcomes.

Based on Table 2, it is evident that the inputs cluster served as the foundation for the innovation initiative in PIPPK. The urban innovation in this context was driven by unique development needs and the active role of the community in identifying developmental issues within each sub-area. This background informed a focused objective within the outputs, which aimed to address development needs and enhance community empowerment in sub-areas through the synergy between the government and active community participation. These objectives were pursued through various processes, and evaluated using budget performance, innovation, usefulness, and public participation, leading to outcomes that are beneficial to the community.

Table 1 Interview and Documents Coding

Interview Coding	Documents Coding
Inputs	
• There is a desire of the community to solve problems in their neighborhood unit (local) • Fulfilling the sub-area development needs • Equitable development in all sub-area	• Dynamic change in society can be achieved optimally with active public participation • Collaboration between local officials and the community is the key to solving development problems
Processes	
• Measured by budget number • Measured by innovation number • Measured by its usefulness • Measured by public participation	• Sub-area priority proposal accomplishment • Innovative activity • Public participation number in the development area • Benefits for community/public
Outputs	
• Fulfilling the sub-area development needs • Sub-area community empowerment	• Realizing the synergy of the apparatus/officers • Improve the duties, roles, and functions of the apparatus/officers • Increasing the role of social/public institutions • Improve the ability of the community and LKK (Sub-District Community Institution) to map issues and solve problems
Outcomes	
• Sub-area priority proposal accomplishment • accomplish the needs of the public/community • Resolved the public/community problems • Sub-area affairs can be handled	• Benefits for public/community

The perspective of innovation in PIPPK focuses solely on urban development, with its core issue being equitable development. In contrast to conventional development approaches, PIPPK emphasizes community empowerment at both local and sub-area levels. Furthermore, according to Cheshmehzangi and Li (2020), this approach responded to the diverse spatial structures, which allowed local communities to learn from environmental conditions. The Bandung government views development as "an integrative process, comprising planning, implementation, and control, conducted continuously to achieve community welfare" (Bandung Mayor Regulation, 2020). PIPPK's bottom-up participation emphasizes the community's role in identifying basic

infrastructure needs, which is being interpreted as 'equitable development.' Gu (2017) asserted that physical infrastructure is intrinsically related to the institutions managing it. Within this context, PIPPK has effectively bridged the communication gap between stakeholders and the need for physical infrastructure. As a form of soft infrastructure, the initiative plays a crucial role in ensuring inclusive development. This is in line with Gu (2017) concept of "integrating soft and hard infrastructures for inclusive development."

The various approaches outlined in PIPPK serve as the technical steps for realizing its development goals. These approaches, including collaboration among actors, synergy among government apparatus, and public participation, position the initiative within the framework of Urban Governance. According to Bekkers et al. (2011), the concept of innovation in governance comprises participation, inclusion, and empowerment, which are integral to institutional innovation and represent a new model of democratic governance as well as its processes. Therefore, PIPPK, as a government initiative, is complemented by urban governance, which emphasizes innovation in political leadership.

In this context, PIPPK shows that innovation extends beyond ICT, contingent upon its specific objectives. Whether aiming to reorganize institutional frameworks, develop models of democratic governance and processes, foster new forms of community inclusiveness and participation, enhance service processes, or devise new managerial and organizational solutions, the essence of innovation is versatile (Solong et al., 2024). UNECE (2018) stated that innovation is not confined to technology but broadly centered on the application of knowledge and ideas to address existing problems effectively. Furthermore, it is also crucial to identify innovations that incorporate democratic considerations, as these advancements rely not only on visionary leadership but also on political constituents and existing mechanisms (Wang et al., 2021). This approach seeks to create participation and empowerment opportunities that are accessible to all citizens and development stakeholders. In Indonesia, while government-related advancements have been increasingly pursued, there remains a need for efforts to integrate the innovations into a cohesive governance framework (Damuri et al., 2018).

In Indonesia, several gaps in the exploration of innovation at the governance level can be addressed by integrating local wisdom and culture (Suranto and Darumurti, 2024). For instance, from a managerial and organizational perspective, adopting the principle that the government serves as a public servant ensures the provision of excellent service. Additionally, new forms of community participation can include institutionalizing traditional practices such as the mutual assistance system, revolving funds, and the concept of rice barns, which have been passed down through generations (Khadijah et al., 2024). This approach not only preserves valuable cultural practices but also fosters innovative governance that is both effective and culturally resonant (Saputra, 2024).

Figure 2 shows the intricate concept of innovation within public governance, laying emphasis on its multifaceted nature and transformative potential. From the figure, it can be seen that PIPPK serves as an effective representation of Institutional Innovation due to its new arrangements and frameworks in development governance. Additionally, the initiative exemplifies Democratic Innovation as it harnesses the democratic process in novel ways, fostering community empowerment and exemplifying Public Innovation in action. When compared with the case presented by Patterson and Huitema (2019) on institutional innovation for addressing climate change, PIPPK shares similarities as an institutional innovation introduced by the Bandung City government in tackling development issues.

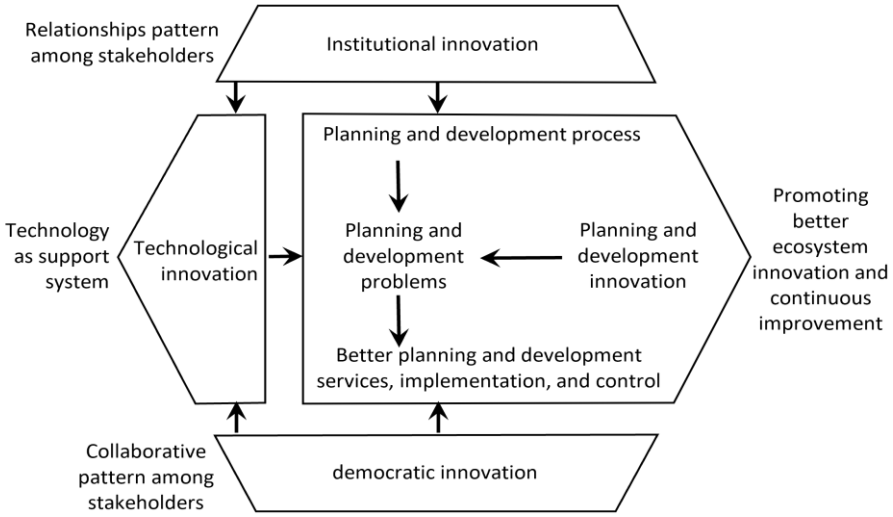

Figure 2 Innovation Concept on Public Governance

3.2. PIPPK in Urban Planning Constellation

Urban planning in Indonesia typically adopts a distinctive sub-area-based development approach (Buchori et al., 2017). According to the Agrarian Affairs and Spatial Planning Ministry Regulation Number 11/2021 on Detailed Spatial Plans, each region must define an 'objective' as the foundation for conception drafting. This objective serves as a reference for developing a spatial pattern plan, a spatial structure plan, provisions for spatial use, and zoning regulations.

These objectives also serve to maintain the consistency and harmony of urban development in correspondence with the urban spatial plan. Several bases and considerations inform the formulation of the objectives, with the most prominent being based on strategic issues within the sub-area, while also taking into account the area's potentials, advantages, social conditions, competitiveness, and priority problems. It is important to understand that the role and aspirations of communities are crucial in associating implementation with the prioritization of problems. This perspective is also shared by the city government of Bandung, among which the belief exists that sub-area strategic issues can be easily identified and confirmed through the roles and aspirations of local communities. However, the scale of the sub-area is still too large for the local community to manage effectively. To address this, the city government of Bandung introduced PIPPK initiative, which replicated the pattern of utilizing public participation in urban planning on a smaller scale.

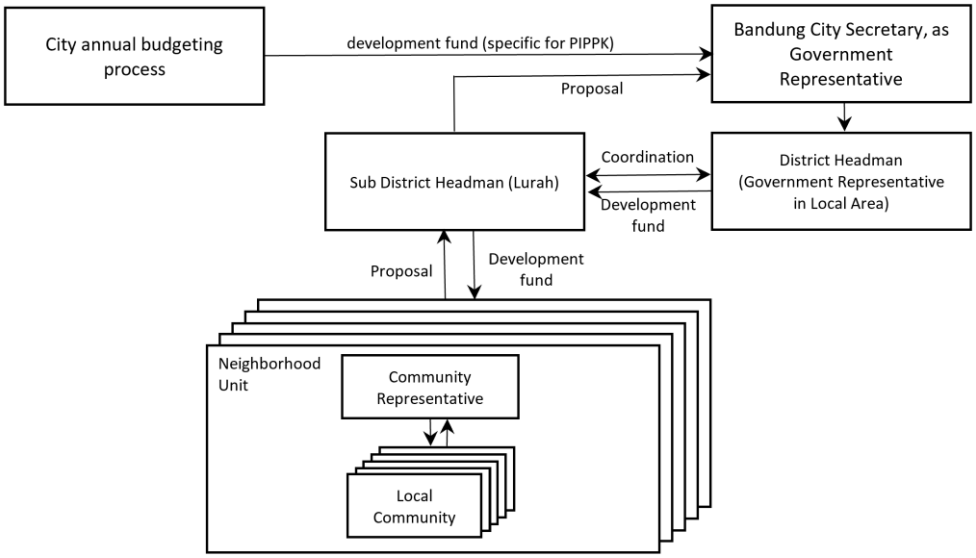

Figure 3 PIPPK Application Flow

Figure 3 shows the implementation flow of PIPPK, detailing the entire process of applying the initiative. As outlined in the figure, the local community conducts discussions within respective neighborhood units to compile proposals, which are then submitted to the Sub-District Headman (*Lurah*). These proposals are subsequently forwarded to the Bandung city government through the city secretariat for verification and approval. Upon approval, development funds are then transferred through the District Headman (*Camat*) to each Sub-District, to be used as per the proposals from the neighborhood units. While the implementation flow appears highly technical, it is in line with urban planning principles primarily because it addresses the dynamic development needs originating from the local community. In summary, PIPPK enables the transmission of valuable information from the public to the government. Although the community appears to be merely "raising a problem" in anticipation of "development funds," the real value lies in the information conveyed to the government. Items in community proposals may emphasize strategic issues in development, providing crucial knowledge for urban planning. Furthermore, a proposal approved by the government simply shows support for local development in line with existing plans. This flow underscores PIPPK's significant role in urban planning in Bandung. Such a participatory model is rare in urban planning and provides planners with direct information about strategic issues. This innovative approach can serve as a benchmark for other city governments in Indonesia facing similar development challenges and can inform the national government's efforts toward equitable regional development.

According to Athey et al. (2007), the Urban Innovation Model constitutes two main variables namely Urban Hubs and Local Links. Urban Hubs focus predominantly on developing specific sectors and clusters based on certain innovations, ensuring broader market development and function specialization. These hubs are supported by Urban Assets, including specific skills and job markets, physical connectivity, and proximity, as well as Urban Markets, which provide market access at various levels and connections with global trades. Alternatively, Local Links are essential for building a network of skills and expertise at the city level, facilitating the development of products or services by connecting sectors and sub-sectors. This constituent comprises Urban Networks, which facilitate the flow of ideas to the market for feedback, and Urban Institutions, including universities, research and development institutions, as well as private sector associations. At the core of urban innovation are Urban Firms, which drive the growth and development of innovative activities within the city, thereby enhancing its competitiveness. It is important to establish that the development of industrial sectors and clusters in Urban Hubs relies heavily on the spatial aspect, as spatial organization is a crucial component of urban assets. Based on this understanding, effective spatial planning becomes essential to ensure that Urban Hubs, Local Links, and Urban Firms are integrated into the city's spatial plan. In accordance with this, the Cities Alliance (2019) emphasized that physical connectivity, as hard infrastructure, must be balanced with soft infrastructure, such as knowledge, governance, and ICT, to promote equitable development.

Based on Athey et al.'s Urban Innovation Model, PIPPK represents an urban innovation initiative introduced and carried out by the government as an "urban firm." This model inherently includes Urban Hubs and Local Links, which serve as vital components in facilitating community engagement and enhancing accessibility to resources. However, the core of PIPPK, which is typically driven by the government's perspective on development issues, does not sufficiently incorporate innovations capable of being generated by the community itself. Urban Hubs, according to the Urban Innovation Model, consists of Urban Assets and Urban Markets. In this context Urban Assets are collections of community expertise in specific areas with physical proximity. Referring to Bandung Mayor Regulation (2020), PIPPK budget can be utilized by neighborhood youth associations (Karang Taruna) and housewives' associations (PKK), which have the potential to produce unique and innovative work. This potential innovation, derived from community groups, is essential for forming Urban Markets. Similarly, within this framework, Local Links comprise Urban Networks and Urban Institutions, both of which play crucial roles in connecting communities and institutions to foster collaboration and resource sharing. Urban Networks facilitate the flow of

innovation to the market but without community-generated demand, these networks cannot form effectively.

In urban settings, the concept aimed to improve public services provided by the government and enhance economic opportunities for the population. It is important to also establish that within the context of the present study, Bandung's efforts to promote a smart and sustainable urban center were in line with strategic technological innovations, environmental conservation, and community inclusiveness in proposing development programs. This effort led to the introduction of PIPPK, an innovative initiative adopted by the local government to facilitate more inclusive and equitable urban development. From the urban planning perspective, the initiative was recommended to be included in both the urban planning formulation and urban governance clusters.

In the context of urban plan layers, which typically ranged from general, and detailed, to design type, PIPPK was found to enhance the role of urban governance by applying community empowerment and public participation-related principles of urban development. This innovative approach fostered mutual understanding between the city government and other stakeholders, starting with problem formulation and the development of innovative solutions. Furthermore, this form of collaboration was considered an initial step towards creating better urban performance. PIPPK was also observed to share a view on the relationship between development and community empowerment. The investigation argued that empowering local communities within respective sub-areas responded to the diversity of spatial structures, leading to varied information that allows locals to learn from environmental conditions. In Indonesia, it is crucial to delineate that PIPPK, as an urban innovation initiative, complements the urban planning process.

The development approach used within the initiative motivates the community to become more familiar with its surroundings while formulating strategic issues that serve as inputs and feedback for the urban planning process. Additionally, PIPPK was developed in line with the Urban Innovation Model. Within this model, urban firms were specifically crucial in driving innovation, suggesting that urban innovation must navigate the complexities of an urban innovation system. During the course of the present study, Urban firms, including PIPPK, showed innovative approaches by promoting novel solutions to problems and creating better economic opportunities through the integration of Urban Hubs and Local Links. These approaches ensured that the community is not only engaged but also integral to the continuous improvement and sustainability of urban development efforts. Urban Hubs proved that PIPPK added value as an urban asset through its bottom-up planning process. Similarly, Local Links also emphasized PIPPK as a legitimate participatory planning approach that promotes diversity and needs to be integrated into common urban planning objectives.

The planning concerns reflected an awareness of a bottom-up concept of change aimed at improving conditions at the local level. This process was coordinated at the sub-district level, compiled and structured at the district level, and finally consolidated at the city level. Following the observations made during the course of the study, it was found that there is a significant element of social learning included in initiating specific programs to address local problems, particularly in development programs and budgeting, such as basic infrastructure. The continuity of PIPPK as an urban innovation initiative is crucial, as it featured pioneering efforts to improve conditions and address fundamental urban issues. The program’s success anchors on cooperation among stakeholders at the local level, indicating that PIPPK, as a grassroot initiative, effectively identified and prioritized local urban problems that need resolution. With its unique composition, PIPPK can play a very crucial role in urban development and planning, although it comes with several consequences.

Within the city government, various offices, including the Bandung City Development Planning and Research Board, have a significant role in implementing this type of innovation. Therefore, coordination between sectors is crucial to ensure the successful execution of PIPPK and its contributions to urban development and planning. It is also crucial to maintain the continuity of this form of innovative programs within city governance. In the context of regional autonomy in

Indonesia, which allocates development authority across central, provincial, and city levels, PIPPK was found to be in line with the increasing awareness among stakeholders about the importance of collaborative programs at the city scale. This collaboration can draw on various funding sources, not just from the city but also from provincial and central governments. In summary, the present study showed the proactive approach adopted by the City of Bandung to establish smart sustainable cities through a governance model that emphasized grassroots community engagement. This approach not only enhances the planning and implementation processes but also ensures that the development initiatives are comprehensive and inclusive, leveraging both local knowledge and broader governmental support.

4. Conclusions

In fact, the regional development and empowerment innovation program in Bandung City tends to focus on community empowerment at the local level, particularly using an innovative and collaborative approach that aligns with Indonesia's regional autonomy policy. This innovative program places greater emphasis on the social and economic aspects reflected in local infrastructure development. Compared to the smart sustainable city initiatives that developed in Indonesia several years later, the regional development and empowerment innovation program focuses less on technological products as part of local infrastructure needs and more on social empowerment and bottom-up urban development. In later stages, the program emphasizes technology integration as an integral part of sustainable smart city governance. Meanwhile, the key to the success of this innovative program is that its success rests more on active community participation. Lack of such active participation will also hinder optimal synergy with the implementation of the sustainable smart city concept. These barriers to synergy result in gaps in the effectiveness and efficiency of program execution. The takeaway from the Bandung City case study of this grassroots innovative initiative relates to the insufficient human resources that can impede the broader implementation and advancement of the concept. Consequently, this innovation program for regional development and empowerment will operate only in part, not yet completely integrated with the broader and more coordinated sustainable smart city initiative, including in reaching the anticipated development goals

Acknowledgements

This study is funded by the Program of Research, Community Service and Innovation Program, Bandung Institute of Technology and the implementation of which is coordinated with the School of Architecture, Planning, and Policy Development (SAPPD), Bandung Institute of Technology.

Author Contributions

The authors confirm their individual contributions as follows: Ridwan Sutriadi contributed to the conceptualization, manuscript drafting, review, editing, and recommendations; Davin Azhari Hadicahyono was involved in manuscript drafting, literature review, and data collection; Naya Cinantya Drestalita were responsible for the review, editing, and visualization. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

References

Ahad, MA, Paiva, S, Tripathi, G & Feroz, N 2020, 'Enabling technologies and sustainable smart cities', *Sustainable Cities and Society*, vol. 61, article 102301, https://doi.org/10.1016/j.scs.2020.102301

Aldianto, L, Wirawan, C, Anggadwita, G & Rizqi, V N 2020, 'Integrated clustering of creative industries to foster innovation: Bandung's creative industries', *International Journal of Entrepreneurial Venturing,* vol. 12, no. 4, pp. 420-438, https://doi.org/10.1504/IJEV.2020.109542

Athey, G, Glossop, C, Harrison, B, Nathan, M & Weber, C 2007, 'Innovation and the city: How innovation has developed in five city regions', *Research Report*, London: NESTA

Bandung Mayor Regulation 2020, Mayor Regulation Number 15 Year of 2020 of Second Amendment of Mayor Regulation Number 15 Year of 2019 of Technical Guidelines for PIPPK, Bandung, Indonesia

Bekkers, V, Edelenbos, J & Steijn, B 2011, *Innovation in the public sector: Linking capacity and leadership*, Palgrave Macmillan, Hampshire

Berawi, MA 2016, 'Value-based innovation: Knowledge and technology transfer in the triple helix model', *International Journal of Technology*, vol. 7, no. 1, pp. 1-4, http://dx.doi.org/10.14716/ijtech.v7i1.3064

Berawi, MA 2022a, 'Fostering smart city development to enhance quality of life', *International Journal of Technology*, vol. 13, no. 3, pp. 454–457, https://doi.org/10.14716/ijtech.v13i3.5733

Berawi, MA 2022b, 'New city development: Creating a better future and added value', *International Journal of Technology*, vol. 13, no. 2, pp. 225–228, https://doi.org/10.14716/ijtech.v13i2.5598

Berawi, MA 2023, 'Smart cities: Accelerating sustainable development agendas', *International Journal of Technology*, vol. 14, no. 1, pp. 1–4, https://doi.org/10.14716/ijtech.v14i1.6323

Buchori, I, Sugiri, A, Maryono, M, Pramitasari, A & Pamungkas, IT 2017, 'Theorizing spatial dynamics of metropolitan regions: A preliminary study in Java and Madura Islands, Indonesia', *Sustainable Cities and Society*, vol. 35, pp. 468–482, https://doi.org/10.1016/j.scs.2017.08.022

Cheshmehzangi, A & Li, HA 2020, 'Innovation through urban diversity and achieving comprehensive sustainable urbanism from a community-oriented approach', *Current Urban Studies*, vol. 8, pp. 222–240, https://doi.org/10.4236/cus.2020.82012

Cities Alliance 2019, *Connecting systems of secondary cities*, Cities Alliance/UNOPS, Brussels

Damuri, YR, Aswicahyono, H & Christian, D 2018, 'Innovation policy in Indonesia', *Innovation policy in ASEAN*, pp. 96–127

Duxbury, N, Cullen, C & Pascual, J 2012, 'Cities, culture and sustainable development', *Cultural policy and governance in a new metropolitan age*, pp. 73–86

Gallotti, R, Sacco, P & De Domenico, M 2021, 'Complex urban systems: Challenges and integrated solutions for the sustainability and resilience of cities', *Complexity*, vol. 2021, no. 1, article 1782354, https://doi.org/10.1155/2021/1782354

Green, A, Fanshawe, F & Crepaldi, N 2021, *21st century cities: Asia Pacific's urban transformation*, MIT Technology Review Insights, viewed 5 July 2025 (https://www.technologyreview.com/2021/11/10/1039592/21st-century-cities-asia-pacifics-urban-transformation/)

Gu, Q 2017, 'Integrating soft and hard infrastructures for inclusive development', *Journal of Infrastructure, Policy and Development*, vol. 1, no. 1, pp. 1–3

Hamnett, S., & Forbes, D. K. (Eds.) 2011. Planning Asian cities: Risks and resilience. Abingdon: Routledge.

Höjer, M & Wangel, J 2015, 'Smart sustainable cities: Definition and challenges', in M Hilty & B Aebischer (eds), *ICT innovations for sustainability*, Springer International Publishing, pp. 333–349

Howard, E 2010, *To-morrow: A peaceful path to real reform, Cambridge University Press.*

Hwang, S 2008, 'Utilizing qualitative data analysis software: A review of Atlas.ti', *Social Science Computer Review*, vol. 26, no. 4, pp. 519–527, https://doi.org/10.1177/0894439307312485

Islam, M. R., & Khan, N. A. 2020. Threats, vulnerability, resilience and displacement among the climate change and natural disaster-affected people in South-East Asia: an overview. Climate Change Mitigation and Sustainable Development, 111-138.

Kamal, SMA, Kafi, N, Samad, F, Syed, HJ & Durrani, MN 2023, 'Modelling civic problem-solving in smart city using knowledge-based crowdsourcing', *International Journal of Computer Science & Network Security*, vol. 23, no. 8, pp. 146-158, https://doi.org/10.22937/IJCSNS.2023.23.8.18

Khadijah, ULS, Winoto, Y, Shuhidan, SM, Anwar, RK & Lusiana, E 2024, 'Community participation in preserving the history of heritage tourism sites', *Journal of Law and Sustainable Development*, vol. 12, no. 1, e2504, https://doi.org/10.55908/sdgs.v12i1.2504

Kilonzo, SM & Ojebode, A 2023, 'Research methods for public policy', *policy and research in Africa*, Palgrave Macmillan, Cham, https://doi.org/10.1007/978-3-030-99724-3_4

Patterson, JJ & Huitema, D 2019, 'Institutional innovation in urban governance: The case of climate change adaptation', *Journal of Environmental Planning and Management*, vol. 62, no. 3, pp. 374–398, https://doi.org/10.1080/09640568.2018.1510767

Rai, N & Thapa, B 2015, 'A study on purposive sampling method in research', *Kathmandu School of Law Review*, vol. 5, no. 1, pp. 8–15

Saputra, R 2024, 'Governance frameworks and cultural preservation in Indonesia', *Journal of Ethnic and Cultural Studies*, vol. 11, no. 3, pp. 25–50, https://www.jstor.org/stable/48793990

Sedgwick, P 2015, 'Multistage sampling', *BMJ*, vol. 351, https://doi.org/10.1136/bmj.h4155

Shah, H 2023, 'Beyond smart: How ICT is enabling sustainable cities of the future', *Sustainability*, vol. 15, article 12381, https://doi.org/10.3390/su151612381

Solong, A, Masriadi, M & Aras, D 2024, 'Governance innovations in urban planning: Leveraging smart city technologies for sustainable development in Southeast Asian metropolises', *CosmoGov: Jurnal Ilmu Pemerintahan*, vol. 10, no. 2, pp. 313–327

Steele, W., & Legacy, C 2017. Critical urban infrastructure. Urban policy and research, 35(1), 1-6.

Suranto, S & Darumurti, A 2024, 'Local wisdom-based policy innovation in Indonesia during 2018–2021', *Journal of Governance and Public Policy*, vol. 11, no. 1, pp. 60–70, https://doi.org/10.18196/jgpp.v11i1.16920

Sutriadi, R 2015, *SMART CITY: Inovasi, kota komunikatif, dan kota berkeadilan (SMART CITY: Innovation, communicative city, and just city)*, Bandung: Inside Publisher

Sutriadi, R 2018, *10 langkah mencerdaskan kota*, ITB Press

Tricahyono, D, Alamanda, D T, Anggadwita, G, Prabowo, F S & Yuldinawati, L 2018, 'The role of business incubator on cultivating innovation on start-ups: The case study of Bandung techno park (BTP) Indonesia', *International Journal of Engineering and Technology*, vol. 7, pp. 226-235

United Nations Economic Commission for Europe (UNECE) 2018, *Guidelines for the development of smart sustainable city action plans*, UNECE, Switzerland

Wang, Q J, Feng, G F, Wang, H J & Chang, C P 2021, 'The impacts of democracy on innovation: Revisited evidence', *Technovation*, vol. 108, article 102333, https://doi.org/10.1016/j.technovation.2021.102333