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EXPLORATION STUDY OF CLIMATE CHANGE MITIGATION USING A PARTICIPATORY DESIGN CHARRETTE APPROACH IN THE ANDIR AREA, BANDUNG CITY, INDONESIA

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Abstract. Climate change poses a challenge for many urban areas worldwide. Inner cities face significant climate change impacts; one such inner city is the Andir Area in Bandung. Andir Area faces climate change issues due to its limited green space coverage of 18.15%, which impacts flood risks and high carbon emissions. However, the Andir Area also has the potential for heterogeneity and societal tolerance. With its potential and challenges, Andir Area can be developed as a climate village prototype, prompting the need for research exploring design strategies to mitigate climate change based on harnessing community heterogeneity. Collaborative planning, such as design charrettes, is one approach that leverages the heterogeneity of a community. This research method is a collaborative experimental study and utilizes design charrettes as an alternative approach to designing a heterogeneous and climate-resilient area. The research findings indicate that the quality of the Andir Area can be enhanced by integrating climate change mitigation with community heterogeneity through participatory design charrettes. The benefit of this research lies in providing insights to reduce the impact of climate change in the Andir Area through community participation. Overall, this article offers valuable perspectives on designing areas that can adapt to the challenges of climate change while preserving social-cultural heterogeneity, acculturation, and tolerance.

Keywords: Urban Design; Climate Change; Community Heterogeneity; Design Charrette

[Judul: Studi Eksplorasi Mitigasi Perubahan Iklim Menggunakan Pendekatan *Design Charrette* Partisipatif di Kawasan Andir, Kota Bandung, Indonesia]. *Perubahan iklim menimbulkan tantangan bagi banyak kawasan perkotaan di seluruh dunia. Kawasan pusat kota menghadapi dampak signifikan dari perubahan iklim, dan salah satu kawasan pusat kota tersebut adalah Kawasan Andir di Kota Bandung. Kawasan Andir menghadapi isu perubahan iklim karena terbatasnya cakupan ruang hijau sebesar 18,15%, yang berdampak pada risiko banjir dan emisi karbon yang tinggi. Namun Kawasan Andir juga memiliki potensi heterogenitas dan toleransi masyarakat. Dengan potensi dan tantangannya, Kawasan Andir dapat dikembangkan sebagai percontohan kampung iklim, sehingga mendorong perlunya penelitian yang mengeksplorasi strategi desain mitigasi perubahan iklim berdasarkan pemanfaatan heterogenitas masyarakat. Salah satu pendekatan yang memanfaatkan heterogenitas komunitas adalah perencanaan kolaboratif, seperti design charrette. Metode penelitian ini adalah studi eksperimental kolaboratif dan memanfaatkan design charrette sebagai pendekatan alternatif untuk merancang kawasan heterogen dan tahan iklim. Temuan penelitian menunjukkan bahwa kualitas Kawasan Andir dapat ditingkatkan dengan mengintegrasikan mitigasi perubahan iklim dengan heterogenitas masyarakat melalui bagan desain partisipatif. Manfaat penelitian ini adalah memberikan wawasan untuk mengurangi dampak perubahan iklim di Kawasan Andir melalui partisipasi masyarakat. Secara keseluruhan, artikel ini menawarkan perspektif berharga dalam merancang kawasan yang dapat beradaptasi dengan tantangan perubahan iklim serta menjaga heterogenitas, akulturasi, dan toleransi sosial-budaya.*

Kata Kunci: *Desain Perkotaan; Perubahan Iklim; Heterogenitas Masyarakat; Desain Partisipatif*

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1. INTRODUCTION

Climate change refers to long-term changes in global weather, including average temperature changes, rainfall patterns, and atmospheric humidity levels (Rosenzweig, Solecki, Hammer, & Mehrotra, 2011). Climate change occurs due to changes in the concentration of greenhouse gases in the atmosphere. Carbon dioxide (CO^2) is mainly caused by human activities such as burning fossil fuels and deforestation. Urban areas have specific characteristics that affect climate change tendencies (Oke, 1982). Population growth and rapid urbanization in urban areas have increased greenhouse gas emissions from transport, Industry, and buildings (Seto & Shepherd, 2009). Solid urban surfaces and the use of heat-absorbing materials such as asphalt and concrete lead to the effect of an urban hot island, where the city temperature becomes higher.

Bandung City is one of the urban areas that has experienced climate change issues. In addition, one of the urban centers in Bandung City is the Andir Subdistrict. Based on the One Environmental Bandung Data, Andir District only has an open space of 18.15%. Based on the Local Climate Zone classification (Stewart & Oke, 2012), where this area has buildings with various heights and patterns, minimal area of open space and vegetation, and dominant pavement, the area classification starts from compact high-rise (LCZ 1) to open mid-rise (LCZ 5). The Andir area can potentially trigger UHI. In research by Lau, Tan, Morakinyo, and Ren (2022), located in Hong Kong, development plans that lead to tall and dense buildings can cause an increase in temperature due to heat being trapped in the area. In addition, according to Koch-Nielsen (2013), a reasonably dense building arrangement can provide shade. However, it will affect the heat stored in the outer space between buildings and cause an increase in ambient temperature.

In addition to the physical problems of the Andir area mentioned above, the Andir area still preserves the potential from its social aspects, namely social heterogeneity, accompanied by a high tolerance level and the nature of its gotong royong or collective collaboration society. Social heterogeneity in an urban area in Indonesia refers to variations and differences in cultural aspects: religion, language, social status, and other social characteristics among individuals and groups of communities living in the area (Jones, 2017). This social heterogeneity reflects the diversity in Indonesian urban society. Putnam (2000), shows that social heterogeneity is a feature of human social life. Those examples are the networks, norms, and beliefs that exist in social participants to take joint action, especially to achieve a common goal effectively. Social capital is considered a stimulant in the development of the social capability of a community (Wuysang, 2014). Social capital is significant for community development, namely a stimulant in developing the social capabilities of a community to achieve goals and encourage the community to adapt, which then becomes a catalyst for change and innovation (Arifa, 2023).

Figure 1. Andir Area as a Kampong of Tolerance

One of the first steps to mitigate climate change in a collaborative effort, such as the Andir Area, is collective problem discussion and collective solutions finding through the design charrette. These participatory discussions can be constructive and participatory climate change mitigation measures, so that the level of community participation can be further increased in the implementation. While urban climate problems and the value of community social capital are well recognized, there remains a knowledge gap in the literature on how these aspects can be integrated for climate change mitigation. Previous research

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has seldom addressed how a socially diverse community can collaboratively design local solutions to mitigate climate impacts. In particular, little attention has been given to leveraging a community's heterogeneity and cooperative spirit through structured participatory design processes as a climate change mitigation strategy. To address this gap, the present study explores a community-driven approach to climate change mitigation in the Andir area using a design charrette, an intensive and collaborative workshop that brings together local stakeholders to identify problems and co-develop solutions.

This paper is a collaborative experimental study that explores the potential for climate change mitigation through a participatory approach using a charrette design in the Andir area, Bandung. The design charrette is expected to produce solutions and efforts to collectively mitigate climate change. The design charrette approach is used as a tool to explore various possibilities in planning climate change mitigation in a collaborative and participatory manner. The findings of this study are neither right nor wrong. However, they are more experimental in gaining insight into the potential and challenges in optimizing acculturation and socio-cultural tolerance of heterogeneous areas in the context of climate change mitigation.

2. METHOD

The methodology of this research is based on a collaborative experimental study that aims to explore the heterogeneity of the community in mitigating climate change together in the Andir area of Bandung. According to Nielsen, Stavrianakis, and Morrison (2022), a collaborative experimental study is a research approach that involves active participation and cooperation among various stakeholders, including community members, researchers, and experts, to investigate and address complex issues such as climate change mitigation. The approach used to explore the collaborative experimentation study is a design charrette in planning the area, which, according toZhang, Mao, and Zhang (2015), design charrette is a collaborative design process.

The design charrette begins with a shared understanding of the local context by conducting field surveys to verify existing conditions after receiving information from discussions on the local context. This step allows the research team to gather data and insights about the Andir area. Subsequently, a collaborative design stage is conducted where stakeholders actively participate in generating innovative ideas and concrete solutions. This stage involves the engagement of residents, communities, environmental experts, and urban planners to ensure diverse perspectives are considered. The results of the collaborative design stage are then integrated to develop a comprehensive planning and design for the Andir area. This integration process considers physical and non-physical aspects, including climate change mitigation strategies and the integration of social-cultural diversity.

Figure 2. Design Charrette Situation

The participatory design charrette approach is based on the principle of involving all members of the community to understand local contexts. This approach emphasizes the importance of community participation and engagement in decision-making, governance, and service delivery processes to address the main issues that affect local stakeholders. Using the participatory design charrette approach, the research team involved individuals and groups within the community in decision-making processes, leading to more comprehensive and holistic planning and design for the Andir area. The collaborative and participatory nature of the approach ensures that the final plan reflects the diverse needs and aspirations of the community. Furthermore, the participatory design

charrette approach provides an opportunity to create a shared vision and roadmap for mitigation strategies to address climate change in the Andir area.

3. RESULT & DISCUSSION

3.1 Knowing the Local Context Together

The first FGD was held on February 28, 2023, at 09.00 - 11.30 AM, at the location of the Samudra Bakti temple. This FGD is organized and managed by the Tuna Nusa Foundation and is expected to be a participatory and collaborative climate change mitigation measure. The objective and the purpose of this workshop are to negotiate plans for the arrangement of the Andir District and the forerunner of Chinatown Bandung. The outputs from the workshop were directed to become the director of the Urban Design Guideline (pre UDGL) of Andir District, which covered two aspects, namely:

- Physical aspects, including maps of problems, potentials, and directions for spatial development.
- Non-physical aspects such as socio-cultural, including calendar of joint activities and economics-welfare, direction, and branding strategy.

Figure 3. Knowing the Local Context Process Using Participatory Mapping of Potentials and Problems

The output of this FGD is the aspirations of Andir's society as stated in the collaborative mapping results, stakeholders mapping results, and program proposals through the Problem, Potential, and Opportunity Summarize Documentation.

Figure 3. Collaborative Potentials and Problems Mapping

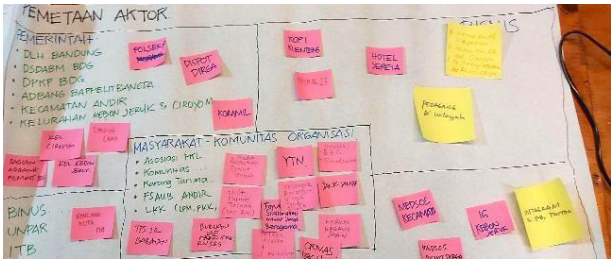

Figure 4. Stakeholders Mapping Results

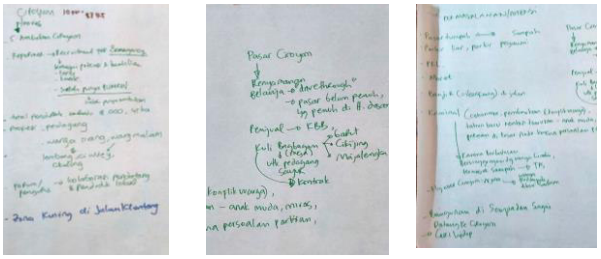

Figure 5. Problems, Potentials, and Opportunities

The results of the discussion show the following physical and non-physical points. The following physical points of the discussions are divided into facilities, roads, a parking lot, and the Andir market. The location of Andir Subdistrict, with complete facilities such as provincial roads, railway lines, and markets (Pasar Baru, Andir Market, and Ciroyom Market), is an attraction. It supports easy access into and out of the sub-district and the city of Bandung. Madanipour (2007), show that complete facilities in a town area are conditions of availability and a comprehensive range of essential amenities and services that cater to the needs of the residents. Further scientific insights into the benefits of complete facilities in town areas and their impact on various aspects of urban life, including quality of life, economic development, social cohesion, and sustainable urban development.

The extension of Andir and Ciroyom market buying and selling activities in the form of "spill markets" took over urban space, especially along the corridors

of Jalan Sudirman, Jalan Waringin, and Jalan Kebon Jeruk. This happens even though the market building is not fully occupied. It happens because of the convenience of shopping on the ground floor and roadside. On Jalan Klenteng, street vendors alternate from morning to night. This activity conflicts with regulations as a yellow zone; street vendors are only allowed to move from evening to morning (17.00-06.00 WIB). Parking lot extensions and street vendors appear to accommodate the needs of shopping center employees, be it markets, malls, shops, or the street vendors themselves.

Because of its strategic location, Andir is also where waste is disposed of by passing residents. Integration with the Bandung PROKLIM program for handling waste and food security is needed. Waste management and food security in Bandung, highlighting the importance of proper waste management practices and the benefits of ensuring food security for the city's population. Efficient waste management practices help prevent air, water, and soil pollution. Proper disposal and treatment of waste minimize the release of harmful substances and reduce the risk of environmental degradation. Lang (2009), show that food security is the availability, accessibility, and affordability of food for its residents in the area. Food security contributes to social stability by reducing the risk of social unrest and conflicts arising from food shortages. Access to affordable food reduces socioeconomic disparities and ensures equal opportunities for all residents (Madanipour, 2007). The Andir local community asked for the Andir Market arrangement or improvement. A market arrangement or improvement program is a meeting (cross-cutting) of improvement, followed by the arrangement and control of other activity centers, such as terminals, shopping centers, and universities. Stiglitz (2000), shows that market rearrangement is the process of reorganizing or restructuring a market to improve its efficiency, competitiveness, and effectiveness. It involves changes in market structures, regulations, policies, and mechanisms to enhance performance.

The discussion's non-physical following points include the population's social diversity and crime thuggery social issues. The diversity of the population that arises due to economic motivation is currently growing in layers on top of the ethnic and cultural diversity that has been built since the 19th century when Andir was one of the areas where oriental ethnic (Chinese, Indian, Arab) were allowed to live in Bandung by the Dutch East Indies government also for economic reasons. Nowadays, despite indications of Chinese culture's embodiment in Andir, the area's demography has not been dominated by Chinese community groups, unlike the Chinatown area, where Chinese community groups are demographically dominant. Instead, Chinese community groups and their cultural forms mingle with Sundanese community groups (China-Sundanese). The Andir local community asked for a sub-district population census. Sub-district population census needs to be carried out to identify the current diversity in detail (ethnicity, cultural background/place of residence, livelihoods, population status in Bandung, and other diversity factors that give rise to a new layer of society in Andir District). A population census is a systematic collection of demographic, social, and economic data about a specific population, and it can be used for resource allocation, monitoring, and research (Baffour & Valente, 2012).

Besides its socially diverse population, Andir District faces crime and thuggery social issues related to location, activities, and the economy in its district. Examples of thuggery arose from controlling parking lots in markets and shopping centers. Examples of crime are murder and theft, supported by easy access to out-of-town areas. Integration to increase area security by inviting local organizations is needed. Apart from those following the discussion's physical and non-physical points, the Andir local community agreed that climate change is also an urgent agenda. It is necessary to agree on:

a. Climate change mitigation as a common goal
b. How to address socio-economic issues and climate change mitigation.

The existence or arrangement of green or shared open spaces, green corridors, and blue spaces is aimed at improving the physical quality of the area, building social cohesion, and reorganizing economic interests.

3.2 Exploring Site

This section focuses on field exploration to understand the actual conditions of the Andir area. The research team conducted direct surveys on-site, collecting data on the physical and socio-cultural characteristics of the area. This was also done to confirm the initial data obtained in the FGD 1. The field survey scheme was conducted by traversing different parts of the urban area in the study area at three different times and days: morning, afternoon, and evening. This was done to explore the potential and challenges during different periods, allowing this information to serve as a basis for planning climate change mitigation strategies appropriate to the existing conditions.

3.2.1 Verification of Andir's Potentials

After a field survey to check the compatibility between the results of FGD 1 (Knowing The Local Context) and the facts, new findings support the development of the Andir area as a climate mitigation pilot. The potential that has just been discovered is the identification of distinctive characters in the Andir area (building typology, vegetation, etc.), and the residual space is used to store traders' goods (Figure 6). This reduces the visual quality of the environment, so intervention is needed. This residual space can be used as supporting facilities, playgrounds, pocket parks, and even for urban farming.

Figure 6. Residual Space Has the Potential to be Developed as a Climate Mitigation

The potential for consistent physical aspects found in the field with the results of FGD 1 is that the Andir area has a strategic location and an economic generator that increases the role of the Andir area in the city of Bandung. This will also have an impact on the high movement in the area, thereby increasing air pollution and resulting in an increase in air temperature, especially on a micro-scale. As for the potential in the non-physical aspects, namely, the diversity of the social environment and communities that play a role at this time support each other, especially for physical and social development activities.

Figure 7. Condition of Andir Market During the Day (Right) and Night (Left)

The Andir area, a 24-hour trading zone (Figure 7), also holds great potential for the local economy. In addition to the market and the ITC mall, the presence of culinary establishments, including street vendors, cafes, and legendary restaurants, adds to the appeal. This impacts the building typology, with several trading areas maintaining their original facades (Figure 8). As a result, the character of the old city buildings is still visible and contributes to the area's identity.

Figure 8. Building Typology at Klenteng Street

The data comparison in this section (Table 1) is used to see the suitability of the data between the actual conditions and the FGD 1 results as data verification. The following is a table of potential:

Table 1. Comparison of the Findings of Andir's Potentials

Findings based on FGD 1 (Knowing The Local Context)	Findings based on Exploring Site
A. Physical Aspect	
X	Identification of Characters: ● Building typology can be maintained and duplicated ● Ornament: Mozaic from ceramics/building remains, reliefs on the walls. ● Mural: Community Collaboration. ● Vegetation: Bodhi Tree, Euphorbia Flower, Yellow Betel
The location of Andir Subdistrict, with complete facilities such as provincial roads, railway lines, and markets (Pasar Baru, Andir Market, and Ciroyom Market), is an attraction and supports easy access.	Activity centers (markets, street vendors, Chinatown, temples) are mass and economic generators for the local community and the city of Bandung.
X	Residual Space can be used to develop the micro-scale of green open space.
B. Non-Physical Aspect	
The diversity of the population that arises due to economic motivation is currently growing in layers on top of the ethnic and cultural diversity that has been built since the 19th century when Andir was one of the areas where oriental ethnic (Chinese, Indian, Arab) were allowed to live in Bandung by the Dutch East Indies government - also for economic reasons.	The community becomes social capital: ● Divine providence foundation & 2 monastic managers: support resources for area improvement ● Karang Taruna: making murals & cleaning the environment independently ● Gymnastics community: attraction of physical activity ● Street vendors: as culinary area developers
X	Integration of food needs with urban farming plans

Notes:
X: Findings have not been identified in FGD 1
V: Findings have been identified in FGD 1

3.2.2 Verification of Andir's Problems

The results of area exploration show that problems are categorized into physical and non-physical problems in the area. In general, the problem that the Andir local community was aware of in FGD 1 was the high interest of people coming (shopping) or passing through the area. This has resulted in a series of impacts, including traffic jams (Figure 9), the spread of illegal parking on the street, the number of traders on the road, and increased waste and pollution on the road (Figure 10).

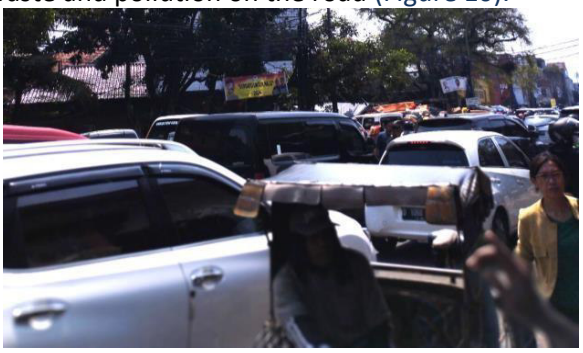

Figure 9. Traffic at Kebon Jati Street

Figure 10. Pedestrian-Vehicle Conflict in Using Sidewalks and Liquid Waste Pollution on Roads

The irregularity of urban areas marks a decline in environmental quality. In the Andir area, there are many inefficient and disruptive spaces. Public areas, such as the park on Kebon Jati Street, are being used as parking lots and storage spaces for Andir Market trading activities (Figure 11). The image below shows a building next to the church being used for storage, where significant structures like places of worship should not be obstructed. The disorderliness in this trading area also hampers the mobility of pedestrian buyers. Sometimes, motorized vehicles are parked on sidewalks intended for pedestrians, where there are clearly "no parking" signs (Figure 12).

Figure 11. Decrease the Visual Quality of the Area

Figure 12. Pedestrian-Vehicle Conflict Using Sidewalks

Other issues, such as illegal buildings along the river and the direct discharge of wastewater into the river, significantly impact the degradation of the area's ecosystem. Additionally, flooding frequently occurs at specific points, such as Budiman Street. These floods are caused by heavy rainfall, blocked water flow due to waste, and ground-level differences caused by obstructed houses.

Data comparison in this section (Table 2) is used to see the suitability of the data between actual conditions and the results of FGD 1 as data verification. The following is a table of Andir's problems:

Table 2. Comparison of the Findings of Andir's Problems

Findings based on FGD 1 (Knowing The Local Context)	Findings based on Exploring Site
A. Physical Aspect	
Parking lot extensions and street vendors appear to accommodate the needs of shopping center employees.	V
X	Pollution and pollution of river water from leachate mixes with household waste, which causes odors and endangers the ecosystem.
X	Flood on Budiman Street
The extension of Andir and Ciroyom market buying and selling activities in the form of "spill markets" took over urban space.	V
	Impact: Motorized vehicles seeking shortcuts through residential areas
X	The lack of green areas on Klenteng Road and the residential area
X	Residual space used to store merchant tools causes slums.
X	Illegal building on the riverside
Strategic location: Andir is also a place where waste is disposed of by passing residents	V
	Waste system: Remote location, unorganized waste, especially for traders
On Jalan Klenteng, street vendors alternate from morning to night. This activity conflicts with regulations.	V
B. Non-Physical Aspect	
The emergence of crimes such as thuggery and murder due to the disorganization of the area	V
	No system integrates economic stakeholders (PKL, Parking, etc.)

Notes:
X: Findings have not been identified in FGD 1
V: Findings have been identified in FGD 1

The current non-physical issues occurring are the presence of criminal activities such as theft, extortion, and even murder, partly due to the lack of a strict management system in the area. The physical condition and environment of the area, with its numerous residual spaces, often become blind spots and sources of criminal activities. Integrated improvements in the environmental conditions can be one alternative to reduce the negative impacts or serve as mitigation measures. The local Andir community does this and requires alignment with the government and other stakeholders.

Based on the results of the location exploration, the main point that becomes an issue is that the Andir area can become a mass generator with the main function of trading and the primary access to the city center. This will significantly impact the Andir local community as the need for people to mobilize and be active increases. The impacts that the community will feel directly include air pollution, rising temperatures, waste, and others. The existence of this challenge can trigger the improvement of environmental quality with the social capital already owned by the local Andir community. Residual space, an inefficient area, can be converted into centers for climate change mitigation.

3.3 Designing Together

In Focus Group Discussion 2 (FGD 2), a collaborative design process was organized involving various stakeholders, including residents, communities, academics, urban planners, and designers. The objective of the discussion was to provide an opportunity for every participant to share ideas, knowledge, and viewpoints related to designing climate change mitigation solutions that integrate the social-cultural diversity of the Andir area. The inclusive approach of involving the various stakeholders ensured that multiple perspectives were considered when designing mitigation solutions for climate change in Andir. This is in line with Saha, Nhu Quynh, Sáha, and Sáha (2017), who state that an approach involving local communities, as well as experts from various fields of study, has unique knowledge and skills that can be used to inform the design of effective mitigation solutions.

Various participatory methods and techniques were used in these discussions to encourage collaboration and creativity. First, a brainstorming session was conducted to identify the problems and potential of the Andir area. This process helps deepen understanding of the Andir Area from various participant perspectives so that all participants gain a more comprehensive contextual understanding. Furthermore, participatory design and mapping methods are applied to formulate climate change mitigation solutions in various aspects, both physical (spatial planning, infrastructure) and non-physical (social, economic). In this participatory design and mapping process, all participants are actively involved so that the results represent a comprehensive and holistic solution. This aligns with the statement of Zong, Yang, and Pei (2023), that emphasizes the need for integrated solutions in climate change mitigation through stakeholder involvement. His research shows that a stakeholder-centered approach should be used to get more out of co-created solutions that impact positive change. This discussion occurred in a series of interrelated stages to create an understanding and integrate emerging ideas. Open questions were asked to encourage participants to express their perspectives, and discussions were carried out collaboratively to bridge differences. Through this process, integrated ideas are formed, which reflect the socio-cultural diversity of the Andir area while at the same time considering aspects of climate change mitigation. The collaborative planning and design of the Andir area resulted in two comprehensive plans and designs consisting of physical and non-physical aspects.

Figure 13. Designing Together: Process Situation

3.3.1 Designing Together in the Physical Aspect

The physical aspect's design aims to improve the area's quality, create comfortable and environmentally friendly public spaces, and address

existing infrastructure problems.

Figure 14. Collaborative Physical Aspect Planning and Design Process Situation

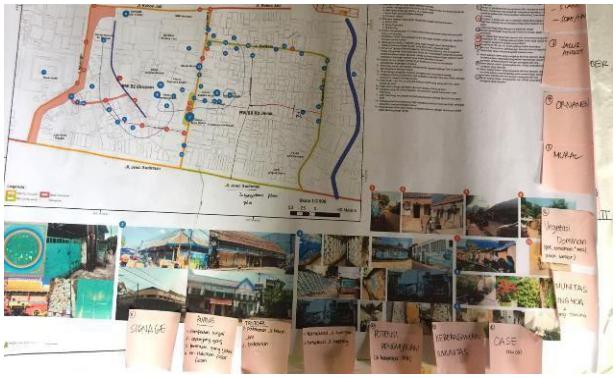

Figure 15. Results of Collaborative Planning and Design of Physical Aspects

The physical aspects of the design include the improvement of road corridors, the arrangement of green open spaces, and the handling of infrastructure. The physical design of the road corridor involves various improvement elements such as adding street lighting, road markings, signage, pedestrian ways repairs, and redesigning a continuous circulation system. The construction of a gate or gate and the addition of mural art are also essential parts of this design, aiming to enhance the landmarks and image of the Andir area. In addition, this design also includes controlling parking on the street to increase the comfort of all road users. Furthermore, other physical designs also include the arrangement of green open spaces such as pocket parks and small plant pots and green paths, such as roadside trees along the road, which aim to respond to the microclimate of the Andir area and increase comfort inside. The area. This plan also involves vertical gardens and urban farming plans to increase self-sufficient food security in the Andir area. The physical aspect of designing the facility also includes infrastructure handling, waste management, repairing drainage channels in roads and alleys, and constructing communal septic tanks.

3.3.2 Designing Together in Non-Physical Aspect

Meanwhile, the design of non-physical aspects aims to strengthen the economic and social aspects of the Andir area. Economically, it includes arranging street vendors in the Waringin Street corridor so that they are spatially distant from pedestrian paths.

Figure 16. Collaborative Non-Physical Aspect Planning and Design Process Situation

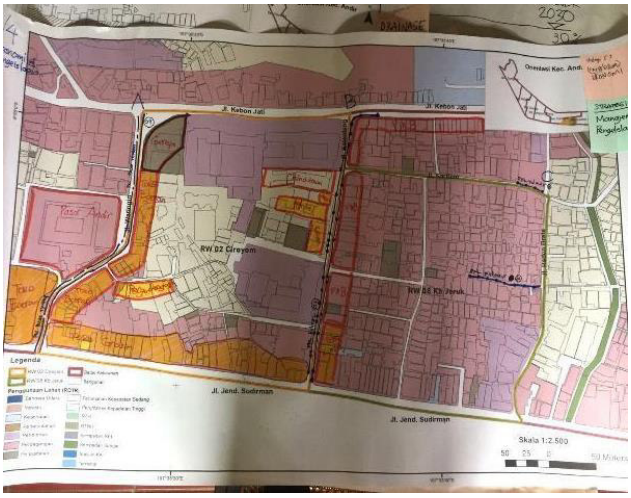

Figure 17. Results of Collaborative Planning and Design of Non-Physical Aspects

The social aspect focuses on cooperation between stakeholders involved, such as traders, residents, local government, market organizations, and

reformers. The integration of increased security is also a concern in this design, as it involves local community organizations, such as Karang Taruna. The arrangement of street vendors and stakeholder collaboration is expected to increase business opportunities, improve social cohesion, and encourage sustainable local economic development. In addition, the integration of increased security by involving local community organizations will provide protection and a sense of security for residents and visitors.

Through this planning and design, two significant plans and designs were produced that integrated physical and non-physical aspects to improve the Andir area. With these two grand plans and designs, it is hoped that the Andir area will be able to face the challenges of climate change sustainably and comprehensively while increasing its people's quality of life and welfare. Through a participatory joint planning approach, all parties are involved in the decision-making process so that the interests and needs of all stakeholders can be adequately accommodated.

This joint design process created a design that reflects the Andir area's diversity while still paying attention to climate change mitigation efforts. This participatory and inclusive approach not only generates innovative solutions but also strengthens social and cultural ties in the area. Thus, this Focus Group Discussion 2 formed a design framework that combines socio-cultural acculturation with climate change mitigation in the Andir area, Bandung. This process demonstrates the importance of involving all stakeholders in urban planning in an inclusive and collaborative approach.

3.4 Assembling The Design

After going through the joint design process in Section 3, Section 4 focuses on assembling and compiling the results of the participatory design that was produced previously. This will create a bridge that connects the joint design stage in Section 3 with the later implementation stages. This design includes a concrete strategy to address climate change and integrate socio-cultural diversity in the design of the Andir area. In Section 4, there are 3 conceptual outputs and the resulting design framework, which include:

3.4.1 Urban Design Framework

The first output is the Urban Design Framework (Figure 18), which aims to bring together two significant plans covering physical and non-physical aspects. The Urban Design Framework provides the vision and guiding principles on which the overall development of the Andir area is based. This document describes the leading strategies and design principles applied to address the challenge of climate change and promote socio-cultural diversity within the area. The Urban Design Framework provides comprehensive directions for the area's decision-making process and future development. In order to minimize the impact of climate change in the Andir area, there are several points for the development of the area. Within this Urban Design framework, climate change mitigation efforts aim to integrate the area's physical, economic, and social conditions. This includes enhancing productive green spaces such as urban farming, vertical gardens, and pocket parks, and organizing green corridors along road networks and pedestrian paths. Organizing productive and efficient green areas, market areas, and street vendors, and reorganizing waste management are efforts to regenerate the environment.

Figure 18. Urban Design Framework of Andir Area

Integrating physical and non-physical aspects in the Urban Design Framework is essential for achieving holistic and sustainable development in the Andir District. The collaborative design process involving various stakeholders during the design's drafting has significantly contributed to the formulation of this Urban Design Framework. This participatory approach ensures that people's perspectives and aspirations are represented in the resulting framework (Zhang et al., 2015). By combining physical and non-physical aspects, this Urban

Design Framework serves as a comprehensive guide for decision-making processes and future development plans for the Andir area in depth through strengthening strategies: Reinhabitation, Redevelopment, and Regreening.

3.4.2 Physical Aspect Framework

The second output is the Physical Framework, which breaks down the Urban Design Framework by focusing on the physical aspects of the design. This Physical Framework (Figure 19) translates design principles into more detailed physical interventions and spatial arrangements that involve participative and implementable physical designs for sustainable urban development. The Physical Framework includes plans and strategies related to the physical elements improvements essential for creating a comfortable and sustainable urban environment in the Andir area, such as road networks, green open spaces, urban farming initiatives, and infrastructure improvements. This design framework includes spatial programs such as street lighting, road markings, signage and wayfinding, pedestrian facilities, green corridors, tree planting, and other elements related to physical layout.

Furthermore, the Physical Framework proposed for the Andir area reflects the interdisciplinary nature of urban design by addressing physical aspects related to urban ecology and sustainability issues. It shows that urban design is not just about creating aesthetically pleasing spaces but is also about incorporating sustainable practices and promoting environmental health (Salmanian & Ujang, 2022).

This design approach aligns with the theoretical framework by Moudon and Lee (2003), which emphasizes the importance of understanding human interactions within the built environment and creating a lucid and informed physical design. Moreover, the Physical Framework proposed for the Andir area also integrates a participatory approach that engages local community members and stakeholders in the design process to ensure that their needs and concerns are addressed in the design.

Figure 19. Physical Aspect Framework Design

Figure 20. Precedent of Shared Street in Florida
Source: www.cnu.org

Figure 21. Precedent of Tactical Street Furniture in Oslo
Source: www.openaccessgovernment.org

Figure 22. Precedent of the Green Corridor in Adelaide
Source: www.adelaidenow.com.au

Figure 23. Precedent of the Pocket Park in Thailand
Source: www.equitableresilience.mit.edu

Figure 24. Precedent of Vertical Urban Farming in Jakarta
Source: www.thejakartapost.com

3.4.3 Non-Physical Aspect Framework

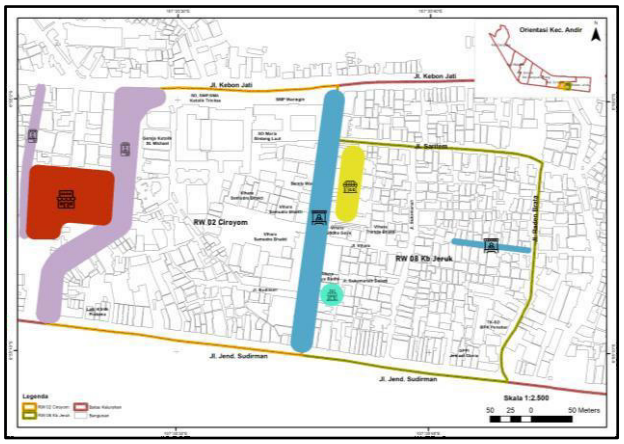

Figure 25. Non-Physical Aspect Framework Design
Source: Illustration by Team, 2023

Figure 26. Precedent of Traditional Market
(Pasar Johor, Semarang)
Source: www.pinterest.com

Figure 27. Precedent of Open Street Vendor
Source: www.familyvacationist.com

The third output is the Non-Physical Framework (Figure 25), which also breaks down the Urban Design Framework by focusing on the design's economic and social aspects. The Non-Physical Framework outlines the strategies and concrete actions to increase the economic vitality and social cohesion of the Andir area. This design framework addresses topics such as the organization and management of street vendors, collaboration between stakeholders, local economic development, and initiatives to build social cohesion. The Non-Physical Framework highlights the importance of inclusive economic opportunities, positive social interactions, and strengthening local businesses as crucial factors in creating a sustainable and inclusive area, thus providing precise and detailed guidelines for implementing economic and social strategies within the Andir area.

The Non-Physical Framework Design in the Andir area addresses the organization and management of street vendors. Street vendor management is carried out in collaboration with local thugs, local traders, and community building owners. It is necessary to arrange the air market to tidy the road on Jalan Waringin. Then, the arrangement of street vendors to become culinary center vendors on Jalan Kelenteng. In addition, the arrangement of vendor strings was also carried out on Jalan Raden Brata. There is a formal cuisine on the right side of Jalan Kelenteng. Local economic activity contributes to the diversification and sustainability of the overall regional or national economy, leading to increased economic stability and improved quality of life for residents (Sultanova & Naser, 2025).

In addition to the economy, the social and institutional aspects are also strengthened by collaborative cultural events, collaborative healthy gymnastics taichi events, and improving the environmentally conscious community in Andir, which helps clean up the river in Andir. Andir institutions can be strengthened by cooperation between youth organizations, the PKK, local communities, and local RT and RW. These social and institutional aspects promote social cohesion, cultural preservation, and community resilience (Afidah, Chairiawaty, & Zulfa, 2025). It facilitates the implementation of community-driven initiatives, such as infrastructure development, social programs, and environmental conservation efforts, ultimately enhancing the overall livability and sustainability (Arifin & Kurniadi, 2024) of the Andir area.

3.5 Discussion of Potential, Challenges, & Lessons Learned from the Design Charrette Process

This analysis explores in depth the potential, challenges, and lessons learned that can be drawn from the Design Charrette process that has been implemented. The results of the collaborative design are assembled and compiled to provide a design framework for climate change mitigation in the Andir Area. In addition, the challenges faced in integrating socio-cultural diversity in design are also analyzed. This section also serves as a learning and insight for improving the charrette design process in the future.

3.5.1 Potential

A. Increased Community Participation

The Charrette design allows the community to participate actively in the area planning and design process (Asqhor, Yatmo, & Paramita, 2021). This can increase the sense of community ownership and involvement in the development of the Andir area. Design charrette can be an effective method of engaging multiple stakeholders and facilitating intensive collaboration. Grosse and Femenias (2022), state that a design charrette is a participatory process involving stakeholders in discussions and decision-making related to urban design. In the context of the Andir area, the design charrette provides an opportunity for individuals from diverse backgrounds, such as residents, local government officials, and academics, to come together and engage in a collaborative process. Through this process, they can share knowledge and expertise while presenting creative and innovative ideas that can potentially shape the community's future development. This approach fosters a sense of inclusivity by allowing all stakeholders to participate in decision-making processes, which ultimately helps strengthen social ties among members of the Andir community.

B. Discovery of Innovative Ideas

Through intensive dialogue and collaboration between various stakeholders, Charrette enables the emergence of new ideas and creative solutions that may not have been thought of before. As explained by Meschede and Mainka (2020), the main benefit of the charrette is the social capital generated from intimate, direct dialogue and collaboration between lay participants and professional planners and architects. This potential not only improves the quality of the design but also strengthens the social capital of the local community and produces unique designs following the needs of the area.

3.5.2 Challenge

A. Differences of Opinion and Interests

In the design charrette process, there were often differences of opinion and difficulty in unifying various stakeholders' diverse visions and interests. As Adrianto (2016), stated, collaborative processes such as the design charrette often encounter differences of opinion, conflicts of interest, and difficulties reaching consensus. Therefore, this challenge requires a careful approach to managing conflict and facilitating inclusive dialogue so all stakeholders feel involved and heard. While these challenges may appear insurmountable, they must be navigated by tactful communication and active listening to ensure that all stakeholders are heard, respected, and represented throughout the process. By embracing this collaborative approach despite the difficulties, the professionals involved can create a more equitable outcome for all parties involved.

B. Capacity for Participation

Not all communities have the same ability or access to participate in the design charrette process. This challenge involves ensuring inclusive representation of various community groups and equitable

participation (Krstikj, 2021). In overcoming this challenge, it is necessary to use strategies such as ensuring that information is widely available and accessible, considering the time and place that is easily accessible to everyone, and using easy-to-understand language to keep dialogue and collaboration running smoothly.

3.5.3 Lesson Learned

First, active community participation in the planning and design process can enhance the legitimacy of decisions and increase public acceptance of the resulting plans (Innes & Booher, 2004). In the participatory planning process conducted in the Andir area, several complex external factors were encountered. Its strategic location, functioning as a key node of urban economic activity, has attracted a wide range of stakeholders with varying interests, making inclusive planning particularly challenging.

The social capital possessed by the local residents, reflected in their traditions of cooperation and mutual support. However, this must be acknowledged and supported by all stakeholders involved, including governmental institutions, private sector actors, and informal community groups. Participatory planning in an urban context characterized by such spatial and stakeholder complexity inevitably requires considerable time and effort, particularly for aligning diverse perspectives and negotiating shared use of space. Nevertheless, involving residents meaningfully and providing them with the opportunity to participate in decision-making processes leads to outcomes that are not only more contextually appropriate but also more widely accepted.

This underscores the importance of inclusive, deliberative planning practices in fostering collective ownership and producing solutions that align with the community's actual needs and aspirations. In the entire process of implementing participatory regional planning and design, assistance is needed from experts and policy makers so that existing ideas can be realized in accordance with the potential of the region and can be implemented in the entire process of implementing participatory regional planning and design, assistance is needed from experts and policy makers so that ideas can be implemented in accordance with the responsibilities of the region (LopezDeAsiain & Díaz-García, 2020).

Second, the integration of physical and non-physical aspects in planning and design. This integration involves two stages: verifying potential and challenges in the field based on the results of Focus Group Discussion (FGD) 1 and the collaborative design process in FGD 2. The verification process requires expertise, sensitivity, and thoroughness in field exploration. In the context of the Andir area, several new findings were identified that FGD 1 participants had not previously identified, such as the large amount of residual space that could be developed as micro-scale green open spaces, detailed regional character, and other needs that could potentially pose challenges or even hinder regional development. In the context of the Andir area, integrating all these processes and approaches allows for the development of solutions that improve physical infrastructure and address social, economic, and environmental issues, particularly to minimize the impact of climate change. This approach aligns with the New Urbanism perspective, which emphasizes the importance of creating sustainable, environmentally friendly, and socially and culturally diverse areas (Calthorpe & Fulton, 2001).

Overall, from an analysis of the potential, challenges, and lessons learned from the design charrette process, we can see that the design charrette provides great potential in engaging the community and generating innovative ideas. However, challenges in managing dissent and ensuring equitable participation remain and must be addressed. As a whole, this design charrette process can become a strong foundation for developing the next stage in the planning and design of the Andir area. Through a participatory and integrative approach, it is hoped that the Andir area will continue to develop as an inclusive, sustainable environment that benefits its people.

4. CONCLUSION

In this research, we explore the process of planning and designing the Andir area through the design charrette approach involving stakeholders' active participation. Through the design charrette process, two significant plans and designs were formed that integrated physical and non-physical aspects to improve the area comprehensively. The results of the analysis of potentials, challenges, and

lessons learned from this process provide a deeper understanding of the strengths and constraints faced. The design charrette process provides the potential to generate innovative ideas and creative solutions to suit contextual needs. By involving various stakeholders, including local communities, academics, and local government, collaborations are created that enable cross-disciplinary thinking and a variety of perspectives. This participatory approach also promotes inclusivity in decision-making and gives communities a sense of ownership of their area's planning and design processes. However, the design charrette process also faces challenges that must be addressed. Differences of opinion, conflicts of interest, and the complexity of socio-cultural dynamics are challenges involving various parties in the planning process. Building suitable communication mechanisms, encouraging open dialogue, and seeking points of understanding are essential to overcome this challenge. In addition, integrating physical and non-physical aspects is the key to achieving sustainable and holistic results.

In facing these potentials and challenges, this research provides several valuable lessons. First, a participatory approach must become the main foundation of urban planning and design. The involvement of the community, academics, and local government is vital to achieving sustainable results. Second, the integration between physical and non-physical aspects must be considered as a whole to balance physical development, environmental sustainability, and social welfare. Third, equitable participation of various community groups is essential to ensure that the interests and needs of all stakeholders are accommodated in the planning process.

Overall, this research makes an essential contribution to understanding urban planning and design through the design charrette approach. The results of the analysis of potentials, challenges, and lessons learned provide the basis for the development of better policies and strategies in urban planning and design. By paying attention to potential, challenges, and taking lessons learned, we can improve urban design processes. With a participatory approach, holistic integration, and equitable participation, we can create an area that is more sustainable, inclusive, and responsive to societal needs.

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