Perspectives on the implementation of shared space street concept as an alternative to improve the environmental quality in Peunayong area

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Abstract. Shared space street (3S) is an urban design concept applied by eliminating physical barriers and markers on road space to create uncertainty that will drive motorists to reduce vehicle speed and be more tolerant with other road users. The implementation of 3S contributes to the environmental quality through an emphasis on reducing motorized vehicles, improving people's habits to walk and use public transportation. This study aims to understand the public's perspectives about the implementation of 3S as a new concept for an old downtown area in Banda Aceh. This study further examines whether familiarity with the area affects the acceptance of 3S, type of expected facility needs, and confidence of 3S impact to reduce congestion. The study uses the qualitative method (interviews) for key informants and quantitative (online surveys) for the public. The results show that although 3S is a new concept for the area, there is a high level of acceptance from the public. The results also show that frequency of visits does not significantly affect the acceptance, need for facilities, or view on impact to congestion. However, a variety of facility requirements was revealed. It is also found that the combination of several methods in data collection and communicating the proposed design is more effective for the implementation of new urban design innovation.

1. Introduction

Shared space street (3S) is an approach in urban design to reduce the dominance of motorized traffic by creating uncertainty and eliminating traffic signs and road markings [1]. This concept was developed to improve the movement and comfort of pedestrians, among others, by reducing the dominance of motorized vehicles, the use of different road materials, and an integrated traffic system in the hope of allowing all users to share space.

The 3S concept was first proposed in the 1970s by Hans Monderman, a traffic engineer from the Netherlands. The idea has spread worldwide in response to the negative effects of motorization [2]. One of the negative effects of motorization is air pollution which reduces regional air quality. The implementation of the 3S concept in an area is expected not only to improve air quality but also to improve the quality and rights of road users, especially pedestrians, as well as lead to environmental, health, and quality of life benefits for all [3].

Gampong Peunayong (Gampong is an Acehnese word for village or neighborhood in urban area) in Banda Aceh is a Central Business District or CBD [4] with a fairly high level of resident visits. It is...
also a historic area that has diverse land use, dominated by trade and service functions [5]. The main attraction of visits mainly comes from commercial land use and generates very high traffic movements. This condition is exacerbated because the pedestrian service is not optimal. A decrease in the physical quality of the built environment caused by the unavailability of adequate pedestrian paths in the area has been reported, among others [6].

In addition, the high traffic movement also greatly affects the comfort level of a pedestrian in accessing the streets and amenities. Therefore, good and careful planning is needed to provide attractive and proper public spaces providing easy access, comfort, and security for users [7] along the street corridor in Peunayong.

The fish meat and vegetable market, which were the main traffic generators in Peunayong has been recently relocated in 2021 to Lamdingin [8]. This condition opens opportunities to improve the quality of the environment not only by adding new buildings but also by changing the types and methods of infrastructure management, especially roads. The characters of the 3S concept can also support Peunayong as a strategic heritage area as mandated in the spatial plan of Banda Aceh. The 3S concept is expected to provide equal opportunities for road users to comfortably access the area and reduce congestion levels. The condition of Peunayong as a historical area, a CBD, as well as a settlement characterized by the diversity of resident ethnic compositions and the 3S concept are valuable ingredients to provide quality street space.

Essentially, cities will increasingly be a key determinant of how people can perceive and conceive the space; this is an area that demands more attention. Importantly, cities and municipalities are not isolated entities. They are interconnected in complex ways through the global economy and society, and they can be catalysts for change at wider scales [9]. The changes in the city can be initiated by the local people or in the case of a contested neighborhood or district like Peunayong it can be driven by public demand. As the main factor that determines the success of local development, this study aims to identify public perspectives and acceptance of shared space street concept to be implemented in Peunayong and investigate whether familiarity with the area indicated by the frequency of visit affects acceptance, demand for facilities and view on the ability of 3S to reduce potential future congestion in Peunayong.

2. Materials and methods

2.1. Study location
Gampong Peunayong in Kuta Alam sub-district is located in the central part of Banda Aceh, along the West side of Aceh River which was the main transportation access in the past (Figure 1). The area is 36.1 hectares with a population of 3,036 people. The land use is mainly trade and services, government, and offices. There are 14 major street spaces and some are appropriate for 3S.

![Figure 1. Map of the study area.](image)

2.2. Shared Space Street (3S) concept
The 3S concept refers to a road space design system with the aim that vehicles passing the street operate at low speed using pedestrian volumes, designs, and other signals to divert traffic which can create a conducive public space [7]. The shared space street must be well connected to the surrounding streets to make it easier for road users to access public transportation. The 3S creates a livable street that encourages community activities in street space to make it more lively but remain comfortable. The livable street also ensures the establishment of internal activities in the street space to increase social interaction.

The concept of shared space street is based on four aspects: accessibility, social interaction, walking comfort, and acceptance of stakeholders [7]. Sustainable transformation of the city's face requires involvement and active collaboration among various key stakeholders. The integration of various perspectives from users and people who are involved in the planning process is highly important. This paper focuses on the acceptance aspect by looking at perspectives on the various feature of existing conditions, acceptance, and facilities demand. It is intended to ensure that the 3S concept can accommodate the needs of its stakeholders and the initiative can improve the quality of a CBD environment sustainably.

Since the sustainable transformation of the city's face encourages the involvement of active collaboration among various key stakeholders and the integration of various perspectives from the people who are directly involved in the planning area, this study wants to see whether the intensity of community visits and frequency of visit will influence the community acceptance of 3S concept and facilities expected in the location. It is intended that the 3S concept that will be planned can represent the needs of its users. Therefore, public opinion and key stakeholders are considered to improve the quality of a sustainable environment.

2.3. Survey design
The methods used in this study are qualitative in the form of interviews for key informants and quantitative methods through online surveys (google-form) for the public who live or have visited Peunayong. Qualitative methods were carried out to gather in-depth information related to the Peunayong planning program and the possibility of implementing the shared space street concept. A quantitative approach was taken to see how the general public's understanding of the familiarity and space experience, and responses related to the 3S concept. The online survey in this study uses an illustration technique for the application of the 3S concept applied in other cities so that the public has a clearer picture and understanding of the 3S concept in the context of the existing area.

3. Results and discussion
The online survey was conducted for a total of 6 days in July 2021 and managed to attract 101 respondents. It was dominated by women (68.3%), mainly from Banda Aceh (67.3%). The majority (90%) were from the young age group of 18-35 years. Most of the respondents have a higher education background (40.6%) and high school by 38.6%. They represent educated and productive age people who will become active users and visitors to the area within 10 years-20 years into the future.

3.1 Familiarity and space experience
The level of familiarity and space experience was assessed through the frequency, the location, and the purpose of visit as well as the mode of transportation used (Figure 2). For the frequency of visits, the majority of the respondent (48.5%) visited Peunayong three times a week (see Figure 2A for detail). The frequency of visits was then reclassified into two types: frequent (several times a week and every day) with a total percentage of 60% and infrequent category (consists of several times a year and visited once) which include 40% of respondents.

In addition, most of the respondents came to Peunayong for shopping (80.2%). Only 2% of respondents visited for work. The rest went shopping-sightseeing, having culinary tours, and coffee.
The most visited locations were fish meat and vegetable markets (36.6%). The location visited is reported in Figures 2B and 2C.

Figure 2. Familiarity and space experience based on (a) Frequency of visit (b) Location of visit; and (c) Map of visited location in Peunayong.

Figure 2C shows that the intensity of visits to Peunayong is quite high and dominated by shopping activities. Then figure 2C shows that the streets are the main public space with the fish-meat and vegetable market area as the main traffic generator. These two markets have been relocated and recently this condition significantly reduced the traffic.

Considering the wider aims of environmental improvement, A Curl et al (2015) in their research explained that 3S pilot projects used in their study were sufficient to enhance older people’s perceptions of street walkability. It drives the neighborhood to create a good quality of the built environment. However, to achieve the purpose, it is additionally fundamental to include more radical changes to the local street or neighborhood, other means of support alongside environmental support for the community [10]. Therefore, it is hoped the 3S concept will contribute effectively to create a new image of a comfortable area in Peunayong, able to reduce congestion levels and improve the quality of the local environment.

3.2. Perspectives on the application of the shared space street concept
3.2.1. Public acceptance of the Shared Space Street (3S) concept. The majority of respondents (96%) agree that the shared space street concept can be applied in Peunayong. The main reasons were aesthetic considerations (30 respondents) and comfort aspects (20 respondents) especially the convenience of walking in Peunayong. Meanwhile, respondents who disagree with the 3S concept think that community habits such as precarious parking or overcrowded street vendors are the biggest challenge. Thus, it is undeniable that the aspect of many road users who are not orderly can interfere with the smooth flow of traffic which causes traffic congestion [11].

The 3S concept can potentially exacerbate existing congestion. Many years on failed partial attempts to address these issues could be the reason for the doubts. This function embodies the concept
that urban streets disclose a city's history, urban varieties, and societies that have created them [12]. However, a key informant from the Regional Planning Board of Banda Aceh City considered that it is feasible to implement the 3S concept in Peunayong because the idea is in line with both the Banda Aceh Spatial Plan and Peunayong's vision. 3S will potentially level up the quality of the local environment. Based on community group representative opinion, the shared space street concept is applicable since it can enhance the value of the area [13]

In addition, the Chinese community representative in Peunayong also said hopefully Peunayong would be an attractive CBD area and able to scale up its potential extensively. Especially in the current pandemic that seems to have reduced the activity in the area and make it unproductive. The revitalization of ancient buildings and districts also opens up possibilities for the improvement of public space and social inclusion [14]. In recent years, tactics to financial improvement in various cities have attracted activity and cities are being highlighted as successful increase engines [15].

Meanwhile, according to Geuchik (village leader) of Peunayong, the challenge that will be faced in implementing the 3S concept is the demographic characteristics of the area with a fairly diverse level of community interest. As well as the reluctance of the community, especially traders who are still selling along the shoulder of the road to be relocated. Planning experts in the government also continue to explore ideas for developing regional strategic concepts to be applied in Peunayong in addition to the ongoing waterfront city on the banks of the Krueng Aceh River. So that it can solve problems in Peunayong Village [16].

One of the significant changes that have been made is by relocating Peunayong Market. The appreciation has been given by the general public to the government on the successful market relocation. Despite many challenges, the government is finally able to relocate the market with almost 1000 vendors to Lamdingin which proves that a radical change such as market relocation or implementation of a new concept such as 3S is possible with a coordinated effort by all stakeholders. This provides a good precedent for future control and management of street vendors [17]. Additionally, it has to be supported by a proper 3S design concept since it can lead to positive and impactful change in perceptions that may be an essential early stage in behavior change [11].

Additionally, in a way to create more conducive area and carry out structural changes, support and involvement from various parties are required. The structural transformation processes that are multi-dimensional and involved radical change can effectively direct urban development towards ambitious sustainability goals and achieve sustainable urban transformation [15].

3.2.2. Expected facilities. The results show that the most considered facilities when implementing 3S by the public are vegetation or greenery (38.6%), followed by transportation facilities (22.8%), and seatings (benches and chairs). A smaller percentage requires other facilities such as parking spaces (Figure 4a). Meanwhile, based on the results of interviews with representatives of the Chinese community, Gampong Peunayong stated that the community hopes that there will be additional convenient stores at a more strategic location, as well as other important facilities such as green open spaces (RTH).

The green open space along Krueng Aceh Riverbank is considered not optimal as a recreational and culinary area. This shows that people tend to choose more functional facilities. The dominating functions of urban streets reflect what society expects in a certain period [12]. Additionally, as a CBD, Peunayong is already all built up. This could be a challenge in providing designated open green space. Thus, 3S could accommodate greenery as part of street design and to accommodate the public high preference.
Public optimism about the 3S concept can potentially reduce traffic congestion

The results showed that 47.5% believed that congestion would be reduced and greatly reduced (16.8%) if this concept was implemented (Figures 3b). It shows that respondents have high optimism about the positive impact of implementing 3S, especially in overcoming congestion and providing better aesthetic value and providing a sense of comfort for walking.

One of the factors behind the high level of community approval in the concept implementation is respondents were educated about the general description and contribution of 3S to the area. As well as visualization of the 3S concept that has been applied in several cities as well. Thus, an interactive method through visualization helps to increase community engagement in its planning process and increase community awareness in addressing social learning issues related to the shared space street concept. It is concluded that visualization facilitates the planner’s reflection, dialogue, and therefore serves the purpose of representing and testing the planner’s intent. In other words, diagrams or illustration is an ultimate tool for thinking and solving problems [18].

3.3. The relationship between Community knowledge regarding existing facilities, respondents' frequency of visits with the acceptance, expected facilities and impact on congestion

3.3.1. Community knowledge regarding existing facilities. After identifying the acceptance of 3S, this study also identifies the respondent's frequency of visit in understanding the quality of the existing facilities. It shows that both respondents who often and do not frequently visit Peunayong agree the condition of the sidewalks along Peunayong does not require standards for pedestrians. It does not indicate that the answers are significantly different between respondents with frequent and infrequent visits. It also shows with the same response to public transportation and vegetation are not reachable.

Figure 3. (a). The facilities expected by the community in the application of 3S and (b) Impact on 3S in reducing congestion in Peunayong.

Figure 4. Community Knowledge about existing transportation based on (a) Pedestrian, (b) Public Transportation, and (c) Vegetation.
3.3.2. Respondents' frequency of visits with the acceptance, expected facilities and impact on congestion. After identifying the public's perspective toward the 3S concept in general, this study then examined whether the intensity of visits affects acceptance toward the 3S concept, expected facilities, and impact on congestion, by assessing their relationships with cross-tab analysis and chi-square in SPSS. The results showed that there is no significant difference in acceptance ($p=0.517$), expected facilities ($p=0.471$), and perception of impact on congestion ($p=0.278$) between respondents with frequent and infrequent visits (Figure 5).

|          | Acceptance ($p=0.517$) | Expected Facilities ($p=0.471$) | Impact on congestion ($p=0.278$) |
|----------|------------------------|-------------------------------|----------------------------------|
| Infrequent | ![Bar Chart](infrequent.png) | ![Bar Chart](infrequent.png) | ![Bar Chart](infrequent.png) |
| Frequent  | ![Bar Chart](frequent.png)   | ![Bar Chart](frequent.png)    | ![Bar Chart](frequent.png)     |

Figure 5. Grouping based on the frequency of visit and relationship with (a) the acceptance, (b) expected facilities, and (c) impact on congestion (Crosstab and chi-square in SPSS).

Although the difference was not significant, Figure 5B show some useful information. The group of respondents with frequent visits proposed more variety of facilities as compared to those with infrequent visits. In addition to requesting that functional facilities be accommodated, respondents with frequent visits also ask for facilities such as Artspace to add to the beauty of the area.

These results indicate that soliciting public input for an urban design project can be done by involving the wider community with varying levels of familiarity with the area. It also shows that online surveys can produce valid input, especially to explore general agreement (agree/disagree). However, it should be noted that this does not eliminate the need for direct participation of the local community and active users (frequent visitors) because their input is more detailed for example in terms of facilities (Figure 5b).

The result of the insignificant difference between frequent and infrequent visitors could also be attributed to the fact that Peunayong is a CBD that has a distinctive character that has been recognized by all residents, even by those from outside the city. So there is a general sense/familiarity, including indirect information. However, the conditions may be different for areas that are not widely recognized. This is in line with the earlier argument that Peunayong is a contested area with many stakeholders and the general public beyond the local resident have their perspective and wishes for the area.

4. Conclusions

Based on the results of online surveys and interviews with stakeholders in Peunayong Village, public acceptance about the shared space street concept in Peunayong Village is very high. Most respondents also believe the 3S concept can reduce congestion in Peunayong Village. Especially after the Peunayong Market is relocated, it is potentially applied and hopefully can improve the quality of the built environment.

In addition, the relationship between the visit intensity and community acceptance of the 3S concept shows that both groups of respondents with frequent and infrequent intensity have no
significant difference in answers between these community groups. The two groups of respondents both agreed that the 3S concept should be applied in Peunayong.

Meanwhile, the choice of facilities applied in Gampong Peunayong also reveals that two groups of respondents tend to choose functional facilities, such as vegetation and transportation. However, apart from choosing functional facilities, the group of respondents who frequently visited Peunayong also chooses more specific detail such as Artspace to enhance the local value of Peunayong and attract more visitors.

Furthermore, the use of visualization methods and exploring public opinion on the 3S concept is considerably effective to increase public awareness of Gampong Peunayong. It also has the potential to promote the value of local inclusiveness and address social issues related to 3S.

By determining the existing conditions with various levels of importance, this concept will be successfully realized to improve the quality of the environment if it involves multi-dimensional stakeholders by considering strategies that are structural and by the needs of its users. Because urban transformation is about more than creating technically sustainable urban areas and stimulating economic development. It must engage, attract, and excite people about opportunities and lifestyles today and into the future [15].

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