

Key Environmental Factors Affecting the Mental Health of Residents in Urban Residential Neighborhoods: A Case study of Sangi Neighborhood, Bushehr, Iran

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ABSTRACT

In recent years, mental health has emerged as a growing concern within residential settings of developing countries, where fast urbanization and environmental stressors have contributed to a rise in psychiatric disorders. Among the various factors influencing public health, the quality of the urban environment plays a significant role in supporting or undermining the mental well-being of residents. Within this broader context, this article explores the relationship between urban environmental conditions and mental health outcomes, focusing on the Sangi neighborhood in Bushehr City, Iran. By examining this specific case, the study seeks to uncover the key environmental and social variables that influence mental health in urban residential areas. This study employs descriptive-interpretive qualitative method, which has led to practical strategies for Sangi neighborhood. Twenty-four variables relevant to the subject were identified from reliable, up-to-date, and pertinent sources. These variables were then entered into MicMac software for cross-effects analysis. Pairwise comparisons between the variables were conducted using the Delphi method, with the involvement of five experts. The findings show that noise pollution and congestion, safety and security, participation in neighborhood affairs, sense of attachment to the neighborhood, social interactions, facilities and amenities within neighborhood, residents' sense of happiness, vitality and diversity, social capital, adequate housing and social unity are among the effective and controllable key factors affecting the mental health of residents in Sangi. Also, variables such as cleanliness and natural light are known as effective and uncontrollable driving factors of mental health. Ultimately, the study formulates necessary operational strategies to improve the quality of the identified variables in Sangi neighborhood in Bushehr. The findings of this study can be applied on similar case studies in Iran and other countries.

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1. Introduction

The Sustainable Development Conference in Rio de Janeiro, Brazil has emphasized the importance of maintaining and promoting human health through Directive 21 (Von Schirnding, 2002). In the field of public health, there has been a growing focus on mental health (Votruba et al., 2014) and awareness about mental health is the key to improving policies and practices, as well as increasing access to health services (Patel et al., 2008). Meanwhile, a review of relevant studies shows the prevalence of mental disorders during recent years in Iran (Noorbala et al., 2004). Over half of the world's population resides in urban areas, and this figure is expected to increase to two-thirds before 2030.

This increasing urbanization of the world's population carries significant health implications. Nearly a century of research has shown that the risk of developing a mental disorder is higher among people living in cities than in rural areas. Some studies have shown the relationship between specific characteristics of an urban environment, such as high density, social isolation and social norms, and the risk of mental illness (Galea et al., 2011). Several studies, particularly in western countries, have established a strong link between urban environmental conditions - such as noise pollution, access to green spaces, housing quality, and neighbourhood design - and residents' mental health, highlighting the role of urban planning in mitigating these issues through green infrastructure and noise control (Clark et al., 2006; Evans et al., 2003; Frank et al., 2005; Maas et al., 2006; Pevalin et al., 2008; Stansfeld & Matheson, 2003; White et al., 2013).

Similarly, studies in developing nations emphasize socio-environmental stressors, such as overcrowding and lack of recreational spaces, as key determinants of mental well-being (Das & Bhattacharya, 2020; Ferguson & Mace, 2015). People in developing countries face higher risks of mental disorders due to extreme poverty, inadequate health facilities, rapid urbanization and greater exposure to environmental hazards (Qiu et al., 2019). Previous research emphasized the important role of environmental quality in urban neighborhoods in supporting mental health (Dannenberg et al., 2011). This influence operates through various mechanisms, including increasing social cohesion and unity, enhancing social capital, strengthening friendship groups and partnerships within the community, and improving the quality of landscapes and natural sceneries. Additional contributing factors include better access to local services, greater housing satisfaction, and enhanced neighborhood security. These factors collectively contribute to improved mental well-being and a reduction in mental disorders in urban environments.

While previous studies provide valuable insights, their findings are often generalized and fail to capture the unique socio-cultural and climatic conditions of specific regions. In the context of Iran, research on mental health determinants has predominantly focused on individual or clinical factors, such as stress management, cultural stigmas surrounding mental health, and healthcare accessibility (Azadeh et al., 2019; Azadeh et al., 2021). However, the environmental aspects of urban neighborhoods - such as spatial configurations, noise levels, and urban heat - have remained partially underexplored. Moreover, no substantial

studies have utilized systematic methodologies, such as the MicMac method, to evaluate and prioritize environmental factors influencing mental health in Iranian cities.

Due to the growth of urbanization in the old neighborhoods of Bushehr city, such as Sangi neighborhood, and the increase in population density in such areas, the need to pay attention to the mental health of residents is of great importance. This study aims to identify and prioritize the key environmental and social factors that influence mental health in urban residential settings of the Sangi neighborhood in Bushehr, using structural equations within the framework of MicMac software. To achieve this goal, this research tries to address the following question, i.e. which environmental variables most significantly impact mental health in the Sangi neighborhood of Bushehr City, and how should they be prioritized?

1.1 Literature Review

Yen and Kaplan (1999) in research through the analytical framework of multivariate prospective analysis determined that characteristics of a place affect health conditions and health status of residents. In their research, the parameters for measuring neighborhood characteristics were the socioeconomic features of the neighborhood such as percentage of people with low income, percentage of people living in substandard housing, percentage of people with low education level, percentage of unemployed people, percentage of male workers without skills and the percentage of single-parent families with children. The criteria for measuring depression symptoms were the 18-item scale based on Roberts and O'Keefe's study (Yen & Kaplan, 1999). Evans (2003) states that the built environment has direct, as well as indirect effects on citizens' mental health. Poor quality housing increases mental distress among residents. Similarly, mental health of psychiatric patients is also related to design elements such as furniture, ergonomics and privacy. Overcrowding in residential spaces (number of people per room) and loud outdoor noise sources, such as airports, can increase psychological distress; however, they may not cause serious mental illness. Bad-smelling pollutants cause negative effects and some toxins, such as lead, can cause behavioral disruptions for instance, deficient emotional self-regulation and aggression. Inadequate daylight is also significantly associated with increased depressive symptoms (G.W.Evans, 2003).

Schaefer-McDaniel's research (2009) examines the relationship between stressful factors in a neighborhood, children's assessment of the quality of neighborhood and their depression from 126 teenagers in three disadvantaged neighborhoods in New York. Parents also expressed their opinions about the mental health of teenagers in the survey. According to the results, children's assessment of the quality of the neighborhood was positively related to their assessment of depression, and there was an unexpected positive relationship between the stressor of drugs/alcohol in the neighborhood and children's depression. Furthermore, the relationship between neighborhood stressors (drugs/alcohol) and children's depression was fully mediated by children's ratings of neighborhood quality (Schaefer-McDaniel, 2009). Melis et al. (2015) assert that the urban built environment

is one of the potential determinants of health and health inequality. While the effects of certain aspects of the built environment on health—such as housing, traffic, environmental pollution, and security—have been extensively studied, there has been less research on the impact of key structural features of the urban context, including land use, building density, and the distribution of services and facilities (Melis et al., 2015). Gong et al. (2016) stated that some characteristics of urban environments including neighborhood quality, quantity of green spaces, land use mix, industrial activity and traffic volume are associated with mental distress.

An extensive literature review reveals several research gaps, contextual, regional, and methodological. Contextually, limited research addresses the specific environmental factors affecting mental health in urban neighbourhoods in Iran. Most existing studies are clinical or broadly examine urban challenges without explicitly linking them to mental health outcomes. For instance, a study in Tehran found that access to green spaces can help mitigate mental disorders, particularly anxiety, underscoring the role of environmental features in urban mental health (Shahabi Shahmiri et al., 2024). Similarly, a review in Tehran linked built environment characteristics to population health, suggesting a connection between urban design and mental well-being (Assari et al., 2016). Regionally, Southern Iranian cities such as Bushehr, with their unique socio-environmental contexts, remain underexplored. Factors like high temperatures, coastal urbanization, and traditional neighbourhood structures require dedicated investigation due to their potential mental health implications. Methodologically, few studies worldwide and none in Iran, have applied the MicMac (Matrice d'Impacts Croisés Multiplication Appliquée à un Classement) method to identify and rank environmental variables influencing mental health. While studies such as Dhirasana et al. (2021) have used MicMac to analyse complex systems related to well-being, its direct application to environmental determinants of mental health remains scarce. This absence presents both a methodological gap and an opportunity to address the complexity of interrelated environmental factors in Iranian urban contexts. Employing MicMac could therefore offer valuable insights for targeted interventions and urban planning strategies aimed at improving mental health outcomes in diverse neighbourhood settings.

This study attempts to address certain research gaps including:

- I. *Introducing a Systematic Framework:* The study will utilize the MicMac method in order to provide a structured base to identify and rank environmental factors which may impact mental health in urban residential neighbourhoods. This way, through a methodological novelty, the study provides a robust analysis that goes beyond purely descriptive studies. Moreover, by selecting the Sangi neighbourhood in Bushehr as a case study, the study will have a localised focus which offers an in-depth understanding of how specific environmental variables - such as coastal climate, housing patterns, and urban density - may affect mental health in this region. The findings highlight unique challenges and opportunities pertinent to southern Iran.
- II. *Policy Implications:* By identifying key environmental factors, the study offers actionable insights for urban planners and

policymakers in Iran. The results can inform targeted interventions to improve mental health outcomes and enhance the liveability of residential neighbourhoods.

- III. *Broader Relevance:* While localized, the study's methodology and findings can serve as a reference for similar urban contexts in other developing regions, particularly those with comparable climatic and socio-cultural conditions.

This research thus bridges critical gaps in the literature by providing a localized, methodologically rigorous analysis of environmental factors influencing mental health, with specific emphasis on the underexplored urban context of southern Iran.

1.2 Theoretical Framework

The physical and social characteristics of a neighborhood can significantly influence residents' mental health, both positively and negatively. The physical environment includes natural elements such as air quality and built environment aspects like land use, transportation, street design, urban design, public spaces, and access to resources such as healthy food and recreational opportunities. The social environment is defined by the nature of interactions between neighbors, prevailing social norms, levels of safety, and aspects of social organization (Chen & Chen, 2015). Mental illness is strongly linked to the urban environment, with notable variations across regions and even within the same city. Factors such as perceived crime, poor security, inadequate facilities, weak neighborhood attachment, dissatisfaction with housing quality, and overcrowding can harm residents' mental health (Kasl & Harburg, 1975). Economic disadvantage further exacerbates these effects, as socio-economic status shapes overall health outcomes (Kim, 2010). For example, African-American adolescents in urban neighborhoods often face poverty, violence, gang activity, victimization, stressed parents, and limited social support. Such challenges create environments of chronic stress and instability. Research indicates that prolonged exposure to these negative neighborhood characteristics during adolescence is associated with higher rates of mental health disorders, such as aggression, depression, anxiety, and stress, which can also impair academic performance (Perry et al., 2015). Addressing both the physical and social dimensions of neighborhoods is therefore crucial for promoting mental well-being and reducing the risk of long-term psychological harm.

Numerous theories have attempted to understand the relationship between neighborhood environments and depression. Most of these theories identify two categories of influencing factors: environmental factors and individual factors. Environmental factors are categorized into built environment and social environment. Features of built environment include morphological dimensions, land use, transportation, public facilities, and design layouts. Features of social environment are comprised of social capital, sense of community and social disorder. Individual factors are a combination of socio-economic characteristics, mental and psychological factors, and health-related behaviors. Therefore, measuring the effect of neighborhood environments on depression is somehow complicated as a large number of the above factors may correlate to each other and may also affect each other (Zhang et al., 2019).

Lower quality of the built environment is associated with higher levels of depressive symptoms. Undesirable neighborhood characteristics such as lack of waste management, vacant housing and high crime rate trigger more depressive symptoms (Gary et al., 2007). A study by Fenns and Dunham (1939) found that admission rates for schizophrenia increased towards the inner part of cities, whereas this was not the case for manic-depressive psychosis. Their interpretation was that social isolation and disorganization in inner-city housing have led to social and psychological confusion at individual level (Dalgard & Tambs, 1997). It is generally assumed that poor housing conditions have a detrimental effect on the health and well-being of family members. One of the key factors related to housing is the internal density or the amount of crowding of the house (Gabe & Williams, 1987).

Recently, there has been more recognition of the importance of urban green spaces on mental health, as well as physical health. Proximity to green spaces improves mental health by dropping cortisol levels, reducing the negative effects of stressful life, decreasing genetic depression, developing social cohesion and increasing general psychological well-being (Callaghan et al., 2021). Physically unhealthy people who live in places without green spaces are prone to mental problems (Wang et al., 2021). Gibson et al. (2011) found out that communal areas behind high-rise buildings were associated with worse social effects (i.e., higher perceptions of antisocial behavior and lower sense of

control) than private gardens in homes, which in turn were associated with a decline in Mental health (Barros et al., 2019).

In this paper, firstly, through a review of valid studies, variables affecting mental health in urban areas have been extracted. Since mental health is affected by various physical, social, economic and environmental factors, it is essential to identify a comprehensive list of variables. Therefore, after formulating the theoretical framework of the research, final variables related to the subject have been extracted from several valid studies as mentioned in Table 1. While selecting the variables "frequency of variable use in articles", "minimum overlap with other variables", "feasibility of analysis by experts" and "compatibility with the cultural and native conditions of Iran" were taken into account.

2. Methodology

The research method for this study is descriptive-interpretive. There were two techniques for data gathering; survey of existing literature and questionnaire. To identify primary variables, after reviewing various sources available on the topic, 24 variables were finally selected for evaluation (Table 1). MicMac software was used for data analysis, and a questionnaire survey was designed in the form of cross-effect matrix and its validity was checked by the experts. Then, based on the structural equations and in the framework of the MicMac model, the assessment of the variables for Sangi neighborhood was conducted.

Table 1 Effective variables on mental health in urban areas

Variables of mental health		References
1	Nature and natural elements	(Callaghan et al., 2021), (R. Barnes et al., 2019)
2	Natural light	(Aries et al., 2013), (Wang et al., 2023)
3	Cleanliness	(Chan & Liu, 2018), (Naragatti & H.S., 2023)
4	Safety and security	(Mori et al., 2021), (Whitley et al., 2008)
5	Noise pollution and congestion	(Stansfeld et al., 2000), (Hahad et al., 2024)
6	Social unity	(Ganji et al., 2012), (Hawdon et al., 2012)
7	Sense of attachment to neighborhood	(B. Fisher et al., 2015), (Kitchen et al., 2012)
8	Social interactions	(Santini et al., 2016), (Kiecolt et al., 2008)
9	Participation in neighborhood affairs	(Tomioka et al., 2017), (Domènech-Abella et al., 2020)
10	Quality of environment, air, water and soil	(Bhui et al., 2023), (Zhang et al., 2017)
11	Appropriate road network	(Plowden, 2020), (Porter et al., 2019)
12	Adequate housing	(Franco Suglia et al., 2011), (J. Pevalin et al., 2017)
13	Amenities and facilities within neighborhood	(O'Campo et al., 2009), (Wan et al., 2022)
14	Appropriate waste management	(Vinti et al., 2021), (Peprah et al., 2024)
15	Spatial quality	(Clark et al., 2007), (Kwon et al., 2019)
16	Legibility	(Lynch, 1960), (Evans & McCoy, 1998)
17	Vitality and diversity	(Mouratidis & Poortinga, 2020), (Pan et al., 2023)
18	Memorability	(K. Lukashok & Lynch, 2007), (Jahanbakhsh et al., 2015)
19	Residents' happiness	(Li et al., 2019), (Yiengprugsawan et al., 2012)
20	Life satisfaction	(Bao et al., 2013), (Fergusson et al., 2015)
21	Social capital	(Hamano et al., 2010), (M. Almedom, 2005)
22	Resilience	(Zeng et al., 2022), (Zhang & Li, 2018)
23	Job satisfaction	(Capone & Petrillo, 2020), (Faragher et al., 2005)
24	Physical health	(Ohrnberger et al., 2017), (Mahindru et al., 2023)

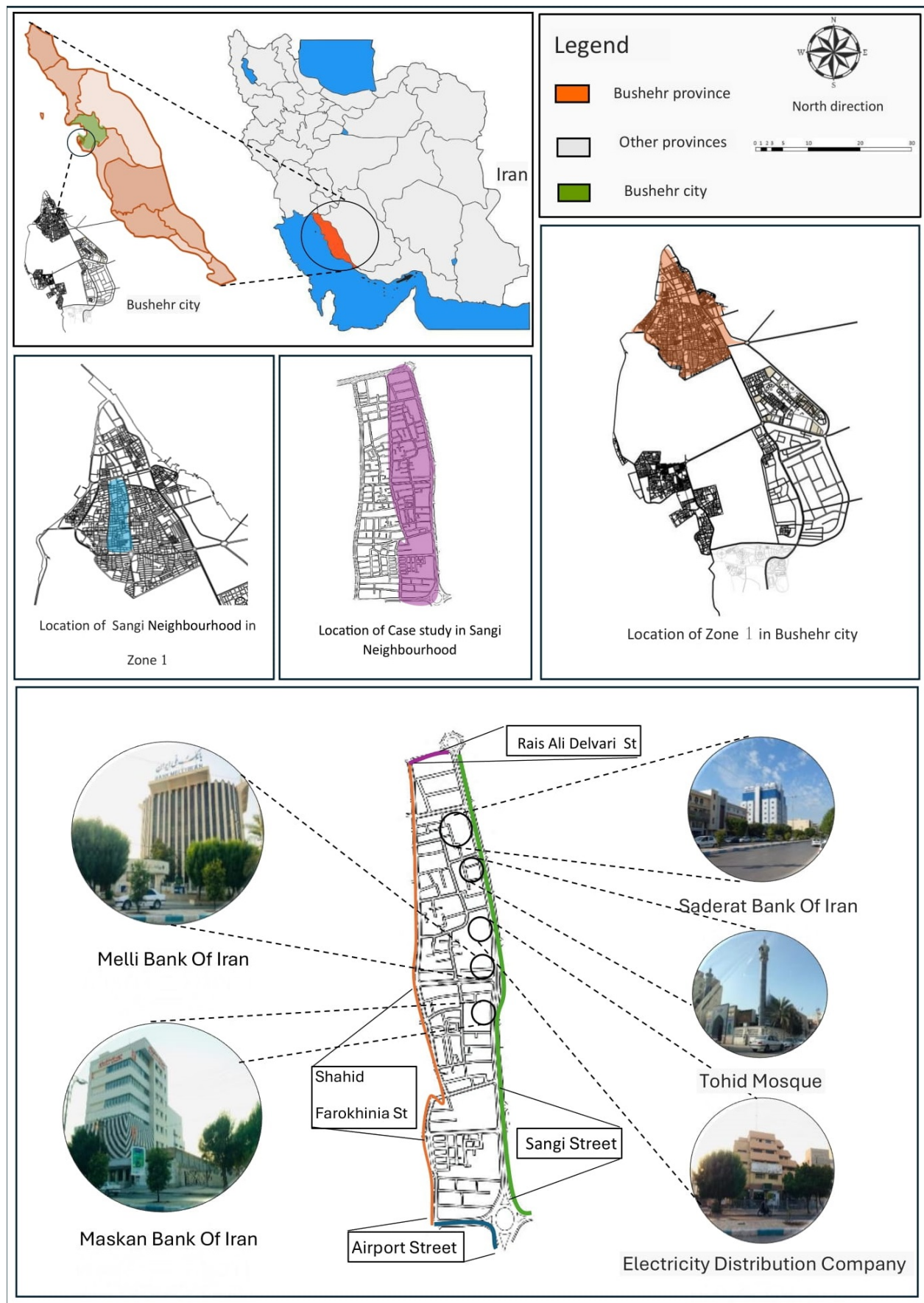


Figure 1 Location of the study area (Source: Authors)

The input data to the MicMac model was obtained from Delphi method and by distributing a questionnaire survey among five urban experts who were fully aware of the condition of Sangi neighborhood. In the cross-effect matrix, variables were assigned values based on their level of influence and susceptibility to influence, using a scale from 0 to 3, where 0 indicated no effect and 3 indicated a high effect. Additionally, "P" was used to denote potential direct and indirect effects. After scoring the variables, by calculating the data saturation factor, the accuracy of the data collection tool was measured and according to the obtained matrix, the key variables of the research were identified. In the end, based on the key variables, the study suggested strategies for improving mental health in Sangi neighborhood in Bushehr City.

2.1 Case Study

Sangi neighborhood is one of the main neighborhoods of Bushehr city with an approximate area of 113 hectares. This neighborhood is situated in district No.1 of Bushehr city, notable for its strategic location with diverse land uses. The main thoroughfare near this neighborhood is Sangi street with an estimated length of 2,050 meters. In terms of location, Sangi neighborhood is connected with other important neighborhoods of Bushehr such as Bisim, Ashuri and Bagh Zahra (Figure 1). This neighborhood from the North is adjacent to Quds square (Sa'at), and from the south to Imam square, which is one of the main intersections in the city. The dominant land use in the neighborhood is residential; however, the outer edge of Sangi features a variety of mixed land uses at the city level, including key provincial offices and headquarters, various bank branches, clinics and medical buildings, as well as several commercial buildings and shopping malls.

Sangi neighborhood is classified as part of the old fabric of the city, nevertheless, many buildings and sites have been renovated, resulting in most structures being of acceptable quality. The study area for this research is the eastern part of Sangi neighborhood, with an approximate area of 55 hectares. This area begins at the northern end of Sangi street and extends to its southern end, adjacent to the Airport Street. From the eastern part, it is adjacent to the main Sangi street, and from the west side, it is limited to Shahid Farokhinia Street, which passes through Sangi neighborhood. There were several reasons for choosing this area for this study, including high level of traffic on the main streets, the presence of extra-neighborhood land uses and their impact on the residents of neighborhood, commuting and presence of non-local residents into the neighborhood for business purposes, high cost of housing and land in the neighborhood, and last but not the least, overcrowding and congestion within the neighborhood.

3. Results and Discussion

In this section, the variables were examined and analyzed using the method of cross-effect analysis in the MicMac software. For this purpose, a 24×24 matrix was employed to assess the status

of each index within the system. The respondents were asked to evaluate the variables based on the situation of Sangi neighborhood. In the matrix, numbers were specified in the measuring range from 0 to 3. Respectively, each number indicated the influence of the variables on each other. The final analysis was conducted by examining the diagram of direct and indirect dependence effect. It is important to note that not all variables consistently have a positive effect on one another. People's evaluations of the variables are general, and both positive and negative aspects of influence and susceptibility to influence have been taken into account (Figure 2).

3.1 Analysis of the effect of direct dependence and dispersion of variables

The final matrix derived from the study includes five main zones:

Zone 1 (Driver variables): This zone shows the most important and influential variables in affecting the mental health of residents in the Sangi neighborhood. In fact, the degree of influence of these variables is far more than their susceptibility to influence. Not only they are considered as the most critical variables of the system status, but system changes depend on them. As illustrated in Figure 2, the variables situated in this zone include natural light and cleanliness. The variables identified in this zone are considered system input variables and cannot be controlled by the system; because they are outside the system and act as stable variables.

Zone 2 (Linkage variables or intermediates): This zone highlights the variables that have a significant impact and can also be actively influenced. They are also called intermediate variables. In other words, the status of these variables and their influence depends on many other factors, and they have a considerable impact, so any action on them will cause changes in other variables too. Therefore, they are very sensitive and require continuous monitoring and control. These variables include noise pollution and congestion, safety and security, participation in neighborhood affairs, sense of attachment to neighborhood, social interactions, amenities and facilities within neighborhood, residents' happiness, vitality and diversity, social capital, adequate housing and social unity.

The variables of zone 2 are also divided into two categories: risk factors and target factors. The risk factors are located around the diagonal line of zone 2 and have a high ability to become key players in the system. They include neighborhood amenities & facilities and participation in neighborhood affairs. The target variables are also located under the diameter line of zone 2 and their effect is more than their susceptibility to influence. They are presented as the results of system evolution. In fact, by manipulating these variables, changes and evolution of the system can be achieved in line with the desired goal. The variables in this zone include vitality and diversity, social capital, sense of attachment to neighborhood, social interactions, social unity and residents' sense of happiness.

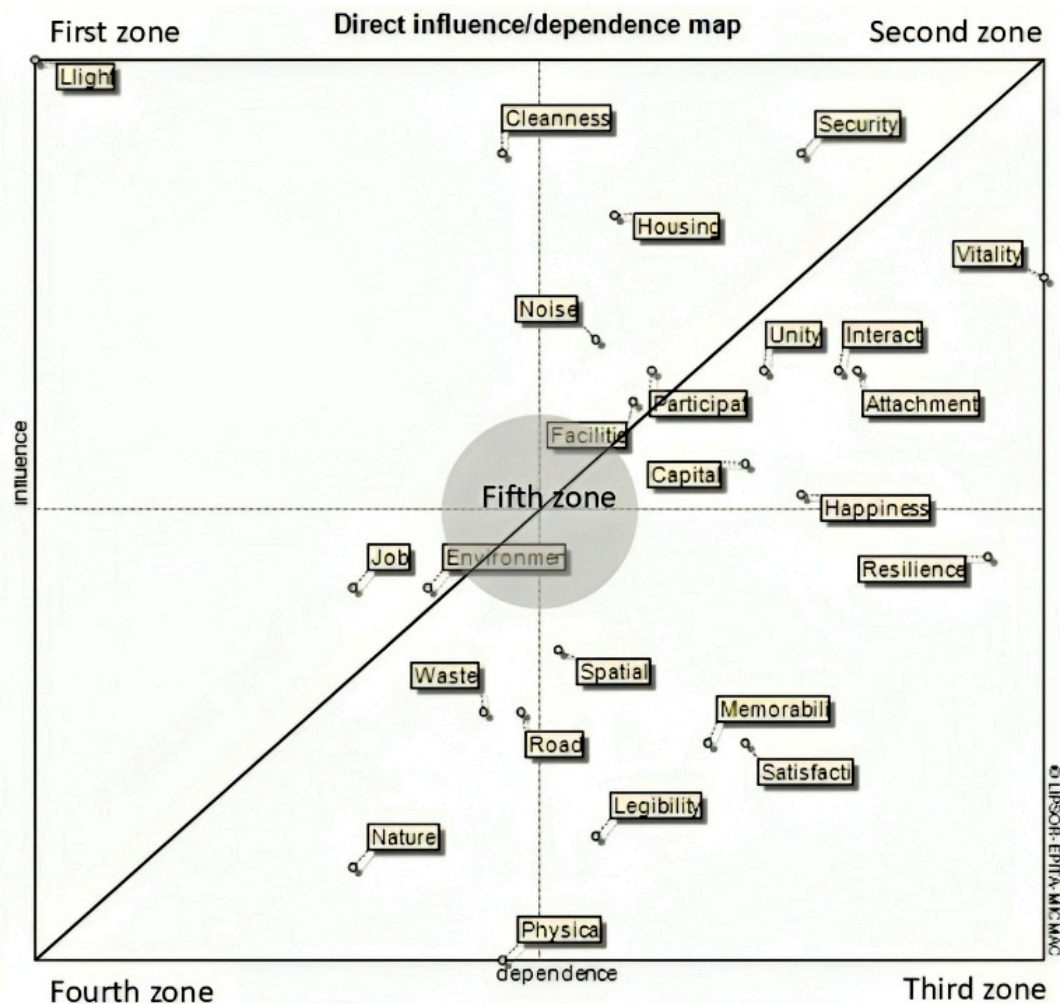


Figure 2 Analysis diagram of the effect of direct dependence of the mental health variables in Sangi neighborhood (Source: Authors)

Zone 3 (Dependent variables): This zone identifies variables that have a low impact but are highly susceptible to influence. These variables are sensitive and often depend on the changes and developments of more influential variables. The variables in this zone include resilience, legibility, memorability, spatial quality, and life satisfaction.

Zone 4 (Autonomous variables): This zone highlights variables that can be effective and are also subject to influence. However, since they are independent, they have a limited impact on the future behavior of the system. Therefore, to streamline planning on key variables, these can be considered less critical and potentially ignored. The variables in this zone include: quality of the environment (air, water and soil), job satisfaction, nature and natural elements, appropriate road network, physical health and appropriate waste management.

Zone 5 (Cluster or indeterminate variables): The variables of zone 5 mainly incline to one of the other four zones, but the system does not have the ability to make a definitive decision against them. Therefore, in terms of the system, they have an uncertain situation in the future. The value of the variables of this zone is higher than the variables of the third and

fourth zones for policy making and intervention. According to Figure 3, none of the variables are located in this zone. Figure 3, through a graphical representation of the variables, explains the direct effects of the variables on each other. The effect of variables can be categorized as the 'weakest, weak, medium, strong and strongest' (red color indicates the strongest influence). Only 10% of the vectors with the strongest effect are displayed to maintain the readability of the graph. Based on Figure 3, the indicators with the most direct influence are: resilience, vitality and diversity, as well as social unity. The variables that have the most direct impact on other variables include: natural light, adequate housing, residents' happiness and social interaction.

3.2 Analysis Of The Effect Of Indirect Dependence And Dispersion Of Variables

In the matrix of indirect effects, each of the variables have been increased by the software to powers of two, three, four, five and so forth. Accordingly, the indirect effects of the variables have been measured (Figure 4). Table 2 evaluates the effects of indirect dependence of mental health variables in Sangi neighborhood through five zones and different indicators.

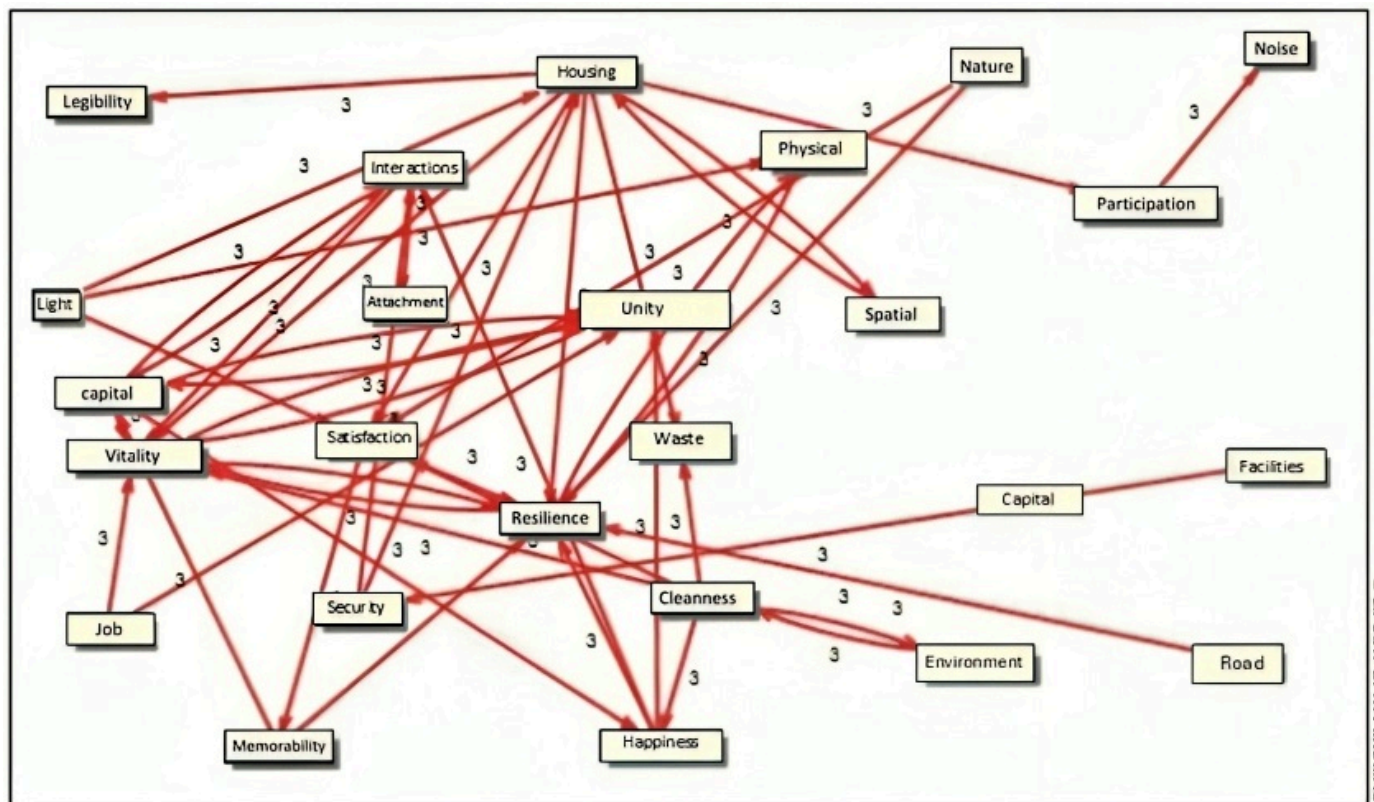


Figure 3 The strongest effects of direct dependence between mental health variables in Sangi neighborhood (Source: Authors)

Table 2 Analysis of the effect of indirect dependence of mental health variables in Sangi neighborhood

Zone	Indicator
Zone 1: (Driver variables)	Cleanness - Natural light
Zone 2: (Linkage variables)	Noise pollution and congestion - Safety and security - Participation in neighborhood affairs –Sense of attachment to neighborhood - Social interactions–Amenities and facilities within neighborhood– Residents’ sense of happiness - Vitality and diversity - Social capital - Adequate housing - Social unity
Zone 3: (Dependent variables)	Resilience- Legibility- Memorability- Life satisfaction
Zone 4: (Autonomous variables)	Quality of the environment (air, water and soil) - Job satisfaction - Nature and natural elements - Appropriate Road network - Physical health- Appropriate waste management
Zone 5: (Cluster or indeterminate variables)	Spatial quality

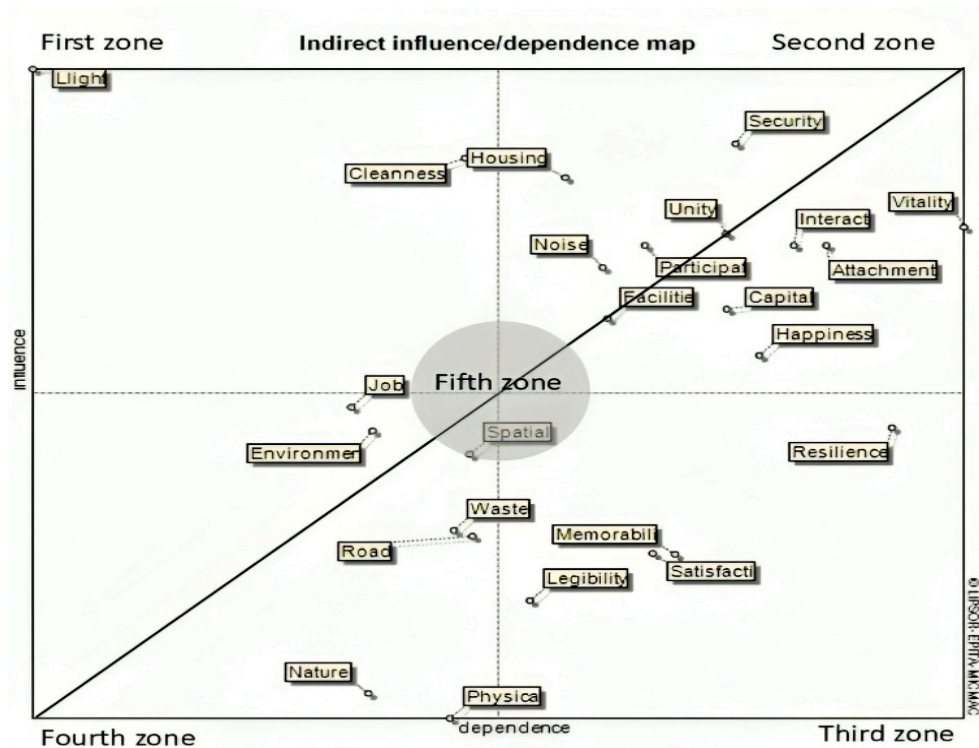


Figure 4 Analysis diagram of the effect of indirect dependence of mental health variables in Sangi neighborhood (Source: Authors)

The graph in Figure 5 illustrates the indirect effects of the index on other system indices. The blue color shows the strong influence and the red color, which is only between the variables of natural light and vitality & diversity, represents the strongest influence. It is evident that variables with the most indirect influence include resilience, vitality & diversity, as well as social interaction. Similarly, the most indirect influential factors include natural light, cleanliness and safety & security. The strongest influence among the variables is between natural light and vitality & diversity.

3.3 Key variables affecting mental health in Sangi neighborhood

The key and strategic variables which influence mental health are those that can be manipulated and controlled and are influential in shaping system dynamics and changes (Table 3). Consequently, variables with a significant impact but beyond control are considered as key variables. Therefore, the variables in zone 1 cannot be a part of the strategic variables of the research. The variables of zone 3 also have insignificant influence and effectiveness in the system and cannot be regarded as strategic variables. The variables of zone 4 do not have key and strategic properties due to their strong dependence on other variables. But the variables of zone 2 are mostly the result of cross effects matrix, because they can be controlled by the management system and have an adequate influence. Therefore, the variables of zone 2 and around the main diameter of the

matrix are identified as key and strategic variables as shown in Table 3.

According to the analysis based on the charts and graphs extracted from the MicMac software, it can be concluded that the factors which have a great influence on other indicators and are controllable are the key variables of mental health in Sangi neighborhood. They are noise pollution and congestion, safety and security, participation in neighborhood affairs, sense of attachment to neighborhood, social interactions, amenities and facilities within neighborhood, residents' sense of happiness, vitality and diversity, social capital, adequate housing and social unity. Also, Variables such as cleanliness and natural light are known as uncontrollable effective key variables of mental health. For instance, a variable such as natural light can have a significant effect on other variables, but it cannot be controlled. Therefore, in order to improve mental health in Sangi neighborhood, it is necessary to pay special attention to such variables in future design and planning of the neighborhood. Moreover, there are other variables such as resilience, legibility and memorability that by getting influenced by the key variables can make an impact on the quality of mental health in Sangi neighborhood. Finally, there is another group of variables that have value, but they cannot be definitely stated as significant impactful variables such as quality of the environment (air, water and soil), job satisfaction, nature and natural elements, appropriate road network, physical health, appropriate waste management and spatial quality. Based on the overall findings, the prioritization of the key variables of mental health in Sangi neighborhood is illustrated in Table 4.

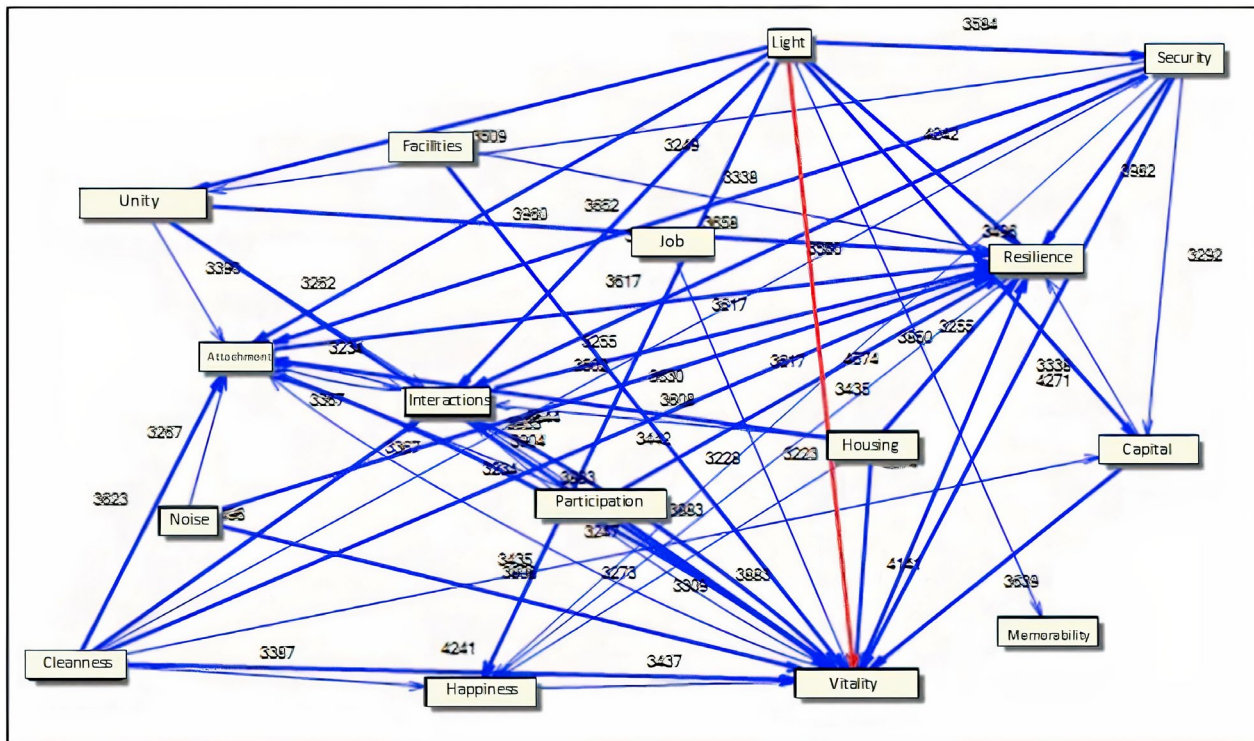


Figure 5. The strongest effects of indirect dependence among mental health variables in Sangi neighborhood (“Strongest influences” are shown in red color & “Relatively strong influences” are shown in blue color) (Source: Authors)

Table 3 Key variables affecting the mental health in Sangi neighborhood

Key variables	Effective and Controllable	Noise pollution and congestion - Safety and security - Participation in neighborhood affairs – Sense of attachment to neighborhood - Social interactions–Amenities and facilities within neighborhood Residents’ sense of happiness - Vitality and diversity - Social capital - Adequate housing - Social unity
	Effective and Uncontrollable	Cleanness - Natural light
Dependent factors: (influenced by key variables)		Resilience- Legibility- Memorability- Life satisfaction
Uncertain factors: (having value but with uncertain effect)		Quality of the environment (air, water and soil) - Job satisfaction - Nature and natural elements - Appropriate road network - Physical health- Appropriate waste management- Spatial quality

Table 4 Prioritization of key variables of mental health in Sangi neighborhood

Priority	Indicator
Priority-1: Effective and Controllable	<ul style="list-style-type: none"> • Safety and security • Participation in neighborhood affairs • Social interactions • Amenities and facilities within neighborhood • Residents’ sense of happiness • Vitality and diversity • Social capital • Adequate housing • Social unity • Sense of attachment to neighborhood • Noise pollution and congestion
Priority-2: Effective and Uncontrollable	<ul style="list-style-type: none"> • Cleanness • Natural light

The Sangi neighborhood of Bushehr faces various urban challenges that directly impact the mental health of its residents. By addressing the key controllable factors, urban planners and policymakers can significantly improve the quality of life in the area. As for a more detailed analysis of the factors and corresponding design solutions, it was found that the Sangi neighbourhood struggles with noise pollution and congestion due to mixed land use and narrow streets. Proposed solutions include insulating building openings to reduce noise, zoning to separate commercial and residential areas, and installing traffic signs near sensitive locations like hospitals to minimize disturbances. These efforts aim to create a quieter, healthier urban environment that supports residents' mental well-being. Safety concerns, particularly from dilapidated buildings, also impact mental health. Measures such as traffic controls for pedestrian safety, repurposing abandoned structures into community spaces, and enhancing nightlife with better lighting and social venues can revitalize the area and promote a sense of security and vibrancy.

Furthermore, active participation in neighbourhood affairs empowers residents and builds a strong sense of community. In Sangi, this can be facilitated by creating public spaces like shaded plazas or parks for dialogue and collaboration, appointing community representatives, and establishing opinion boxes to bridge communication with local authorities. These measures strengthen social ties and foster collective responsibility for neighbourhood development. Next, cultivating attachment to the neighbourhood is key to fostering pride and belonging. Culturally sensitive designs, such as landmarks like small parks, murals, and public art reflecting Bushehr's heritage, can reinforce identity. Involving residents in decision-making and creating spaces for showcasing local crafts further deepen their connection to the neighbourhood and its cultural character.

Social interactions are vital for mental health, fostering community connections and reducing isolation. In Sangi, urban design can enhance these interactions through lively public spaces, cultural festivals, and local cafes that reflect the area's culture. Urban furniture, benches for all age groups, and children's play areas encourage intergenerational exchanges and

parent-to-parent connections, strengthening community bonds and fostering a cohesive social fabric.

Moreover, access to well-maintained amenities is essential for resident satisfaction and mental health. Regular upkeep of public spaces and urban furniture boosts safety and care in the neighbourhood. Encouraging voluntary donations for local improvements cultivates collective responsibility and strengthens community ties, especially in areas with limited municipal resources, ultimately improving quality of life. Also, happiness, a key aspect of mental well-being, can be nurtured in Sangi by creating spaces and activities that celebrate the community's cultural identity. Organizing events like Eid celebrations and festivals fosters cultural pride and strengthens community bonds. Designating plazas or parks for these activities encourages inclusivity, while urban furniture for street music performances activates public spaces and highlights local talent. Handicraft exhibitions and cultural performances based on Bushehr's heritage enrich the neighbourhood's cultural life. Additionally, protected play areas for children promote their well-being, offering families a sense of security and joy.

Furthermore, vitality and diversity are essential for creating vibrant urban spaces that cater to all age groups and activities. In Sangi, local parks offer a respite from urban density, promoting relaxation and social interactions. Active spaces like cafes and cultural hubs infuse energy and connection, while vibrant wall art transforms streets into visually engaging environments, boosting community pride. Natural elements like shaded areas, water features, and plants enhance the microclimate and aesthetic appeal. Additionally, nightlife and food stalls provide economic opportunities and help keep the streets lively and safe after dark. In addition, social capital is key to fostering trust and collaboration in Sangi. Mobile booths and discussion spaces in central areas encourage open dialogue and civic engagement, while a book and film cafe serve as a cultural hub for intellectual discussions. Art and culture centres provide workshops and

exhibitions that strengthen community ties and celebrate local talent, fostering a sense of shared responsibility and solidarity.

Table 5 Design strategies suggested based on each key factor for Sangi neighborhood

Driving factor	Strategy
Noise pollution and congestion	<ul style="list-style-type: none"> • Insulation of building openings. • Avoiding proximity of busy and public land uses with residential areas. • Installation of traffic signs prohibiting noise pollution next to therapeutic land uses such as clinics and hospitals in order to prevent agitation of patients.
Safety & security	<ul style="list-style-type: none"> • Traffic control of vehicles to ensure pedestrian safety and security. • Renovation and activation of dilapidated and uninhabited buildings to prevent the attraction of slum dwellers and mobs to the neighborhood. • Creating active nightlife in the neighborhood.
Participation in neighborhood affairs	<ul style="list-style-type: none"> • Providing public hangout spaces in the neighborhood in order to motivate social interactions, consultation and mutual thinking among the residents. • Appointment of representatives and placing opinion boxes in the neighborhood.
Sense of attachment to the neighborhood	<ul style="list-style-type: none"> • Designing suitable landmarks for the neighborhood. • Creating murals and social arts in public spaces based on the culture and values of the community. • Consulting with residents for decision making to encourage their participation. • Placement of temporary stands for presenting handmade products of local residents.
Social interaction	<ul style="list-style-type: none"> • Increasing the vitality of the neighborhood and attracting residents to centers and public spaces. • Designing local cafes and restaurants to attract residents to hangout within the neighborhood. • Placement of urban furniture and benches for different age groups near each other to encourage more interaction. • Providing children's play area to make children and parents connect with each other.
Amenities And facilities	<ul style="list-style-type: none"> • Maintenance of urban furniture located in the neighborhood. • Collecting voluntary donations from residents on a monthly basis to provide requirements of the neighborhood as much as possible.
Residents' sense of happiness	<ul style="list-style-type: none"> • Creating a place to hold entertainment programs and special events such as Eids and festivals. • Placement of urban furniture suitable for performing street music. • Creating a place for exhibiting handicrafts and performance of cultural events related to the historic city of Bushehr. • Providing a protected and safe place for children to play.
Vitality and diversity	<ul style="list-style-type: none"> • Designing local parks and green spaces. • Creating active and lively centers within the neighborhood. • Enriching the wall arts and creating diversity in their colors and materials. • Attention to natural elements such as plants in abundance and water in a limited way. • Attracting active nightlife. • Placement of temporary and moveable food stalls in wider streets.
Social capital	<ul style="list-style-type: none"> • Placing mobile booths to collect people's opinions. • Designating discussion places in the center of neighborhood. • Creating a book & film cafe near the center. • Formation of art & culture centers in the neighborhood.
Adequate housing	<ul style="list-style-type: none"> • Use of materials suitable for the climate of Bushehr city. • Creating a balance between mass and space. • Observation of skyline of the neighborhood according to the situation and location of the neighborhood. • Attention to the rhythm and visual proportions of buildings in order to enhance visual comfort. • Optimum placement of openings to absorb maximum sunlight and favorable wind direction.
Social unity	<ul style="list-style-type: none"> • Creating collective and inclusive places in the heart of neighborhood to attract residents to interact with each other. • Placement of local land uses in close proximity of each other.
Cleanliness	<ul style="list-style-type: none"> • Placement of adequate number of trash cans in different locations within the neighborhood. • Separation of wet and dry waste • Placing trash cans away from direct sunlight and preventing them from heating up and causing bad odor.
Natural light	<ul style="list-style-type: none"> • Creation of shade, portico and roofs suitable for sunlight. • Use of materials resistant to direct sunlight. • Placement of solar panels in the direction of sunlight. • Avoiding the use of reflective materials and dark colors. • Construction in the optimal direction in accordance with natural light. • Planting trees and vegetation suitable for the climate and requiring a lot of natural light.

Moreover, adequate housing is crucial for mental health, especially in Sangi, where climate and architectural identity require thoughtful design. Using climate-appropriate materials like mud bricks or insulated options helps mitigate extreme weather. Proper spacing between buildings ensures ventilation and privacy, while maintaining the neighbourhood's skyline preserves cultural identity. Thoughtful placement of openings maximizes natural light and cross-ventilation, enhancing residents' well-being. Also, social unity in Sangi can be achieved through inclusive public spaces that encourage interaction and reduce commuting distances, promoting a sense of community and interdependence. Design features like nearby corner shops and schools help strengthen social ties and foster mutual reliance.

Finally, cleanliness is essential for both physical and mental health. Strategically placed trash cans and waste separation promote hygiene, while shaded placement reduces odours, enhancing the neighbourhood's appeal. These initiatives contribute to a cleaner, healthier, and more pleasant living environment. By incorporating culturally and climatically sensitive design, Sangi can become a vibrant, cohesive community, enhancing mental well-being, social harmony, and environmental sustainability. Table 5 demonstrates a summary of the proposed design strategies based on the key factors derived from the MicMac model.

4. Conclusion

This study attempted to investigate the main factors and strategies to achieve mental health in Sangi neighborhood of Bushehr City, Iran. To achieve this goal, 24 variables of mental health in neighborhoods were extracted from reliable sources. By analysing 24 key variables through a qualitative, descriptive-interpretive methodology and employing tools such as MicMac software and Delphi analysis, the research highlights the interplay of controllable and uncontrollable factors that influence mental well-being. The output of the model has obtained the most important and influential variables in the field of mental health for Sangi neighbourhood. Variables such as noise pollution, safety, participation in neighbourhood affairs, social interactions, and social capital emerge as critical and actionable domains for urban planners and policymakers, while factors like cleanliness and natural light, although uncontrollable, demand contextual adaptive strategies.

The study's findings underscore the importance of tailoring environmental interventions to the specific needs and challenges of urban neighbourhoods in developing countries. The operational strategies proposed for Sangi neighbourhood not only aim to enhance the mental health of its residents but also offer replicable insights for similar urban contexts across Iran and beyond. This research contributes to the growing discourse on integrating mental health considerations into urban planning and highlights the transformative potential of environmental quality in fostering healthier and more vibrant communities.

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Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper

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