



# Assessing Residential Environmental Comfort in Kampung Melayu's Historical Area Using a Morphological Typology Approach: Case Studies of Kampung Peranakan, Kampung Banjar, and Kampung Kalicilik, Semarang, Indonesia

Ida Rahayu Widowati <sup>a\*</sup>, Budi Widianarko <sup>a</sup>,  
A. Rudyanto Soesilo <sup>a</sup>, Djoko Suwarno <sup>a</sup>  
and Ignasius D.A. Sutapa <sup>a</sup>

<sup>a</sup> Doctoral Program in Environmental Science, Faculty of Environmental Science and Technology, Soegijapranata Catholic University, Semarang, Indonesia.

## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## **Article Information**

DOI: <https://doi.org/10.56557/jogress/2025/v19i19070>

## **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.ikpress.org/review-history/12741>

**Original Research Article**

**Received: 20/11/2024**

**Accepted: 23/01/2025**

**Published: 27/01/2025**

\*Corresponding author: E-mail: 19o20003@student.unika.ac.id;

## ABSTRACT

This study investigates residential environmental comfort in the historical area of Kampung Melayu, Semarang, Indonesia, focusing on Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik. Using a descriptive qualitative approach, the research explores the impact of air temperature, humidity, noise levels, and morphological typology on residential comfort. Data were gathered through field observations and purposive sampling to assess physical and social dynamics affecting livability. The findings reveal that environmental comfort generally exceeded standard thresholds, with Jalan Kampung Kalicilik exhibiting lower comfort due to dense building layouts and narrow streets. In contrast, the linear layouts of Kampung Peranakan and Kampung Banjar provided conditions closer to comfort standards. Temperature levels consistently surpassed 30°C, while noise levels near main roads often exceeded 55 dB. These results highlight the significant role of urban morphology and spatial planning in shaping residential comfort, providing valuable insights for sustainable development and cultural preservation in historic urban environments.

*Keywords: Environment; residence; comfort; area; noise.*

## 1. INTRODUCTION

### 1.1 The History of Kampung Melayu in Semarang

The city of Semarang is one of Indonesia's urban centres with a rich historical legacy, evident in several culturally and historically significant areas. These historical fragments are spread across various city regions, including Kota Lama (Amin et al., 2019; Nugraha et al., 2021; Puspitasari & Yuliani, 2019), Pecinan (Chinatown), Kampung Melayu, Kampung Arab, the Sam Po Kong Temple at Gedung Batu, and the Colonial Candi area. Collectively, these locations represent the historical, trade, and social dynamics that shaped the city over time.

The development of the Old City of Semarang (Harani et al., 2017; Puspitasari & Kautsary, 2020) cannot be separated from the role of the Semarang River and the port in the northern part of the city. The Semarang River served as a major transportation route, connecting the port with the city's trading hub while enabling the distribution of goods to strategic areas (Yuliati, 2019). The regions along the Semarang River, such as Kota Lama, Kampung Melayu, Kampung Pecinan, and Kampung Arab, developed as vital parts of the trading network. The river became a natural infrastructure facilitating trade activities and fostering economic ties with other trading cities within and beyond the archipelago.

The history of the Old City of Semarang (Yuliati et al., 2023), including Kampung Melayu, can be traced back to the 15th century CE (Rukayah et

al., 2023). The Kampung Melayu site first emerged as a trading hub during this era. By 1600, the embryonic form of Kampung Melayu began to take shape along the banks of the Semarang River and Kali Baru (also known as the New Canal). Its strategic location made Kampung Melayu a docking point for traders from various regions, making it an integral part of the trading routes at the time. Two key areas associated with this site were Dusun Ndarat, meaning "toward the inland," and Dusun Ngilir, meaning "toward the downstream." These names reflect the transportation and interaction activities occurring in the region.

Kampung Melayu became a prominent trading centre involving various ethnic groups, including Gujarat, Arabia, Samudra Pasai, and Banjar traders. These traders brought essential commodities such as spices, textiles, and other highly sought-after goods into the trading economy of the time. Their presence led to the establishment of markets and spurred the development of multi-ethnic settlements in the surrounding area. These settlements reflected the cultural diversity and social interactions arising from cross-cultural trade relations. Kampung Melayu is tangible evidence of cultural acculturation, the rapid growth of trade, and Semarang's pivotal role as a port city and trading centre during this period.

As one of the earliest regions in Semarang, Kampung Melayu functioned as an economic hub and an area of dynamic social activity. The process of cultural integration within this area contributed significantly to forming Semarang's identity as a centre of multicultural interaction.

The interconnection between trade, settlement, and cross-ethnic interactions in Kampung Melayu makes it an essential part of the historical development of Semarang as a whole.

According to Liem Thian Joe's notes in *Riwayat Semarang* (Liem, 2004), Dusun Ndarat and Ngilir originated the Kampung Melayu settlement. This area is now divided into three administrative villages: Dadapsari, Melayu Darat, and Banjarsari. One of the most notable structures on this site is the Menara Layur Mosque, which served a dual purpose. In addition to being a place of worship, the mosque functioned as a dock for small boats known as *jonk*. The Menara Layur Mosque is also the oldest in Semarang, symbolizing an essential part of the historical development of Kampung Melayu.

The Kampung Melayu settlement had already been developed before *Fort de Vijfhoek*, the first VOC fort built at the end of the 17th century. The settlement is located on the Semarang River's western bank and north of *Fort de Vijfhoek*. This geographical location provided strategic access for traders, making Kampung Melayu a bustling centre of commerce. Initially inhabited by the Malay community, the settlement attracted traders from various ethnic groups who chose to reside and conduct their activities there.

Trading activities in Kampung Melayu involved interactions between native and foreign merchants, including those from Malay, Arab, Chinese, and Dutch communities. These activities fostered cultural exchanges still evident in various aspects of life in the area. Traces of this cultural acculturation can be observed in the spatial arrangement of the settlement, the architectural features of its buildings, and the traditions that have developed in Kampung Melayu. Its role as a hub for trade and social interaction highlights the settlement's significance in Semarang's historical narrative.

The Kampung Melayu site is marked by the presence of five historic structures: the Menara Layur Mosque, the Kampung Melayu Temple (Klenteng Kampung Melayu) (Kurniati, 2023), the Indo-Chinese House, the Malay House, and the Indies House. These five buildings are scattered across the geographical area of Kampung Melayu and reflect its distinctive multiethnic characteristics. Each structure exhibits architectural features that represent the cultural backgrounds of the communities active

in the area, making them an integral part of Semarang's cultural and historical heritage (Rukayah et al., 2023).

Kampung Melayu in Semarang is a historic old district characterized by a unique morphological typology that preserves various significant values, both internal and external (Madiasworo, 2009). The area is distinguished as an *Ethnicity Neighbourhood and Living Culture Neighbourhood*, reflecting its cultural diversity and vibrant community life. However, the current state of Kampung Melayu has experienced physical deterioration, declining environmental quality, and the fading of its original morphological typology (Rini & Ridho, 2021). This starkly contrasts with the 18th and 19th centuries, when Kampung Melayu was marked by environmental harmony, including well-organized building masses, architectural designs, landscapes, open spaces, and environmental infrastructure.

Today, Kampung Melayu is a residential (Daraz & Kurniawati, 2021), commercial, and service area. The ongoing activities of its community demonstrate that Kampung Melayu still plays a vital role in daily life. However, the fading of its morphological typology highlights the need for a deeper understanding of the transformations occurring within the district (Putra & Pigawati, 2021). The decline in physical environmental quality, such as disorganized spatial layouts and ageing buildings, represents a significant challenge for this historic area.

The historical morphology of Kampung Melayu once offered unique and harmonious characteristics, such as the integration of building mass arrangements and architectural elements that reflected a strong cultural identity. The landscapes and open spaces of the past provided vital social and ecological functions that supported environmental balance. Furthermore, environmental infrastructure, including road networks, water channels, and public spaces, was designed to accommodate the local community's needs. Over time, these elements have deteriorated due to ongoing social, economic, and environmental changes.

The comfort of residential environments in Kampung Melayu is now a crucial concern, given the numerous community activities still occurring. Changes in the district's morphological typology may significantly impact the quality of life for its residents, particularly in

the context of historic residential neighbourhoods. Observing and analyzing the developments within this area can provide valuable insights into the social and physical dynamics of Kampung Melayu in the present day.

## 1.2 Residential Environmental Comfort in Kampung Melayu

A healthy residential environment is a fundamental element of community well-being, as defined by Winslow and the American Public Health Association (APHA) (Brightharp & Mandelbaum, 2023; Chandler et al., 2022). A healthy settlement is a permanent living space that fulfils essential functions such as residing (Fabris et al., 2020; Martias et al., 2023), resting, relaxing, and protecting residents from harmful environmental influences. It must meet physiological and psychological requirements and be free from disease transmission risks. In this context, Kampung Melayu in Semarang City faces various challenges in creating a residential environment that aligns with these standards (Agustina & Agustian, 2023).

Research conducted by Febbiyana and Suwandono (Febbiyana & Suwandono, 2016) reveals that most residential environments in Kampung Melayu tend to be cramped and lack adequate public spaces and Green Open Spaces (RTH). This condition indicates limitations in managing spaces that support the comfort and health of the community. In response, the Semarang City government has implemented the *Kota Tanpa Kumuh (KOTAKU)* (Suharto, 2021) program to improve the physical quality of residential environments in this area (Sahara et al., 2023). Additionally, Kampung Melayu has been incorporated into Semarang City's Spatial and Environmental Building Plan (RTBL) to support more structured development (Sitorus et al., 2020).

Research on the environmental comfort of residential areas in Kampung Melayu focuses on specific locations, such as Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik. These areas were chosen as they represent the unique characteristics of Kampung Melayu's residential areas. The residential environment in these areas features architectural typologies and spatial arrangements that reflect a blend of local culture and historical heritage. However, it also faces pressures from urban development and modernization demands (Hribar et al., 2015).

The physical condition of the environment in Kampung Melayu highlights challenges in creating a comfortable living space for its residents. Common issues include limited accessibility, inadequate infrastructure, and a lack of open spaces for social interaction. In collaboration with local communities, the government continues to address these problems through various policy interventions and sustainable development programs.

This study aims to provide a deeper understanding of the environmental comfort conditions in Kampung Melayu while emphasizing the importance of collaborative efforts between the government, residents, and other stakeholders. Through an integrated approach, the area is expected to preserve its cultural and historical characteristics while improving the quality of life for its inhabitants.

## 1.3 Temperature

Based on the Decree of the Minister of Health of the Republic of Indonesia No. 1077/Menkes/PER/2011 concerning Guidelines for Indoor Air Health, which aims to improve indoor air quality, physical requirements in the form of suitable air temperature are in the range of 18-30°C.

## 1.4 Humidity

Factors that affect the humidity conditions of a residence include:

1. Weather conditions and temperature levels outside the home
2. How the building is protected from humidity, leaks, etc.
3. Daily activities carried out in the residence.

Based on the Decree of the Minister of Health of the Republic of Indonesia No. 1077/Menkes/PER/2011 concerning Guidelines for Indoor Air Health, good indoor air humidity is a standard for residential environmental comfort, 40-70%.

## 1.5 Noise

Based on the Decree of the Minister of State for the Environment KEP-48/MENLH/11/1996, noise is unwanted from a business or activity at a certain level and time that can cause health problems and environmental discomfort. The limit of noise value that is allowed to be exposed

to the environment is sound energy expressed in decibels (dB).

**Table 1. Permissible Noise Value Limits**

<b>Area Designation / Activity Environment</b>	<b>Noise Level (dB)</b>
Area Designation	
Housing and Settlement	<b>55</b>
Trade and Services	<b>70</b>
Offices and Trade	<b>65</b>
Green Open Space	<b>50</b>
Industry	<b>70</b>
Government and Public Facilities	<b>60</b>
Recreation	<b>70</b>
Special	
Airport*	
Railway Stadium*	
Sea Port	<b>70</b>
<b>Activity Environment</b>	
Hospital or similar	<b>55</b>
School or similar	<b>55</b>
Place of Worship or similar	<b>55</b>

Based on the Table 1 above, the maximum allowable noise level for residential and housing areas and public facilities is set at 55 dB. This threshold reflects the importance of maintaining a quiet and comfortable environment for residents and public service functions. Similarly, places of worship and similar facilities also have a maximum noise level limit of 55 dB, recognizing the need for tranquillity in these spaces to support their intended function. These noise level standards are crucial for promoting health and well-being in these areas, ensuring they remain conducive to peaceful living, worship, and public services.

Based on the description above, the formulation of the problem in this study is how the condition of the comfort of the residential environment in Kampung Melayu, especially in Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik, in the city of Semarang, Central Java, which represents a residential area with unique residential environmental characteristics. This study focuses on identifying factors that influence the comfort of the residential environment in the area, as well as how physical and social conditions can affect the quality of life of the people living in it. Thus, this study is expected to provide insight into the challenges faced by the community in creating a comfortable and livable residential environment, as well as provide recommendations for

improving the residential environment in the area.

## 2. METHODS

This study employs a qualitative descriptive approach to thoroughly depict, analyze, and explain the phenomena observed in the field. Descriptive qualitative research focuses on exploring the relationships between two or more variables by presenting data in tables, graphs, or maps while categorizing and analyzing the data collected through surveys (Ridwan et al., 2022). The sampling technique used is purposive sampling, where samples are selected based on specific criteria, such as the condition of roads and the diversity of typology and morphology within the study area.

According to Creswell, in qualitative research, the researcher must be present at the research site to gain a holistic understanding of the social phenomena under study (Chu, PH. and Chang, 2017). Therefore, data collection is conducted through direct field observations, documentation, and relevant literature reviews. The data analysis in this study adopts a descriptive approach, which aims to explain the findings from the field survey and draw conclusions that reflect the actual condition of the phenomena being studied. The dependent variables used in this research include three environmental factors that influence residential comfort: air temperature, air humidity, and environmental noise levels. These three variables are expected to provide a comprehensive understanding of the factors affecting the comfort of residential environments in the Kampung Melayu area.

## 3. RESULTS AND DISCUSSION

### 3.1 Research Location

This study was conducted in Kampung Melayu, located in Semarang City, with a focus on three sample locations: Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik. These three streets are situated within the Kampung Melayu area, exhibiting different characteristics of a residential environment. Jalan Kampung Peranakan and Jalan Kampung Banjar are located in the southern part of Kampung Melayu, while Jalan Kampung Kalicilik is in the northern part of the area. The selection of these research locations is based on the diverse typology and morphology of the area, which provides a comprehensive overview of the

residential environment conditions in Kampung Melayu.

The sample buildings observed in this study include 13 buildings on Jalan Kampung Peranakan, 11 buildings on Jalan Kampung Banjar, and 21 buildings on Jalan Kampung Kalicilik. These samples were purposively selected based on specific criteria, including the suitability of the building locations with the area's typology and morphology. The selection criteria aim to ensure that the observed buildings represent the environmental conditions within the Kampung Melayu area, which has a rich historical background and social and cultural diversity.

Each selected location reflects distinct conditions, which allow for an examination of the differences in residential environmental comfort across various parts of Kampung Melayu. Each location has unique characteristics related to building typology, land use, and the area's

layout. Additionally, the condition of the roads, infrastructure, and public facilities in each location significantly contributes to the comfort and quality of the residential environment, which is the primary focus of this study. As such, the study aims to provide a deeper understanding of how environmental factors influence residential comfort in Kampung Melayu.

The selection of these three sample locations was also based on their representativeness, with the expectation that the research findings would reflect the broader conditions of the Kampung Melayu area. These locations were chosen not only because of their diverse typology and morphology but also because they feature unique aspects of spatial use and building structure, providing valuable insights into the changes and developments occurring in this area. Consequently, this study has the potential to offer broader insights into the factors that influence the quality of the residential environment in this historic area.

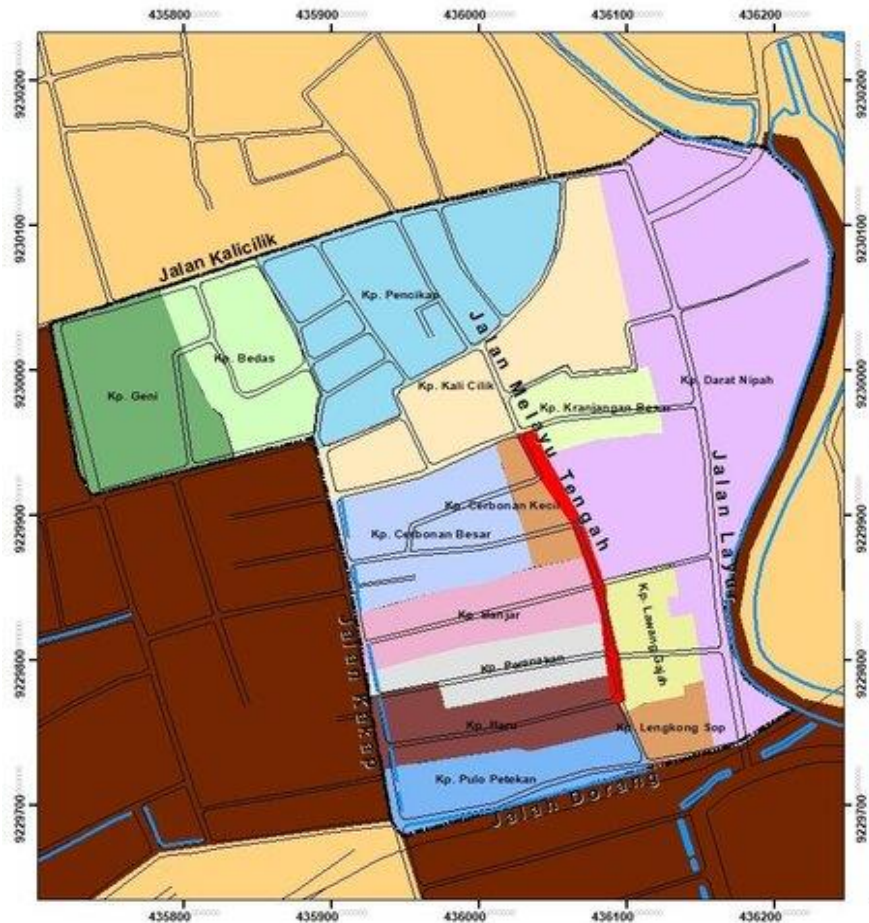


Fig. 1. Map of the Kampung Melayu area

### 3.2 Case Study of Peranakan Village, Banjar Village and Kalicilik Village

Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik have developed organically, following the landscape patterns shaped by the interactions between the local community and their surrounding environment. The formation of these three roads reflects a natural process in which spatial planning and infrastructure evolve according to the residents' social dynamics and practical needs. These roads signify the community's adaptation to their surroundings' physical and social conditions, resulting in street structures that align with the characteristics of each locality. Despite differences in social and cultural contexts, these three roads share a common approach in their planning, focusing on the sustainability and long-term use of space.

Regarding typology, the buildings along Jalan Kampung Peranakan, Kampung Banjar, and Kampung Kalicilik predominantly comprise residential homes and public facilities. On Jalan Kampung Peranakan, for instance, two buildings serve as places of worship and eleven buildings are used as residences. The presence of public facilities, such as places of worship, within residential areas highlights the importance of social space functions supporting spiritual and communal life. Although the number of public facilities is limited, they are significant in fostering harmonious social relationships among residents and strengthening community bonds.

Regarding construction, the buildings along these three roads are primarily made of permanent structures using brick as the main material. As the primary construction material, Brick reflects a practical decision based on its durability against weather conditions and its ability to provide optimal protection for the inhabitants. This material choice also indicates a degree of social and economic stability, as the community tends to invest in long-lasting housing. However, despite the uniformity in construction materials, there are significant variations in the physical conditions of the buildings, reflecting differences in the level of maintenance and upkeep performed by the homeowners.

The physical condition of the buildings along these three roads shows apparent disparities in maintenance. Most of the residential buildings along Jalan Kampung Peranakan are well-maintained, as evidenced by the well-preserved paint and relatively sturdy structures. However, some homes show damage in certain areas, such as wall cracks or roof deterioration, indicating a lack of adequate maintenance systems. Environmental factors, limited resources, and insufficient access to maintenance services may contribute to the neglect of certain buildings. These differences in condition also reflect the socio-economic dynamics within the community, which influence residents' decisions regarding the upkeep or renovation of their homes.

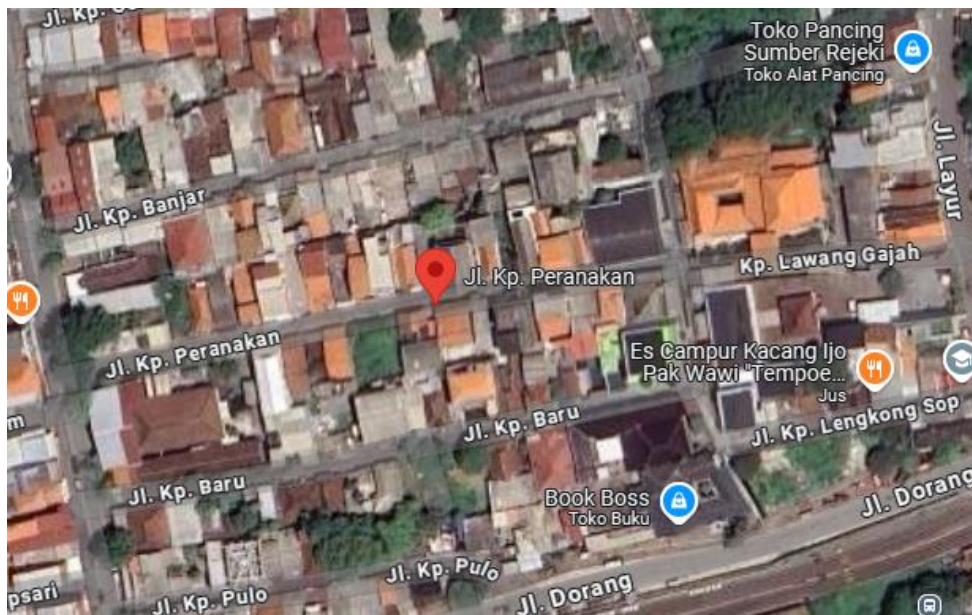


Fig. 2. Street Sketch in Jl. Kampung Peranakan



**Fig. 3. Peranakan Village Road from west to east**

The road pavement on Jalan Kampung Peranakan consists of paving blocks, which support the accessibility needs and long-term durability of the road. The area has a linear morphological layout, with buildings arranged in a row along both sides of the street, creating a spatial pattern directly connected to the daily activities of the local community. With a road width of 3.5 meters, the street provides limited space for vehicles and pedestrians, indicating a semi-private character. The road functions as a shared public facility among the residents, fostering social interaction in a constrained public space.

Along Jalan Kampung Peranakan, the residential houses are built in a row and adjoined to one another, creating a dense housing pattern. This reflects the efficient use of space, considering the limited land availability. In addition to the residential buildings, unused vacant land is covered with wild grass, indicating neglect in the land's utilization. This vacant area remains uninhabited and appears to be left unattended. This may suggest a lack of attention to the upkeep of the surrounding environment or limited land use in the settlement context. Thus, the physical condition of this area reflects a balance between public and private spaces, formed naturally according to the dynamics of the local community.

On Jalan Kampung Banjar, two buildings serve as public facilities, namely a mosque and a Taman Pendidikan Al-Qur'an (TPQ), both of which play important roles in supporting the social and religious activities of the local community. In addition to these public facilities,

nine buildings function as residential homes, forming a well-organized housing pattern along the street. Structurally, all of these buildings are permanent houses constructed using brick materials, which reflect a durable and functional choice of construction. The use of brick in these buildings also indicates a relatively high construction standard aimed at providing comfort and protection for the residents.

Most of these buildings are well-maintained, with their structural integrity and appearance preserved. This is evident from the still, which painted walls and the buildings remaining solid. However, the level of maintenance across each building varies, influenced by factors such as the age of the buildings, the owners' awareness of the importance of upkeep, and the resources available for routine maintenance. The well-maintained condition of these buildings reflects the community's efforts to maintain the quality of life and comfort in their living environment.

The road pavement on Jalan Kampung Banjar consists of paving blocks, providing a stable and durable structure for vehicular and pedestrian access. The area features a linear morphological layout, with buildings on both sides of the street, creating a densely organized spatial pattern. The road has a width of 2.5 meters, offering limited space, which makes it a semi-private space where the street functions not only as a transportation route but also as a shared public facility between residential homes. Using the road as a shared space between residences leads to interactions among individuals in a constrained environment, with personal space for each resident becoming increasingly limited due to the proximity of the buildings.



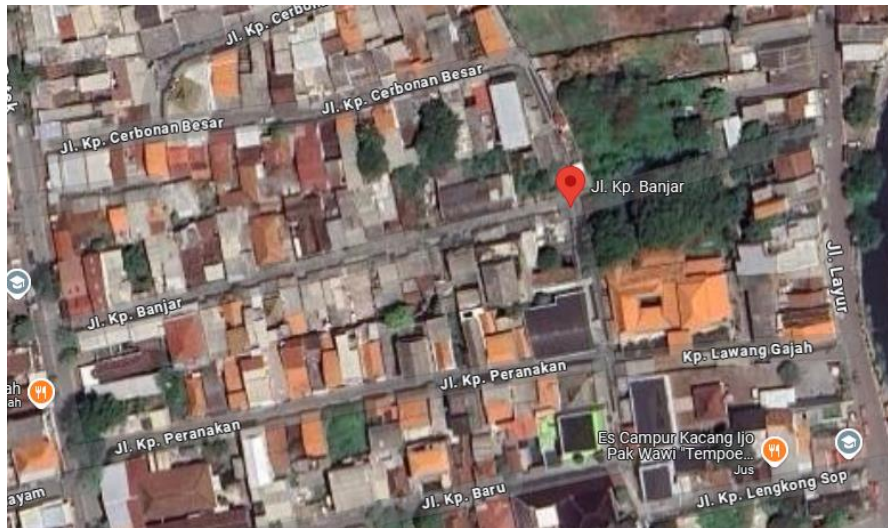


Fig. 4. Street Sketch in Kampung Banjar



Fig. 5. Banjar Village Road from west to east



Fig. 6. Banjar Doors, Windows, Roofs and Ornaments (Source: RTBL DistaruKota Semarang, 2022)

The narrowness of the road, combined with the tightly packed buildings, further affects the use of private space for the residents. The houses along Jalan Kampung Banjar are adjoined in rows, with fences directly next to the drainage ditches on both sides. This arrangement contributes to the overall sense of density in the area, as the fences act as boundaries to the private spaces in front of the homes. Despite the density, the area still feels relatively comfortable due to the well-maintained condition of the road and the absence of excessive public activity that might disturb the residents' peace. Despite the dense population, the relatively well-preserved road and the absence of heavy public activity create a sense of tranquillity.

One of the unique characteristics of Jalan Kampung Banjar is the presence of houses that retain Banjar's distinctive architectural style. This cultural feature is significant to the local heritage. However, the condition of these buildings has deteriorated over time, and they are no longer well-maintained. The decay of these structures highlights the challenges of preserving cultural heritage despite their historical and cultural importance to the local community. The presence of these Banjar-style houses adds value to the local identity of the area, although their current state of disrepair indicates a lack of preservation efforts.

On Jalan Kampung Kalicilik, 14 residential buildings create a dense housing pattern along

the street. In addition to residential buildings, there are several mixed-use buildings, such as one building used as a place of worship and a cemetery, one functioning as a small eatery, and one serving as both a shop and a residence. Additionally, one building is a combination of an eatery and a residence, reflecting the multifunctional use of space within this area.

In terms of the building structure, most of the buildings on Jalan Kampung Kalicilik are permanent houses constructed with brick materials, indicating higher stability and durability in the construction. However, two residential buildings are made from wood, demonstrating some variation in the choice of building materials used by the residents in this area. The use of wood in these two houses offers a distinct contrast to the brick buildings, yet both still serve as comfortable residences. Overall, while the materials used vary, the Jalan Kampung Kalicilik area displays diversity in building types and functions, reflecting the dynamic nature of the local community's way of life.

The condition of residential buildings on Jalan Kampung Kalicilik is quite varied, with some structures being well-maintained while others are in a state of disrepair. This disparity in maintenance may reflect differences in the economic circumstances or priorities of the property owners. Compared to Jalan Kampung Peranakan and Kampung Banjar, the density of buildings on Jalan Kampung Kalicilik is higher,



**Fig. 7. Street Sketch in Kampung Kalicilik**

creating a more compact area. This increased density is also influenced by the strategic location of Jalan Kampung Kalicilik, which is closer to the main road, Jalan Kakap, a vital access point for the local community, thereby increasing the activity intensity in this area.

Jalan Kampung Kalicilik is paved with block paving, which is functional and sturdy. The morphology of the buildings along the street is irregular, with a denser concentration of buildings on one side of the road. The road's width, which measures only 1.5 meters, makes it relatively narrow, categorizing the area as a public space utilized collectively by the community. The narrowness of the street and its function as a public facility make this area more active, with interactions between residents and other road users. The blend of residential and economic activities reflects the mixed-use nature of the space in this area.

With the buildings' irregular layout and proximity, Jalan Kampung Kalicilik is the most vibrant residential area among the three kampungs. The presence of many small eateries and shops along the street contributes to the bustling activity in the area. The proximity of Jalan Kampung Kalicilik to the busy Jalan Kakap further enhances the dynamic flow of traffic in the area, creating a strong connection between public and private spaces. The closely packed

homes in this area highlight this kampung's more compact and dense character compared to Kampung Peranakan and Kampung Banjar.

### 3.3 Comfortable Conditions of the Residential Environment

The comfort of a residential environment can be assessed through various parameters, including air temperature, humidity, and noise, which play a crucial role in creating a comfortable living space (Zhao et al., 2018). An optimal air temperature for residential comfort typically ranges from 18 to 30 degrees Celsius, while the ideal humidity level is between 40 and 60%. Noise, often influenced by external factors such as traffic or surrounding activities, should also be controlled to avoid disturbing the residents' comfort. These three factors must be considered to ensure optimal comfort in the living environment.

#### a. Jalan Kampung Peranakan

From 13 building samples located on Jalan Kampung Peranakan, the average indoor temperature (including the living room, family room, bedroom, bathroom, kitchen, and other rooms) ranges from 31.3°C to a maximum of 34.8°C. The average indoor temperature of all samples is 32.9°C.



Fig. 8. Kalicilik Village Road from east to west

**Table 2. Calculation of Average Temperature, Humidity and Noise for each Building on Jalan Kampung Peranakan**

No Sample	Building Function	Average		
		Each Building		
		°C	Rh	Db
1	Place of worship	31,3	61,3	55,3
2	Residence	33,4	59,4	61,8
3	Residence	33,4	57,9	58,4
4	Official residence	33,0	57,2	69,5
5	Residence	32,9	58,8	44,2
6	Residence	32,7	59,8	50,8
7	Residence	32,4	63,7	54,8
8	Residence	32,4	60,0	55,7
9	Residence	31,7	60,5	64,6
10	Residence	32,4	64,5	62,6
11	Residence	32,4	68,2	60,6
12	Mushola	34,8	58,0	63,0
13	Residence	34,6	53,1	72,9

The results of this survey show that the temperature between sample buildings does not differ much, and the outdoor temperature conditions also influence the indoor temperature. This is also influenced by the condition of the road pavement, which is made of paving blocks that reflect sunlight into the house so that the air temperature becomes quite high.

A reasonable temperature limit or air temperature range of 18-30°C shows that the buildings on Jalan Kampung Peranakan are above the threshold of the comfort level of the residential temperature, which is at an average temperature of 32.9°C. The air around the environment is quite hot and is also influenced by the density of buildings and permanent building structures made of bricks.

Good indoor air humidity is considered a standard for residential environmental comfort and is in the range of 40-70%. Based on the results of research in the field, it was found that the humidity of buildings on Jalan Kampung Peranakan is in the range of 53.1%—68.2%, with an average humidity of sample buildings at 60.2%.

Statistically, the humidity level on Jalan Kampung Peranakan is still within the comfort standard limits of housing. However, the figure is in the upper range of the value limit. This shows

that the humidity level is relatively high and puts the residential environment in the reasonably comfortable category.

Noise levels also affect a residence's environmental comfort. For residential areas with a standard noise level limit of 55 dB, the average noise value on Jalan Kampung Peranakan, at 59.5 dB, is above the standard comfort limit. Noise on Jalan Kampung Peranakan ranges from 44.2 dB to 72.9 dB. The highest noise occurs in sample building 13, a house close to the main road, which is also influenced by the location of quite busy community activities.

Of the three variables (temperature or air temperature, humidity and noise), it shows that the comfort conditions of the residential environment on Jalan Kampung Peranakan are slightly above the standard comfort value of the residence, especially for the temperature and noise variables.

#### **b. Jalan Kampung Banjar**

From 11 building samples located on Jalan Kampung Banjar, the average indoor temperature (including the living room, family room, bedroom, bathroom, kitchen, and other rooms) ranges from 33.7°C to a maximum of 34.7°C. The average indoor temperature of all samples is 34.3°C.

**Table 3. Calculation of Average Temperature, Humidity and Noise for each Building on Jalan Kampung Banjar**

No Sampel	Building Function	Average		
		Each Building		
		°C	Rh	Db
1	Residence	33,7	57,1	66,3
2	Residence	34,5	58,0	59,8
3	Residence	34,4	58,0	56,0
4	Residence	34,4	57,1	61,8
5	Mushola	34,0	55,0	67,0
6	Residence	34,2	55,6	64,1
7	Residence	34,0	58,1	63,6
8	Residence	34,7	57,5	73,4
9	Residence	34,4	56,6	63,0
10	TPQ	34,6	55,2	59,4
11	Residence	34,5	58,4	58,4

The results of this survey show that the air temperature between the sample buildings is almost the same, and the indoor temperature is also influenced by the outdoor temperature conditions. This is also influenced by the condition of the road pavement, which consists of paving blocks that are not too wide so that they do not reflect sunlight too much.

With a good temperature or air temperature limit in the range of 18-30°C, this shows that the buildings on Jalan Kampung Banjar are above the threshold for residential temperature comfort, namely at an average temperature value of 34.30°C. The air around the environment is quite hot, also influenced by the level of building density and the structure of permanent brick buildings.

Based on the field survey results, the humidity of the buildings on Jalan Kampung Banjar ranged from 55% to 58.4%, with the average humidity of the sample buildings at 57%. Statistically, the humidity level on Jalan Kampung Banjar is still within the standard limits of residential comfort. However, it should be noted that this figure is in the upper range of the value limit. This shows that the humidity level is relatively high, making the residential environment reasonably comfortable.

Noise levels also affect the environmental comfort of a residence. For residential areas with a standard noise level limit of 55 dB, the average noise value on Jalan Kampung Banjar at 57 dB is slightly above the standard comfort limit. Noise

on Jalan Kampung Banjar is in the range of 56 dB - 73.4 dB. The highest noise occurs in sample building 8 (eight), which is a house close to the main road, so that noise is also influenced by the location of community activities, which are pretty busy.

The three variables (temperature or air temperature, humidity, and noise) show that the comfort conditions of the residential environment on Jalan Kampung Banjar are slightly above the standard comfort value of the residence. This is influenced by the condition of the road, which is also narrower, and the density of buildings.

### c. Jalan Kampung Kalicilik

From 21 building samples located on Jalan Kampung Kalicilik, the average indoor temperature (including the living room, family room, bedroom, bathroom, kitchen, and other rooms) ranges from 33.3°C to a maximum of 35.5°C. The average indoor temperature of all samples is 34.4°C.

The results of this survey show that the air temperature between the sample buildings is almost the same, and the indoor temperature is also influenced by the outdoor temperature conditions. This is also influenced by the condition of the road pavement, which consists of reasonably narrow paving blocks and a large amount of vegetation cover (trees) in front of the house so that it does not reflect too much sunlight.

**Table 4. Calculation of Average Temperature, Humidity and Noise for each Building on Jalan Kampung Kalicilik**

No Sampel	Building Function	Average		
		Each Building		
		<sup>o</sup> C	Rh	Db
1	Residential	35,5	54,6	67,7
2	Food Stalls	34,5	55,8	74,0
3	Food Stalls and Residential	34,7	56,7	90,1
4	Residential House	34,5	56,0	75,2
5	Food Stalls and Residential Houses	34,7	55,0	63,3
6	Food Stalls and Residential Houses	34,5	56,5	69,9
7	Residential Houses	34,4	58,8	66,6
8	Residential Houses	34,6	58,0	52,5
9	Residential Houses	33,7	60,1	65,8
10	Mushola and Grave	33,6	60,4	52,0
11	Residential House	34,0	58,8	63,8
12	Residential House	34,5	58,6	60,3
13	Residential House	34,3	60,4	68,0
14	Residential House	33,3	59,7	56,0
15	Residential House	34,4	60,5	58,8
16	Residential House	34,3	60,4	73,0
17	Residential House	34,7	57,9	64,5
18	Shop and Residential House	34,6	58,0	76,9
19	Bicycle Shop and Residential House	34,9	56,0	73,4
20	Residential	34,5	56,5	72,3
21	Food Stalls	33,6	57,3	73,0

With a good temperature or air temperature limit in the range of 18-30°C, this shows that the buildings on Jalan Kampung Kalicilik are above the threshold for residential temperature comfort, namely at an average temperature value of 34.4°C. The air around the environment is quite hot, also influenced by the fairly high level of building density and permanent brick building structures. Based on the field survey results, the humidity of the buildings on Jalan Kampung Banjar was found to be between 54.6% and 60.5%, with the average humidity of the sample buildings at 57.9%.

Statistically, the humidity level on Jalan Kampung Kalicilik is still within the standard limits of residential comfort. However, the figure is in the upper range of the value limit. This indicates that the humidity level is relatively high and makes the residential environment fairly comfortable.

The noise level also affects the environmental comfort of a residence. For residential areas with a standard noise level limit of 55 dB, the average noise value on Jalan Kampung Banjar at 67.5 dB is above the comfort standard limit. Noise on Jalan Kampung Banjar is in the range of 52 dB - 90.1 dB. The highest noise occurs in sample building 2, which is a house and a food stall, and is located close to the main road so that noise is also influenced by the location of relatively high community activity. Of the three variables (temperature or air temperature, humidity, and noise), it shows that the comfort conditions of the residential environment on Jalan Kampung Kalicilik are also above the standard comfort value of the residence. This is influenced by the condition of the road, which is also narrower, and the density of buildings.

#### 4. CONCLUSIONS

The analysis of field survey data reveals that the residential comfort levels in Jalan Kampung Peranakan, Jalan Kampung Banjar, and Jalan Kampung Kalicilik are above the established threshold for residential comfort standards. The most significant factors influencing these comfort levels include temperature or air conditions and environmental noise. The morphological differences in each area play a crucial role in creating varying levels of comfort across these three locations. Jalan Kampung Kalicilik, characterized by higher building density and irregular building morphology, demonstrates a lower residential comfort level compared to the

other two locations. The closely spaced buildings and relatively narrow streets contribute to this condition. In contrast, Jalan Kampung Peranakan and Jalan Kampung Banjar, with their linear and more organized building layouts, exhibit residential comfort levels closer to the expected standards. The orderly arrangement of buildings in these two areas positively impacts the overall quality of the residential environment. Morphological differences in each area have a direct impact on environmental comfort conditions. Locations with more organized building layouts tend to achieve higher levels of comfort compared to areas with irregular building patterns. Additionally, environmental factors such as air humidity and the intensity of community activities significantly influence residential comfort in each location. Each area presents unique challenges in achieving optimal residential comfort for its inhabitants. The morphology of the area, environmental factors, and effective spatial planning are critical elements to consider in efforts to enhance residential comfort sustainably. This research provides valuable insights that can serve as a foundation for developing more adaptive and high-quality residential areas in the future.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

This research was assisted by the help of artificial intelligence tools, namely Grammarly, to improve the accuracy and clarity of language.

#### ACKNOWLEDGEMENT

We would like to express our gratitude to the respondents, local government officials, and all parties who contributed to this research. Your invaluable support, insights, and cooperation have been instrumental in completing this research. We greatly appreciate the time and effort devoted to facilitating data collection and ensuring the success of this research effort.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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