

ANALYSIS OF A MICRO-SCALE URBAN PLANNING-BASED SIGNAGE SYSTEM AS A MEDIUM FOR ENVIRONMENTAL EDUCATION AND SAFETY IN THE HIGH-DENSITY RESIDENTIAL AREA OF KRICKAK URBAN VILLAGE, YOGYAKARTA

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ARTICLE HISTORY

Received : 20-05-2026

Revised : 19-06-2026

Accepted : 30-06-2026

KEYWORDS

signage system;
micro-scale urban
planning; edu-safety;
high-density settlement;
spatial legibility;

ABSTRACT

This study examines the problem of unorganized signage systems in the high-density residential area of Kricak Urban Village, Yogyakarta, where visual information is needed to support spatial orientation, environmental awareness, and safety communication. In this study, edu-safety refers to the dual function of signage as a medium for environmental education and residents' safety. This research employed a descriptive qualitative method with a field-based case study approach. Data were collected through field observation, semi-structured interviews, and visual documentation, and were analyzed through data reduction, grouping, coding, theme identification, and interpretation. The findings show that the existing signage system in Kricak Urban Village has not yet been organized as an integrated visual system. Several signs differ in form, color, font size, material, placement, visibility, and legibility. Important information such as evacuation routes, assembly points, vulnerable areas, waste disposal points, drainage areas, and emergency access has also not been systematically represented. The study proposes a signage system model based on micro-scale urban planning by organizing orientation signs, directional signs, facility identification signs, environmental regulation signs, cleanliness education signs, warning signs, evacuation route signs, and "Titik Kumpul" signs. The novelty of this study lies in positioning signage not only as a wayfinding medium, but also as an edu-safety medium that integrates spatial legibility, environmental education, and safety preparedness in high-density residential areas.

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INTRODUCTION

Urban areas develop not only through the increase of buildings and population, but also through changes in spatial patterns that become increasingly dense and complex. In high-density residential areas, space is often formed through narrow alleys, road intersections, community activity nodes, public facilities, and environmentally vulnerable areas that are not always easily identifiable by space users. This condition makes visual information increasingly important, particularly in helping residents understand directions, facility locations, environmental rules, and safety-

related information. Iftikhar et al., (2020) explain that complex environments require wayfinding information support to enable users to navigate more effectively. In line with this argument, Uffelen, (2020) emphasizes that the primary function of signage and wayfinding is to provide spatial orientation quickly and clearly.

A signage system is part of information design that functions to communicate spatial messages visually so that they can be easily understood by users. Baer, (2021) explains that information design needs to be structured through effective and innovative approaches in order to produce visual communication that is meaningful, engaging, and functionally useful. In the context of the urban environment, a signage system should not be understood merely as a directional signboard, but also as a medium that helps users read space, understand messages, and make decisions when moving within an area. Zhou & Ujang (2024) show that wayfinding signage needs to consider material, color, graphic, and textual aspects, as these elements influence pedestrians' visual preferences. Therefore, a signage system should be designed based on users' needs and the spatial characteristics of the area in which the signs are installed.

Aulia, (2024) explains that wayfinding signage is part of Environmental Graphic Design (EGD) which communicates information through simplified visual elements such as text and symbols. The use of simplified visual communication aims to improve user understanding of spatial information in the environment. Studies on signage systems in Indonesia indicate that visual signs have mostly been examined in relatively well-organized public facilities. Calista et al., (2023) examined signage and wayfinding at the National Library of Indonesia as part of environmental graphic design that helps users feel safe and comfortable when navigating crowded spaces. Agnesia (2025) also investigated signage at Telkom University and showed that signage helps users locate intended places or facilities, although it still needs to consider ergonomic standards to ensure usability. These two studies demonstrate that signage systems play an important role in supporting spatial orientation. However, their objects of study remain focused on institutional facilities, such as libraries and campuses, which have more planned spatial systems compared to high-density residential settlements.

High-density residential areas have more complex problems because visual information is not only related to direction, but also to environmental order, cleanliness, safety, and emergency access. Kricak Urban Village in Yogyakarta City is a relevant location for this study because it has the characteristics of a dense settlement and was once one of the priority areas for slum settlement upgrading through the KOTAKU program. Wekawati et al., (2024) show that the physical arrangement of settlements in Kricak Urban Village has a strong influence on improving residents' quality of life, particularly in physical and environmental, safety, economic, and social aspects. These findings indicate that environmental improvement in Kricak has become an important concern. However, environmental visual communication through signage systems has not yet become the main focus of that study. In practical conditions, unorganized signage in dense settlements can make it difficult for residents, visitors, and emergency actors to identify alley directions, public facilities, environmentally vulnerable points, waste disposal rules, evacuation routes, and assembly points. If this condition continues, signage will not only fail to support spatial orientation, but may also reduce environmental awareness, delay emergency response, and weaken residents' compliance with cleanliness and safety messages.

Based on previous studies, there is a research gap that needs to be examined further. Earlier studies on signage systems have mostly positioned signage as a medium for navigation, user comfort, ergonomics, and spatial experience in well-organized public facilities, such as libraries and campuses. Meanwhile, studies on Kricak Urban Village have primarily discussed the physical arrangement of settlements and its influence on residents' quality of life. There remains a lack of research that specifically links signage systems with micro scale urban planning in high-density residential areas as a medium for environmental education and safety. Therefore, the research gap of this study lies in the absence of studies that position signage systems as an integrated visual medium for reading space, educating residents, and supporting environmental safety in high-density residential areas.

The novelty of this study lies in the development of a signage system concept based on micro-scale urban planning for high-density residential areas. In this study, the term edu-safety is used to describe the function of signage systems as both a medium for environmental education and a medium for residents' safety. The signage system is not positioned merely as a directional guide, but also as a visual medium that contains information about the locations of public facilities, environmentally vulnerable points, cleanliness, prohibitions, evacuation routes, assembly points, and safety messages that are closely related to residents' daily activities. The focus of this study is directed toward three aspects: the existing condition of signage systems and spatial legibility in Kricak Urban Village, the need for signage systems based on the micro-scale urban planning of high-density residential areas, and the role of signage systems as a medium for environmental education and safety. With this focus, this study does not only produce a visual design proposal, but also offers a model of environmental visual communication that corresponds to residents' needs.

The objectives of this study are to analyze the existing condition of signage systems and spatial legibility in Kricak Urban Village, formulate the need for a signage system based on micro-scale urban planning, and develop a signage system concept as a medium for environmental education and safety in high-density residential areas. This study is important because local residents are the primary users of the space, while Urban Village officials or local authorities act as environmental managers, and designers or visual practitioners can provide input regarding design feasibility. Informants are selected purposively based on the criteria that they are directly involved with the environment, understand the conditions of the area, and have interacted with the existing signage. Thus, this study has both academic and practical significance: it fills a gap in signage system studies within high-density residential areas and provides a basis for designing visual media that are more closely aligned with residents' educational and safety needs.

METHOD

This study employed a descriptive qualitative method with a field-based case study approach. This method was selected because the study aims to understand the condition of the signage system, spatial legibility, visual information needs, and the educational and safety functions of environmental communication in the high-density residential area of Kricak Urban Village. Creswell & Creswell, (2022) explain that the selection of a research approach should be aligned with the research questions and the study design being applied. Therefore, a descriptive qualitative approach is considered appropriate because this study does not measure relationships between variables, but rather describes and interprets visual phenomena and the needs of space users in depth.

Data were collected through field observation, semi-structured interviews, and visual documentation. The field observation was conducted at several strategic points in Kricak Urban Village, including the main entrance area, main alleys, secondary alleys, alley intersections, public facility areas, waste-prone points, evacuation routes, and assembly point locations. These observation points were selected because they represent important spatial decision-making areas where residents and visitors require visual information. The data collection process was carried out during the field study period by directly observing the physical condition, visibility, placement, and function of the existing signage system.

Observation was used to examine the existing condition of the signage system, the position of signs, visual legibility, and the relationship between signs and the spatial structure of the area. Interviews were conducted with residents, local administrative representatives, and individuals who understood the environmental conditions in order to obtain information about experiences, needs, and problems related to the use of the signage system.

The informants were selected purposively based on their direct involvement with the area, their knowledge of daily environmental conditions, and their experience in using or managing the existing signage. The informants consisted of local residents, representatives of the urban village or neighborhood administration, and visual/environmental practitioners who were considered able to provide input regarding signage needs and design feasibility. The number of informants can be adjusted according to field data, but they should represent both space users and environmental managers.

Visual documentation was used to record the form, color, size, material, physical condition, and placement of signs. Tracy, (2024) positions qualitative research as a process of collecting evidence, developing analysis, and communicating findings effectively; therefore, these three techniques are relevant for obtaining data that are closely connected to real field conditions.

The data were analyzed through several stages, namely data reduction, data grouping, coding, theme identification, and interpretation. The results of observations, interviews, and documentation were read repeatedly to identify patterns related to the existing condition of the signage system, the need for signs based on micro-scale urban planning, and the role of the signage system as a medium for environmental education and safety. Saldaña, (2021) explains that the coding process helps researchers understand qualitative data and identify patterns before further analysis is conducted. To ensure data validity, this study applied source and technique triangulation. Source triangulation was conducted by comparing information obtained from residents, local administrative representatives, and visual/environmental practitioners. Technique triangulation was conducted by comparing interview findings with field observations and visual documentation. In addition, member checking was carried out by reconfirming key findings with selected informants to ensure that the researcher's interpretation was consistent with the actual field conditions. Thus, the analysis in this study was directed toward producing a systematic understanding of signage system issues in Kricak Urban Village, while also formulating design needs that correspond to the characteristics of a high density residential area.

RESULTS AND DISCUSSION

Existing Conditions of the Signage System and Spatial Legibility in a High-Density Residential Area

The observation results in Kricak Urban Village show that the existing signage system has not yet been organized as an integrated visual system for the area. The signs identified in the field still appear separately according to the specific needs of each location, such as alley name boards, prohibition signs against littering, environmental information boards, public facility markers, corner mirrors, and several evacuation route signs. This condition indicates that a signage system already exists in the area, but it has not yet demonstrated consistency in terms of form, color, font size, symbols, and placement patterns. This finding is in line with Akrom and Haryadi, (2021), who explain that signage system design can be developed through three stages: the information content system, the graphic system, and the hardware system. In the context of this study, the signage system found in Kricak Urban Village needs to be examined not only in terms of its information content, but also through the graphic system and the physical form of the signs being used.

In this section, field findings are distinguished from the author's interpretation in order to make the analysis more measurable. Field findings refer to visual conditions directly identified through observation and documentation, such as the type of signs, their placement, color, size, material condition, visibility, and physical relation to surrounding objects. Meanwhile, the author's interpretation refers to the meaning drawn from these findings, particularly how the condition of the signs affects spatial legibility, users' orientation, environmental awareness, and safety communication in the area.



Figure 1. The condition of the signage system in Kricak Urban Village as viewed from the main road or provincial road

Source: Research team documentation, 2026

Figure 1 illustrates the condition of the signage system in Kricak Urban Village located along the main road or provincial road. Based on the documentation shown in sections (a), (b), and (c), it can be seen that the area's signage elements have not been optimally organized, as their presence is mixed with utility poles, other information boards, vegetation, buildings, and the structure of the overpass. This condition reduces the legibility and visibility of the signs, particularly for road users passing through the area by vehicle. In addition, several directional signs appear to have inconsistent sizes, colors, orientations, and positions, resulting in an unclear hierarchy of information. This indicates that the signage system in Kricak Urban Village still requires reorganization so that it becomes more informative, easily recognizable, readable from users' viewing distance, and capable of strengthening the visual identity of the area.

In terms of visual legibility, several signs remain difficult to read due to small lettering, faded colors, low contrast, and sign positions that are obstructed by vehicles, poles, trees, or other surrounding objects. One resident informant stated that alley name signs are sometimes not visible at night, especially for newcomers entering the area. This condition shows that the problem of the signage system is not only related to the design of the signboards, but also to users' experiences in reading the space. Dharmawan & Rachmaniyah, (2021) explain that areas with a large number of buildings require

proper signage and wayfinding arrangements so that users who are unfamiliar with the location can navigate more easily. In the case of Kricak, the narrow, branching, and dense alley pattern makes the need for legible signs more urgent.

Figure 2. Ineffective signage system due to faded lettering, dull colors, and unclear readability of information



Source: Research team documentation, 2026.

Figure 2 shows the condition of the signage system in Kricak Urban Village, which is considered ineffective due to a decline in visual quality. Based on the documentation at the two observed points, several directional signs show faded lettering, dull colors, and damaged surfaces caused by age and weather exposure. These conditions make information that should assist road users and local residents difficult to recognize. In addition, the placement of the signage system, which blends with surrounding environmental elements such as walls, plants, and poles, further reduces visibility and the clarity of the messages conveyed. This finding indicates that the signage system has not yet functioned optimally as an information medium and directional marker. Therefore, design renewal, material improvement, and spatial reorganization are needed to make the signage system more effective, legible, and aligned with users' needs.

Figure 3. A signage system considered effective due to larger lettering and higher contrast

Source: Research team documentation, 2026.



Figure 3 shows the condition of the signage system in Kricak Urban Village, which is considered more effective because it uses larger lettering, higher color contrast, and directional information that is easily recognizable by road users. In the documentation, the directional sign appears to use a sufficiently strong color combination between the background and the text, allowing the visual message to be perceived more quickly, even though it is located in a road environment that is relatively dense with other elements, such as poles, plants, buildings, and additional information boards. The clarity

of the arrow direction and the legibility of the location name also support the function of the signage system as a directional marker. However, this effectiveness can still be improved through better positioning, design standardization, and the reduction of visual distractions around the signboard so that the information conveyed can be read more easily from the road users' viewing distance.

The comparison between signs considered ineffective and those that remain effective shows that legibility is strongly influenced by letter size, color contrast, installation position, and material condition. Signs with large lettering and contrasting colors are more easily recognized by residents, whereas dull signs or signs obstructed by surrounding objects tend to be ignored. Zolkefil & Talib, (2022) emphasize that graphic elements such as text, color, size, and visual quality play a role in helping users interpret information on signage. Thus, the issue of the signage system in Kricak is not merely an aesthetic problem, but also concerns the ability of signs to communicate information to residents and visitors. Empirically, the field data show differences in the visual quality of the signs, especially in terms of lettering size, color contrast, material condition, and obstruction by surrounding objects. Analytically, these differences indicate that signage effectiveness in Kricak is not determined only by the presence or absence of signs, but also by how far the signs can be seen, read, understood, and used by residents or visitors when making spatial decisions.

Field findings also show that not all important spatial information in the area has been represented within the signage system. Alley direction markers and advisory signs have been found, but signs indicating assembly points, fire-prone areas, flood-prone areas, emergency vehicle access, waste disposal points, drainage areas, security posts, and public facilities have not yet been systematically provided. In a high-density residential area, this lack of information may create confusion when residents or visitors require quick information. Gath-Morad et al., (2024) explain that strategic visibility affects wayfinding efficiency and strategy because users need signs that are visible at important decision-making points. In relation to Kricak, signs should therefore not only be installed where space is available, but also at spatial decision points, such as area entrances, alley intersections, public facilities, evacuation routes, and vulnerable locations.

Based on these findings, the existing condition of the signage system in Kricak Urban Village can be understood as an organic system that has not yet been standardized and does not fully support the spatial legibility of a high-density residential area. Pontis & Babwahsingh, (2023) position information design as a practice that helps users understand information in changing and complex situations. Referring to this perspective, the signage system in Kricak needs to be directed toward becoming an area-based visual information system, rather than merely a collection of signboards. Such a system should regulate the types of signs, message content, visual form, color, typography, symbols, materials, and installation points so that residents can read and understand the space more easily.

Table 1. Matrix of Existing Signage System Conditions in Kricak Urban Village

Aspects Examined	Field Findings	Impact on Spatial Legibility
Alley directional signs	Available, but the forms and colors are not uniform	Visitors still have difficulty understanding the area's directions
Public facility markers	Available at several points, but not evenly distributed	Facilities are not always easy to locate
Prohibition signs	Available, but many are presented only as plain text	Messages are easily ignored by residents
Hazard signs	Still limited	Risks are not recognized from the outset
Evacuation routes	Available at several points, but have not yet formed an area-wide system	Safety information remains incomplete
Assembly points	Not clearly visible in several areas	Residents do not have a definite emergency orientation
Waste disposal points and drainage	Not yet mapped as part of the area's visual information system	Environmental cleanliness education remains weak
Security posts and emergency access	Not consistently marked	Access to emergency assistance is less easily understood

Signage System Needs Based on Micro-Scale Urban Planning

The need for a signage system in Kricak Urban Village should be formulated based on micro-scale urban planning, namely an approach to reading the area through main alleys, secondary alleys, activity nodes, intersections, entry and exit routes, public facilities, vulnerable points, and residents' communal spaces. This approach is important because high-

density residential areas cannot be treated in the same way as institutional spaces, which generally have more orderly building structures. Prasetyo et al., (2026) state that effective wayfinding and signage design needs to consider the placement of visual elements, legibility, design consistency, and the integration of local values. In the context of Kricak, the need for a signage system should begin with spatial mapping rather than directly with the production of signboard designs.

Based on the observation, signs need to be classified into several types. First, area orientation signs should be placed at the main entrances and contain a simple map of the area. Second, directional signs should be placed along main alleys, secondary alleys, and intersections. Third, identification signs should indicate public facilities, security posts, public spaces, cultural sites, assembly points, and community service points. Fourth, regulatory signs should contain prohibitions, cleanliness advisories, parking rules, and community study hours. Fifth, safety signs should provide information on evacuation routes, fire-prone areas, flood-prone areas, emergency vehicle access, and assembly points. Sari & Dwitasari, (2024) explain that a good signage system needs to be designed professionally, integratively, and effectively in communicating information. Therefore, signage needs in Kricak should be organized as a unified network of visual information.

Table 2. Signage System Needs Based on Micro-Scale Urban Planning in Kricak Urban Village

Micro-Scale Urban Structure	Signage Needs	Suggested Information Content
Area entrance	Area map and territorial identity	Area name, simple map, directions to public facilities
Main alleys	Directional signs	Directions to RT/RW areas, public facilities, and assembly points
Secondary alleys	Small directional signs	Alley directions, house/block numbers, exit routes
Alley intersections	Directional decision signs	Directional arrows, alley names, short-distance information
Public facilities	Identification signs	Security post, community hall, school, mosque, cultural site
Waste-prone points	Environmental education signs	Prohibition against littering, waste collection schedule, waste icons
Flood-prone points/drainage areas	Warning signs	Flood-prone or waterlogging areas, prohibition against blocking drainage channels
Fire-prone points	Safety signs	Prohibition against burning waste, firefighter access, emergency numbers
Evacuation routes	Safety signs	Evacuation directions, assembly points, safe routes
Child-friendly areas	Child warning signs	Children crossing, reduce speed, play area

The signage system design also needs to consider the hierarchy of information. Primary information, such as alley names, evacuation directions, and assembly points, should be made more prominent than supplementary information. Akrom & Haryadi, (2021) apply the signage pyramid method, which includes the information content system, graphic system, and hardware system. This framework is relevant to Kricak because signage needs are not only related to the written text, but also to the graphic system and the physical form of the signs. At the content level, signs need to present brief and direct information. At the graphic level, signs need to use consistent colors, icons, and typography. At the physical level, signs need to use weather-resistant materials and be installed in positions that are easily visible.

In addition to directional and safety aspects, the signage system in Kricak needs to highlight local identity. Visual data indicate the potential use of Javanese script, brown and white color combinations, geometric-organic motifs, and local narratives such as Watu Ombo and the history of the area. This need should not be understood merely as additional decoration, but as a way to build residents' familiarity and attachment to environmental visual media. Prasetyo et al., (2026) show that signage can be designed by considering local wisdom in order to strengthen the visual identity of an area. Therefore, the signage system in Kricak should not adopt a generic design, but should integrate informational functions with the local visual character of Yogyakarta.



Figure 4. Educational signage system and environmental advisory signs in Kricak Urban Village

Source: Research team documentation, 2026.

Figure 4 illustrates the presence of educational signage systems and environmental advisory signs in Kricak Urban Village, which function as directional media, reminders, and instruments for regulating community behavior in public spaces. Several visible signs include no-parking signs, assembly point signs, evacuation route signs, community study-hour signs, and prohibitions against littering. Functionally, the presence of these signage systems already reflects an effort to communicate information related to safety, order, and environmental cleanliness. However, from a visual perspective, these signs have not yet been fully organized in a consistent manner, as they differ in size, form, color, installation position, and level of legibility. Some signs are relatively clear because they use symbols and contrasting colors, such as assembly point and evacuation route signs, whereas other advisory signs appear simpler and less visually prominent within the surrounding environment. This condition indicates that educational signage systems in Kricak Urban Village already have an important social function, but still require design alignment so that the messages conveyed are easier to understand, more clearly visible, and supported by a stronger visual identity.



Figure 5. The need for safety signs in a child-friendly area

Source: Research team documentation, 2026.

Figure 5 illustrates the condition of a child-friendly area in Kricak Urban Village, which already contains educational visual elements, such as the “Kelurahan Layak Anak” signboard and murals with themes related to health and positive habits for children. The presence of these murals and information boards indicates an effort to create an environment that supports children’s education through visual media. However, in an area of this kind, the need for a safety signage system becomes important because child-friendly areas have the potential to be used for playing, learning, and gathering activities. The required safety signs may include evacuation route signs, assembly point signs, prohibitions against playing in hazardous areas, slippery floor warnings, child supervision information, and safe area indicators. With clear, legible, and child-oriented safety signs, child-friendly areas can become not only informative and educational, but also safer, more orderly, and more supportive of child protection in public environments.

The signage system model formulated based on field needs can be structured into four layers. The first layer is area orientation, which includes maps, area names, and main directions. The second layer is daily navigation, which includes alley signs, facility signs, security posts, and communal spaces. The third layer is environmental education, which includes signs related to waste, cleanliness, drainage, parking, and residents’ behavior. The fourth layer is safety, which includes evacuation routes, assembly points, vulnerable areas, emergency access, and important contact numbers. Gath-Morad et al., (2024) emphasize the importance of allocating visibility to spatial elements that are actionable for users. Based on this perspective, signs in Kricak need to be placed at points that genuinely influence residents’ decisions, rather than merely in locations where signboards are easy to install.



Figure 6. Design of the evacuation route and advisory signs leading to the “Titik Kumpul”

Source: Research team documentation, 2026.

Figure 6 shows the design of the evacuation route and advisory signs leading to the “Titik Kumpul,” which are installed at several strategic points within the research area as part of efforts to improve disaster preparedness. The evacuation route signs function to provide clear directional guidance for residents to reach a safe location during an emergency, while the advisory boards and “Titik Kumpul” signs serve as supporting information that directs residents to

the designated assembly area. The placement of these signs is expected to facilitate the evacuation process, reduce confusion during disasters, and increase residents' awareness and preparedness in responding to emergency situations.

Effectiveness of the Signage System as a Medium for Environmental Education and Safety

The effectiveness of the signage system in this study is understood as preliminary effectiveness based on visual observation, comparison between signs considered effective and ineffective, and informants' responses to environmental information needs. The findings of this study cannot yet claim a quantitative improvement in residents' behavior, as post-implementation testing has not been conducted. However, field data indicate that the proposed signage system has the potential to improve residents' understanding if it is developed with clear messages, easily recognizable visuals, and placement that corresponds to residents' activity points. Sari & Dwitasari, (2024) explain that a signage system can influence users' cognitive, affective, and behavioral responses. In Kricak Urban Village, cognitive responses are reflected in residents' ability to understand directions and locations; affective responses relate to feelings of safety; while behavioral responses are associated with compliance with environmental and safety messages.

From the perspective of environmental education, the existing signage still largely takes the form of textual advisory messages, such as prohibitions against littering, appeals to maintain cleanliness, parking restrictions, and information about community study hours. Informants stated that signs frequently seen by residents are sometimes no longer noticed. This finding indicates the presence of visual fatigue, as messages are repeatedly delivered but are not supported by engaging visual elements. Zolkefil & Talib, (2022) identify visual quality, including color, text, size, and graphics, as components that help users interpret information. Therefore, environmental education messages in Kricak need to be made more concise by using icons, differentiated colors, and visual hierarchy so that they are not merely perceived as prohibitions, but as memorable information. Wardhana & Kholili, (2025) state that, using a descriptive qualitative approach and Gestalt theory, the design of the sign system includes four main types: regulatory and prohibitory signs, directional signs, identification signs, and interpretive signs.

The effectiveness of environmental safety also depends on the presence of permanent and easily identifiable signs. During the interviews, local administrative representatives stated that there was no specific design for safety routes and that safety information was usually conveyed through community socialization. This indicates that safety communication still depends largely on verbal delivery. In emergency situations, however, residents require information that is immediate, visible, and not dependent on explanations from others. Su et al., (2022) show that signage is related to users' wayfinding behavior, and certain types of signs can influence users' visual attention when searching for directions. Thus, the safety signage system in Kricak needs to be prepared as a permanent visual medium that can function before, during, and after emergency situations.

The signage system model proposed to improve the effectiveness of education and safety consists of three principles. First, messages should be short, direct, and closely related to residents' actual problems, such as "Jaga Saluran Tetap Bersih," "Akses Darurat Jangan Ditutup," "Awasi Banyak Anak-Anak," and "Ikuti Jalur Evakuasi." Second, signs should contain easily recognizable symbols, such as icons for waste, children, fire, flooding, evacuation arrows, and assembly points. Third, signs should be placed at points that correspond to residents' behavior, such as alley intersections, waste-prone areas, drainage areas, the front of public facilities, and routes leading to assembly points. Prasetyo et al. (2026) identify simplicity, consistency, visibility, placement, and accessibility as important principles in wayfinding design. These principles are relevant to Kricak because high-density areas require signs that are simple, consistent, visible, properly positioned, and accessible to users of various age groups.

Table 3. Preliminary Effectiveness Indicators of the Educational and Safety Signage System Design

Effectiveness Aspect	Indicators Assessed	Form of Application in the Design
Directional understanding	Residents or visitors are able to recognize alley directions and facilities	Area map, directional signs, arrows, alley names
Understanding of environmental rules	Residents understand prohibitions and advisory messages	Waste icons, parking prohibition signs, drainage advisories
Safety understanding	Residents know evacuation routes and assembly points	Evacuation route signs, "Titik Kumpul" signs, emergency numbers
Visual legibility	Signs are readable from a certain distance	Large lettering, contrasting colors, simple symbols

Message memorability	Messages are easy to remember because they are short and visual	Short phrases, icons, category-based colors
Location suitability	Signs are installed at spatial decision-making points	Area entrances, alley intersections, vulnerable points, public facilities
Residents' acceptance	Signs feel connected to the identity of the area	Javanese script, local motifs, distinctive colors, Watu Ombo narrative

With this design, the effectiveness of the signage system is not only measured by the quality of its visual appearance, but also by its ability to help residents understand space, remember environmental messages, and respond to emergency situations. Gath-Morad et al., (2024) explain that strategically positioned visibility can shape users' wayfinding efficiency and strategies. When applied to a high-density area such as Kricak, signs that are visible at spatial decision-making points can help residents and visitors move in a more directed manner. Therefore, a signage system design based on micro-scale urban planning can serve as a medium for environmental education and safety if it is developed through the integration of area mapping, residents' needs, visual principles, and appropriate sign placement.

Therefore, the discussion in this study should be understood as a critical reading of field conditions rather than as a final measurement of signage effectiveness. The observed signs provide empirical evidence of existing visual problems, while the proposed signage model represents the author's interpretation of how those problems can be addressed through micro-scale urban planning principles. This distinction is important because the proposed model still requires further testing through implementation, user simulation, or post-installation evaluation.

Overall, the findings of this study address the three research questions. First, the existing signage system in Kricak Urban Village is already present, but it has not yet been integrated, lacks visual consistency, and has not fully functioned as an area-based information system. Second, the signage system model needed is a micro-scale urban planning-based model that connects orientation signs, directional signs, identification signs, regulatory signs, environmental education signs, and safety signs. Third, the effectiveness of the signage system design can be seen from its potential to improve residents' understanding of directions, environmental rules, cleanliness, safety, and emergency response, although further effectiveness testing is still needed through user simulation or limited implementation.

CONCLUSION

Based on the findings of this study, it can be concluded that the signage system in Kricak Urban Village has already existed in various forms, such as alley name boards, prohibition signs, public facility markers, evacuation route signs, and "Titik Kumpul" signs. However, these signs have not yet been organized as an integrated visual system for the area. Differences in form, color, font size, material, placement, visibility, and legibility indicate that the existing signage system has not fully supported spatial legibility in the high-density residential environment. The signage system needed in Kricak Urban Village should be formulated based on micro-scale urban planning by considering the spatial structure of the area, including main entrances, main alleys, secondary alleys, alley intersections, public facilities, waste-prone points, drainage areas, vulnerable locations, evacuation routes, and residents' activity spaces. The required signage system should not only function as a directional guide, but also include orientation signs, facility identification signs, regulatory signs, environmental education signs, warning signs, evacuation route signs, and assembly point signs. In this way, signage can become a visual communication medium that helps residents and visitors understand directions, environmental rules, cleanliness messages, and safety information.

This study also shows that an edu-safety-based signage system has the potential to support spatial legibility, environmental awareness, and safety preparedness in high-density residential areas. In this study, edu-safety refers to the dual function of signage as a medium for environmental education and residents' safety. However, the effectiveness of the proposed signage system should still be understood as preliminary because it has not yet been tested through direct implementation, user simulation, or post-installation evaluation. Therefore, further studies are needed to measure how far the proposed signage system can influence residents' understanding, behavior, and response to environmental and emergency situations. As a practical recommendation, Kricak Urban Village needs to remap important spatial points, particularly area entrances, alley intersections, public facilities, flood-prone points, fire-prone points, waste disposal points, drainage areas, evacuation routes, and "Titik Kumpul" locations. After this mapping process, a signage design guideline should be developed to regulate color, typography, icons, size, materials, language, information hierarchy, and installation positions. Priority should be given to safety signs and environmental education signs because they are directly related to residents' daily activities and emergency preparedness. The main scientific contribution of this article is the

positioning of signage systems as an integrated edu-safety medium within micro-scale urban planning, particularly for improving spatial legibility, environmental education, and safety communication in high-density residential areas.

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