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MORALITY BEFORE KNOWLEDGE

Sustainable strategy of green open space in reducing stress levels in urban areas

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ABSTRACT

Background: Cities around the world are facing increasing challenges related to high levels of stress in urban areas. One strategy that has been proposed to overcome this problem is the development of Green Open Space with a sustainable approach. This study aims to evaluate the impact and effectiveness of sustainable strategies for developing green open spaces in reducing stress levels in urban areas, with the City of East Jakarta. **Methods:** The systematic literature review involves searching for previous research that focuses on the relationship between green open spaces and mental health. **Findings:** The research results show that developing green open spaces with a sustainable approach can significantly reduce stress levels in urban areas. The people of East Jakarta indicate that the existence of green open spaces provides an effective escape from the stresses of daily life, as well as improving their overall quality of life. Improving the quality of green open spaces and sustainable development can create an environment that supports the mental and physical health of urban communities. **Conclusion:** Collaborating with community participation in the planning process, as well as continuing to conduct research to understand more deeply the positive impact of green open space on the welfare of urban communities so that a sustainable strategy for developing green open space can become a strong foundation for creating a city that is healthier and friendlier to stress levels and hopefully can make an important contribution to sustainable urban development efforts in terms of psychological well-being. **Novelty/Originality of this article:** This study highlights the significant role of sustainable green open space development in reducing urban stress levels, emphasizing community involvement and continuous research as key factors for fostering a healthier and more livable city.

KEYWORDS: green open space; sustainable strategy; stress level; urban area.

1. Introduction

Urbanization in the world is a global trend that has significantly influenced settlement patterns and social structures. This phenomenon includes population movement from rural areas to urban areas, where cities develop, and urban centers become centers of economic, social and cultural activities. The rapid urbanization process has led to significant environmental and health challenges for the global population. There is a growing emphasis on environmentally conscious and sustainable development worldwide. Green vegetation, being a vital urban natural asset, has the potential to enhance air quality, boost residents' well-being, and contribute to the advancement of both physical and mental health. Consequently, investigating the correlation between greenery and human health holds substantial theoretical and practical importance for upcoming urban greening initiatives (Liu et al., 2023). According to UN data, from 2010 to 2050, the world population living in

urban areas will increase by 15.7%, up from 51.5% to 67.2%, or around 6 million people. Likewise with Indonesia, population movement from villages to cities has contributed to around 49.8% of the population living in urban areas. This number will increase to 66.6% in 2035, with an average annual population growth of 1.49% on the island of Java (Adiyanta, 2018; Caesarina & Rahmani, 2019). In Indonesia, rapid urbanization has changed the city landscape by expanding infrastructure and increasing population density. Increasing urbanization causes various problems, such as decreasing environmental quality, air pollution, water pollution and land pollution. Because green space is increasingly limited, buildings also increase thermal temperatures in urban areas (Purnama, 2023). In line with DKI Jakarta which is the most populous province in Indonesia with a population density of 16,000 people/km2 and a population in 2022 of 10,679,951 people (BPS, 2022). The city in DKI Jakarta that has the largest population is East Jakarta City, namely 2,244,623 in 2022 (BPS, 2022).

Rapid population growth in the City of East Jakarta, along with high urbanization, is causing significant pressure on the environment and the quality of life of the community. High population density often results in a lack of open space, leaving little or no green areas in the middle of urban areas. The majority of land in the administrative city of East Jakarta is used for residential purposes, with 9,300 ha (SIPSN, 2021). However, the area of green open space is only 0.07% of the entire East Jakarta area, so additional green open space is needed (SIPSN, 2021). Apart from that, the City of East Jakarta also has many industrial areas operating in its area, which is one of the causes of population density in the East Jakarta Administrative area. Nowadays, urban industries have developed to become industrial areas, which has led to the stigma of mini-industrial cities with high pollution (Yan & Wang, 2023). Environmental quality tends to decline as a result of industrial activities that emit pollutants.

In the past few years, there has been a notable global focus on the relationship between the constructed environment and mental health. The World Health Organization has acknowledged the Healthy Cities movement as a trailblazer in urban development and transformation. This movement has played a crucial role in fostering the creation of healthier and more amiable urban settings, with a specific emphasis on preserving human mental health and overall well-being (Chen et al., 2021). Green spaces were linked to enhanced mental well-being and a slightly reduced probability of using anxiety or depression medication. This connection was observed indirectly, with the influence mediated through factors such as connectedness and satisfaction within the community (Pasanen et al., 2023).

In this context, stress levels among urban residents increase as access to the natural environment is lost. The World Health Organization (WHO) says that around 450 million people worldwide experience stress, and around 10% of Indonesia's population experiences it. According to 2013 Basic Health Research (Riskesdas) data, around 1.33 million people in DKI Jakarta experienced stress, which reached 14% of the total population, with an acute stress level of around 1-3% and a severe stress level of around 7-10% (Perwitasari, 2015). The need for a modern, busy and stressful lifestyle, which is characteristic of dense and urban areas, where stress is one of the four main health problems experienced by urban residents, especially in developing countries (Corazon, et al., 2019). The amount of land available for green open space areas is decreasing along with the increasing population in the DKI Jakarta area (Ramadhan, 2023). In accordance with Law Number 26 of 2007, which should cover 30% of the administrative area but the amount of green open space in DKI Jakarta is less than 10%, the city government cannot fulfill this requirement. This causes great pressure on the balance of the urban environment and the psychological well-being of the population. City development without considering the environment will cause problems such as hot air, pollution, congestion and noise, which can cause stress in the city (Pratiwi, 2018). As per Stigsdotter (2020), the stress levels, referred to as Stress Level (SL), are significantly impacted by the environment. Recent research extensively supports this notion, providing evidence that the features of open spaces within urban environments, which may seem like typical public areas such as town squares and

parks, have a positive impact in reducing stress levels and enhancing health outcomes. According to the 2013 Basic Health Research (Riskesdas), 1.7 percent of the Indonesian population experienced serious mental disorders and 6.0 percent experienced mental emotional disorders. On the other hand, data from DKI Jakarta Province, published by the Ministry of Health's Research and Development Agency in 2013 in its book Basic Health Research in Figures for DKI Jakarta Province, shows that the country's capital city, East Jakarta City, has the highest prevalence of serious mental disorders at 1. 1% per mile. According to Wicaksono & Choandi (2020), the prevalence of emotional mental disorders in DKI is 6.4%, East Jakarta is ranked highest with 2.2% per mile with the prevalence of emotional mental disorders in East Jakarta being 4.4%. Human behavior can be influenced by the environment and vice versa, human behavior can change the environment. Research on environmental issues aims to explain and change the influence of human behavior on the environment as well as the negative effects caused by humans (such as pollution and noise) which have a negative impact on health and well-being (Steg et al., 2013).

Green spaces primarily affect mental health through physiological, psychological, and social pathways. The impact on mental well-being is influenced by exposure to green environments, with oxidative stress being identified as a contributing factor (Squillacioti et al., 2022). In the midst of the busy urban lifestyle, the presence of green open spaces holds significant importance for fostering healthy, comfortable, and sustainable conditions, particularly in East Jakarta. Exposure to these green spaces emerges as a promising intervention to enhance the mental well-being of adolescents. The constant mobility in urban life, coupled with pollution and the effects of global warming, tends to diminish the quality of environmental services and elevate stress levels among individuals, necessitating mitigation and revitalization efforts. Cities that lack health and comfort typically do not align with the principles of sustainability as outlined in the sustainable development agenda. The development and maintenance of public green open spaces in urban areas such as East Jakarta City is an important strategy for achieving a sustainable city and minimizing environmental factors such as noise, air pollution, population density and traffic jams which can also cause stress. This is known as environmental stress or environmental stress (Gea, 2011). This can happen, especially in urban communities. Green open space is an elongated and/or grouped area covered with plants, either planted naturally or intentionally. Sustainable strategies are needed in designing, developing and managing green open spaces in urban areas so that they can effectively reduce stress and improve the quality of life for urban residents in particular. According to Maric (2021), open space can have a positive influence in reducing overall stress levels for society. Therefore, this research will analyze green open space strategies that can be planned sustainably in East Jakarta City, it is hoped that it can provide recommendations for city planners and other stakeholders in creating green open spaces in urban areas that are healthier, more comfortable and sustainable. psychologically.

2. Methods

The research was conducted in the East Jakarta Administrative City area. This location determination is based on literature results which state that there is a relationship between the availability of green open space and reducing stress for urban residents. The city of East Jakarta was chosen because it has the densest population in DKI Jakarta and also has a lot of industry in its area. This study will employ a qualitative methodology to comprehend the focal issue under investigation. The research approach used in this research is qualitative. This type of research is descriptive research which describes in detail a specific situation and its relationship to the social problems that occur. This research seeks to provide information on the development of public green open spaces in the administrative city of East Jakarta using a social-ecological approach to create public green spaces that are able to provide benefits by reducing stress levels experienced by the community, especially those in the East Jakarta area. The research uses secondary data came from related literature and

administrative and GIS data in East Jakarta City. Descriptive analysis is used to evaluate factors that influence the sustainability of green open spaces.
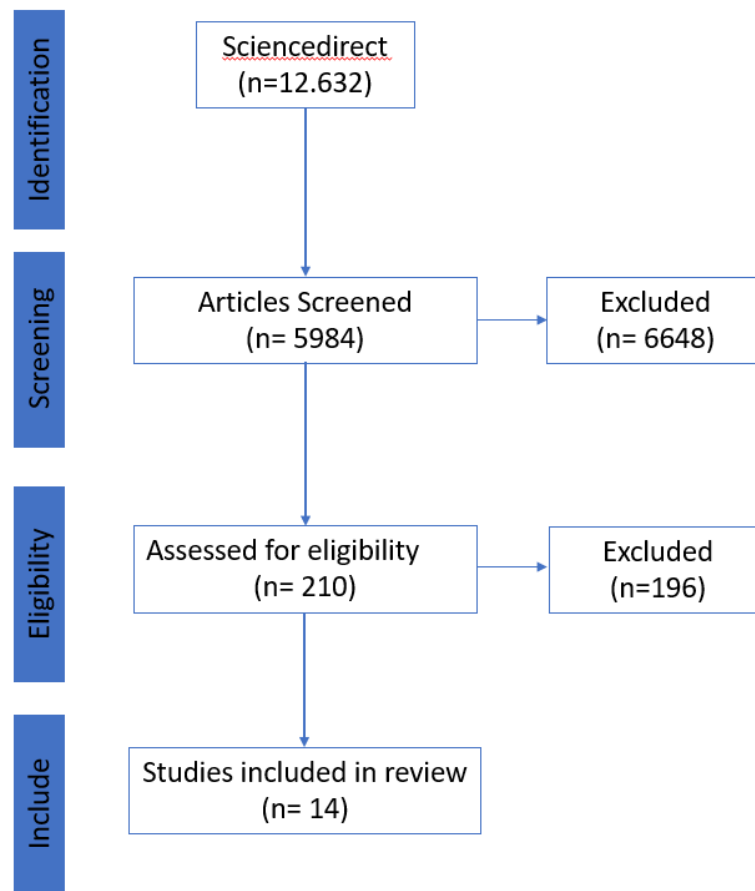

Fig. 1. Diagram of PRISMA

Literature search with systematic literature review obtained 12,632 journals and articles with keywords sustainable strategy, green open space, reducing stress levels, urban areas. Then using exclusion criteria by looking at the time of publication and suitability of the study, 5,984 literatures were obtained. In the final stage, an assessment is carried out by deleting journals that have the same title and author, incomplete texts and verifying research results such as sample adequacy, anticipation of bias, comparison groups, and the suitability of statistical tests from the literature list. The author obtained 13 literatures with full texts and in accordance with the established criteria, consisting of 13 English-language literature in Fig. 1.

Table 1. Table of systematic literature review

No	Name of Researcher (Year)	Research Title (Country Of Origin)	Place of research, Method, Sample Size, Instrument Results	Result
1.	(Mora et al., 2022)	Urban green spaces and stress during COVID-19 lockdown: A case study for the city of Madrid	- Madrid, Spain - Online Survey, Review of Literature - 132 responden - Questionaire: - the first section : the individual's profile - the second section: description of their current residence	In Spain, maintaining and/or increasing contact with green space (private community spaces) and greenery (indoor plants) was associated with lower stress levels.

			and living space typology. - The third section: the participants use and appreciation of UGS prior to lockdown, aiming to understand and gather information about the respondents nearest green spaces (1 km and 3 km). - Fourth section: which UGS were closed in their neighborhood, whether it was a good idea to keep UGS open, and their new relationship with UGS: how frequently, in which way and who they shared the interaction of UGS with.	
2.	(Vegaraju & Amiri, 2024)	Urban green and blue spaces and general and mental health among older adults in Washington state: Analysis of BRFSS data between 2011-2019	- Washington state, USA - This study used 2011–2019 BRFSS data and was reviewed and approved by the Washington State University Institutional Review Board and classified as exempt. - 42,980 responses among people 65 years and above - Data on serious psychological distress, general health, and frequent mental distress of older adults living in Washington state were obtained from the Behavioral Risk Factor Surveillance System (BRFSS)	-Differences in percentage of green space, percentage of tree canopy, percentage of forest space, and distance to blue spaces were significant among respondents with serious psychological distress compared to those not reporting psychological distress. Similarly, differences in percentage of green space, percentage of tree canopy, percentage of forest space, distance to blue space, distance to green space, and length of trails were significant among people reporting suboptimal general health compared to those reporting normal general health
3.	(Vos et al., 2022)	Residential green space is associated with a buffering effect on stress responses during the COVID-19 pandemic in	- North-east of Belgium, in the province of Limburg, Flanders - All statistical analyses were performed using R version 4.0.2 (R Core Team, Vienna,	- Higher residential surrounding greenness in radiuses of 300 m and 500 m around the home residence is associated with an increase in odds of being more resistant to stress or fear during the COVID-19 pandemic

		mothers of young children, a prospective study.	Austria). The threshold for statistical significance was set at a 95% confidence level (p < 0.05). - 766 participants	- n radiuses of 50 m and 100 m, the effect estimates were smaller, and not statistically significant (50 m: OR=1.09, 95%CI: 0.91 to 1.31; 100 m: OR = 15, 95%CI: 0.94 to 1.41). For the largest radius (1000 m), we observed no association (OR=1.11, 95%CI: 0.89 to 1.39). Overall, we found that the association with total green was stronger, as compared with the stratification in low (3 m) green layers
4.	(Aghabozor gi et al., 2023)	Assessing the impact of blue and green spaces on mental health of disabled children: A scoping review	- Scoping Review, PRISMA - 3787 studies screened, 89 Studies assessed for eligibility, 20 studies included in the review	The effect of blue and green spaces on different aspects of mental health was moderated and mediated by several factors categorized into three domains: sociodemographic, personal/parental health, and environmental/contextual. Most of the moderators were non-significant, however some studies indicated significant effects of variables such as age, sex, parental income, and education.
5.	(Pasanen et al., 2023)	Urban green space and mental health among people living alone: The mediating roles of relational and collective restoration in an 18-country sample	- The cross-sectional BlueHealth International Survey was collected in four waves, covering all seasons, during 2017–2018, from 18 different countries/territories: Queensland (Australia), Bulgaria, California (USA), Canada, Czech Republic, Estonia, Finland, France, Germany, Greece, Hong Kong (China), Ireland, Italy, Netherlands, Portugal, UK, Spain, and Sweden. - 8460 samples - Living alone versus with a partner (main effect modifier), Mental Health, Green space – residential (exposure) and visits (mediator), Social restoration processes (mediators), Gender, age, financial strain,	Among respondents living alone (n=2062), neighbourhood green space coverage within 1 km from home location was not associated with visits to green space, and accordingly it showed no indirect effects on mental well-being. Instead, each additional visit to a greenspace in the last two weeks was positively associated with both relationship (b=0.04) and community satisfaction (b=0.06), and via these, indirectly with 0.08 and 0.11 greater evaluation of mental well-being, respectively. These resulted in a total indirect effect of 0.19, holding all covariates constant. In addition to the indirect pathways via relationship and community satisfaction, each bi-weekly visit to green space was also directly associated with a 0.54-point increase in mental well-being. The relationships between all covariates and mediators and both mental health outcomes are provided

No.				
			geographical location (secondary effect modifiers), Covariate	as online supplementary material
6.	(Yañez et al., 2023)	An urban green space intervention with benefits for mental health: A health impact assessment of the Barcelona "Eixos Verds" Plan	- Barcelona, Spain - Quantitative health impact assessment at the Barcelona grid-cell level - The study population was defined as Barcelona city adult residents ≥ 20 years of age - Baseline green space levels, Counterfactual scenario: Eixos Verds plan	We estimated that 31,353 (95%CI:18,126–42,882) cases of self perceived poor mental health (14·0% of total), 16,800 (95%CI:6828–25,700) visits to mental health specialists (13·4%), 13,375 (95% CI: 6107–19,184) cases of antidepressant use (13·4%), and 9476 (95% CI: 802–16,391) cases of tranquilliser/sedative use (8·1%) could be prevented with the implementation of the Eixos Verds Plan
7.	(Wang et al., 2022)	Understanding the relationship between small urban parks and mental health: A case study in Shanghai, China	- Shanghai, China - Multilevel regression model - 322 questionnaires were used for follow–up analysis - Measuring mental health, Park–level variables, Individual-level variables	Aesthetics–Natural Features, Incivilities, and Usability generated significant positive effects on visitors' mental health, while recreational facilities generated negative effects on visitors' mental health.
8.	(Grigoletto et al., 2023)	Restoration in mental health after visiting urban green spaces, who is most affected? Comparison between good/poor mental health in four European cities	- Barcelona (Spain), Doetinchem (the Netherlands), Kaunas (Lithuania) and Stoke-on-Trent (the United Kingdom) - One-way ANOVA, chi-squared test and the Kruskall-Wallis test. - 30 neighborhoods per city - The four cities offer diverse study areas in terms of size, population density, climate and land cover	In the combined sample a significant association (p < 0.05) was observed for all the different kinds of activities for the poorer mental health (Table 5). "Sport" presented a high association (p < 0.001) for the frequency indicators often and very often. "Picnic" and "walk and play with children" had a significant association (p < 0.05) for all the frequency indicators. Finally, "meet family or friends", "tranquility" and "personal relaxing" showed a high association (p < 0.001) for three frequency indicators, from sometimes to very often. The situation was different when we considered the subsample categorized as 'better mental health'. In this group, there were no statistically significant associations linking restoration score with "sport" and "walk and play with children". "Picnic" presented an association with all the frequency indicators, from 1.78 of seldom (95%CI 0.75, 2.80)

				to 5.76 of very often (95%CI 3.53, 7.99).
9.	(Pérez et al., 2023)	Social inequalities, green and blue spaces and mental health in 6–12 years old children participating in the INMA cohort	- Asturias, Gipuzkoa, Sabadell and Valencia - Children 6 to 8 and 10–12 years of age participating in the INMA pregnancy cohort study - The inclusion criteria for pregnant women in the study were being 16 years or older, having a singleton pregnancy, not having received assisted reproduction techniques, planning to give birth in the reference hospital and being able to communicate Spanish, Catalan, Basque or Valencian	Most of the total and direct effects coefficients in the sample of 6–8 year olds sample were negative, the opposite being true for the 10–12 years sample. Nevertheless, none of them reached statistical significance. Confidence intervals of total and direct effects estimates overlapped and due to the fact that both were of null statistical significance in all the models, indirect effects were not statistically significant either.
10.	(Li et al., 2023)	Green and blue spaces, COVID-19 lockdowns, and mental health: An Australian population-based longitudinal analysis	- Australia - Descriptive Statistics - 12,000 Australians aged 15 years and over each year - Mental health, Green and blue spaces, Lockdowns	The mental health effect of lockdowns was smaller where green spaces and inland and coastal blue spaces were available. Effect modification was statistically significant for green space, with smaller negative mental health effects observed where there was sizeable green space coverage, particularly during long lockdowns (COVID-y1: − 2.69, 95%CI: − 3.63, − 1.76 for coverage
11.	(Nieuwenhuijsen et al., 2022)	The evaluation of the 3-30-300 green space rule and mental health	- Barcelona - Cross Sectional - 3145 individuals aged 15–97 years - Survey - Green space exposure variables, Mental health status	A home window view with at least 3 trees within 15 m was not associated with any of the outcomes. Having a sufficient level of surrounding greenness (=>0.3) was associated with a lower risk for all the outcomes and this was statistically significant for poor mental health (Odds ratio (OR)=0.60, 95% confidence interval (CI): 0.40–0.90), combined medication use in the last 2 days (OR=0.60, 95% CI: 0.38–0.97), visit to the psychiatrist over the last 12 months (OR=0.22, 95% CI: 0.08–0.62), and visit to the psychiatrist or psychologist over the last 12 months (OR=0.37, 95% CI: 0.19–0.73). Although there was some suggestion for a reduced

				risk with distance to a major green space for all the outcomes, none of the associations were statistically significant. An increase in the 3-30-300 green space score was generally associated with a lower risk for all the outcomes, but only for visits to the psychiatrist or psychologist combined over the last 12 months (OR=0.31 95%CI 0.11, 0.91) was this statistically significant when the 3-30- 300 rule was fully met.
12.	(Borgi et al., 2023)	Reduction in the use of green spaces during the COVID-19 pandemic and its impact on mental health	- Italia - 2473 Individuals - Questionnaires Survey - Data synthesis and statistical analysis were conducted using Stata software, version 16.0	Being an urban resident (compared to rural residents) does not appear to represent a risk factor for the frequency of green space use and the preference for social activities, although urban residents can be at major risk of spending less free time outdoors.
13.	(Acolin et al., 2022)	Playgrounds are for children: Investigating developmentally-specific "Green Space" and child mental health	- Seattle - 99 samples - Stepped linear regression models - Child mental health, walking distance of a park	Regression coefficients suggest that, among children living near any park and adjusting for individual and contextual covariates, those with a playground have 1.22 (CI: 3.82, 1.38) fewer overall adjustment problems than those without, though results do not reach statistical significance.

3. Results and Discussion

3.1 General description of the city of East Jakarta

East Jakarta Administrative City Government, East Jakarta Administrative City has an area of 18,775 hectares and consists of 10 sub-districts and 65 sub-districts. East Jakarta is the city with the largest population in DKI Jakarta, even though DKI Jakarta consists of 5 administrative cities. According to the DKI Jakarta Provincial Central Statistics Agency, the population of the East Jakarta Administrative City will reach 2,244,623 people in 2022. This number is divided by the area, which means a population density of 119.5 people per hectare. With its population continuing to grow, East Jakarta is experiencing great pressure regarding space and resources. High population density can create an urban environment with busy daily activities and causing stress. The presence of significant industrial and commercial activities in the area can exacerbate this situation. This situation can increase levels of air pollution, noise, and environmental discomfort. All of this can be a source of stress for city residents.

In this situation, the role of Green Open Space becomes very crucial for balance of urban life. The urgent need for green open space in East Jakarta aims to reduce stress levels that may arise due to the pressure of population density and the presence of industrial sector. The function of Green Open Space is not only limited as a place for recreation, but for clean air and a green environmental atmosphere.

Therefore, it is necessary to increase and preserve green open spaces in the midst of urban activity centers to provide a comfortable and refreshing escape space for city

residents. Well-planned green open space development can create a green oasis that reduces tension, improves well-being, and provides opportunities for physical activity that can relieve stress. Local governments must consider the quality and quantity of land when determining the area of green open space. Most of the additional green open space must be used for public purposes. Cities have the opportunity to increase the area of green open space by up to 30% of their area. Land that has been neglected can be converted into parks and green belts to function as a water catchment and the heart of the city. Green open space is designed as green infrastructure or ecological infrastructure.

3.2 Provision of green open space in East Jakarta

Given the numerous advantages associated with Green Open Space, its presence, particularly in urban settings, holds great significance. Green open spaces serve as venues for social interaction within communities, offering a respite from work-related stress and providing recreational spaces for urban families. Minister of Public Works Regulation No. 05/PRT/M/2008, pertaining to the allocation of green open space land, is employed to establish the required extent of public green open space land in the City of East Jakarta. Needs are calculated based on population and 20% of the area. This calculation was carried out from 2019 to 2039 (Fig. 2).
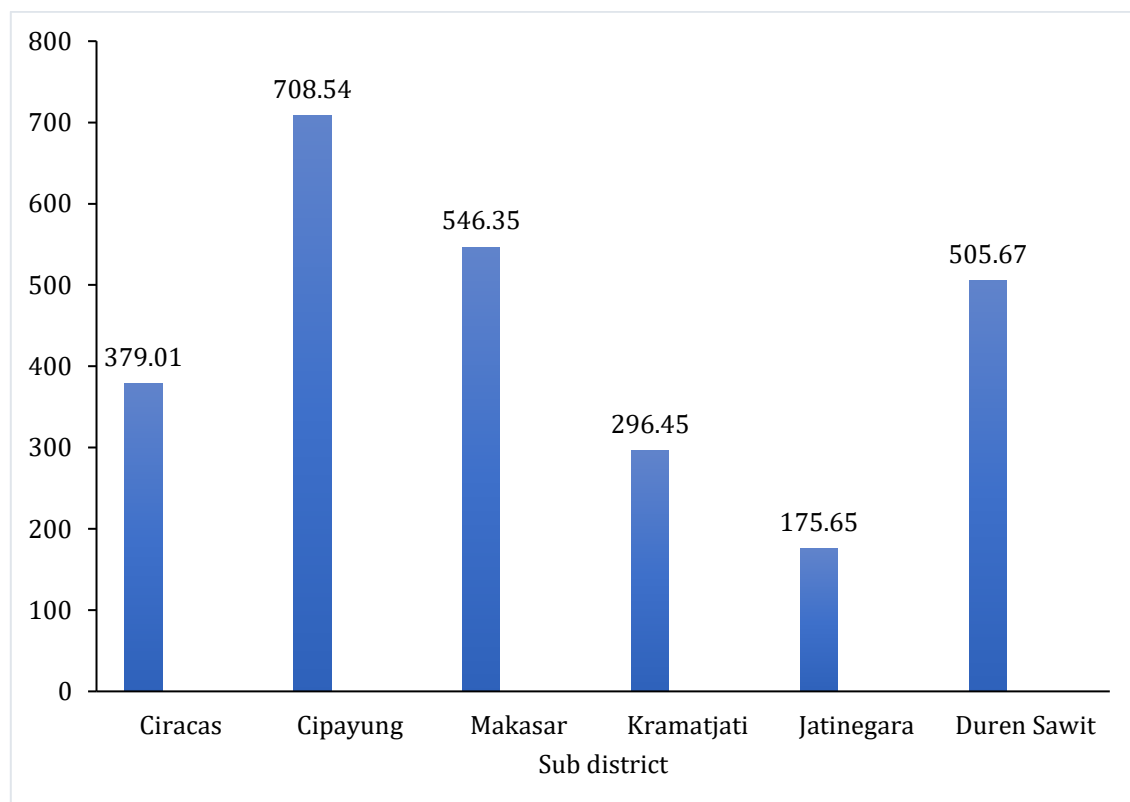

Fig. 2. Need for green open space in East Jakarta based on amount resident
(Setiadi & Kusumawati , 2022)

According to Arifin (2015), green open spaces can be categorized based on typology. Physically, natural green open space can be divided into non-natural or built green open space, such as parks, sports fields, cemeteries, or green lanes. Natural green open spaces consist of natural wild habitats, parks and national parks. Green open spaces are divided into categories based on their function: ecological, socio-cultural, aesthetic and economic. Green open spaces can follow ecological patterns (clustered, elongated, scattered) or planological patterns that follow the spatial structure of the city.
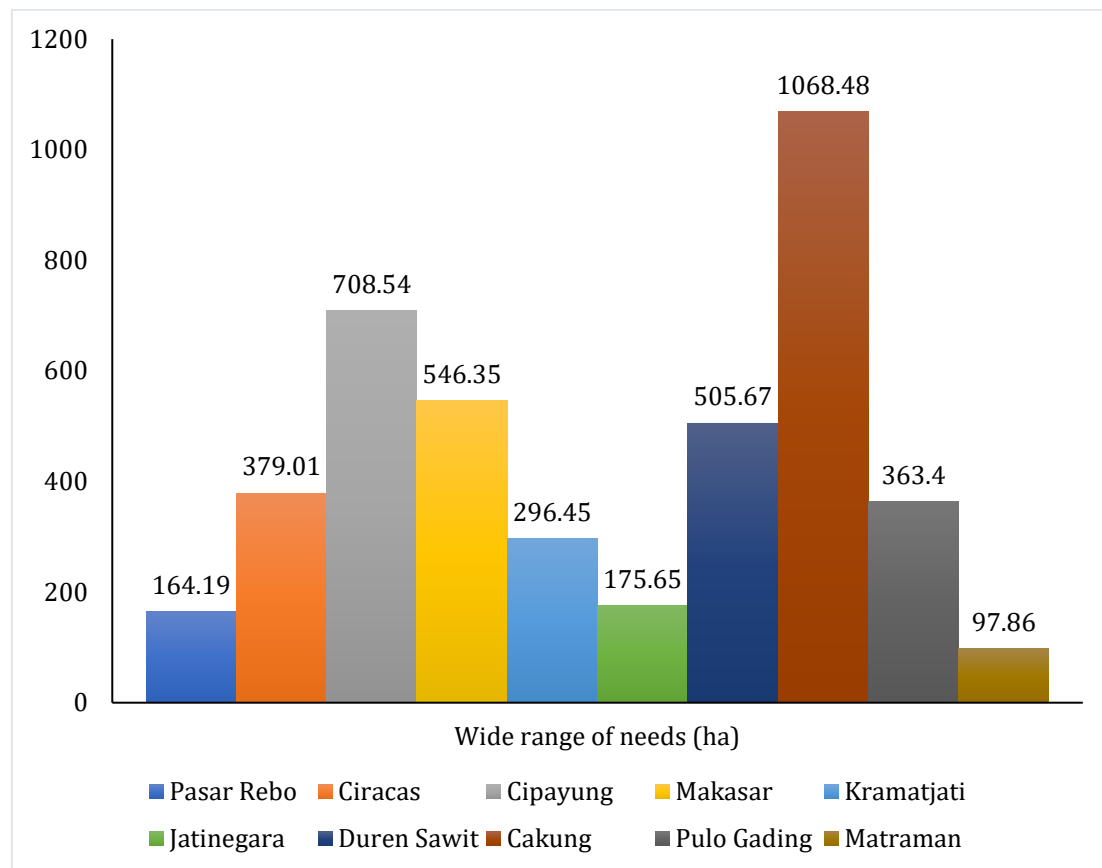
Fig. 3. Graph need for green open space based on district area
(Setiadi & Kusumawati , 2022)

According to Setiadi & Kusumawati (2022) in Fig. 4, the area of public green open space required based on the population in East Jakarta City until 2039 is 10,812 ha with Matraman District having the least area of 97.86 ha and Cakung District having the largest area, namely 1,068.48 ha. Looking at the potential land for public green open space in the City of East Jakarta, it feels like a valuable and attractive asset to be developed into a city park, green corridor and planting appropriate vegetation according to its function and the surrounding environment. It is hoped that these potential lands can improve the air quality in East Jakarta, have a psychological effect on the surrounding community with a greener, shadier atmosphere and an attractive place to visit to unwind after a long day of work. It can also be a place to gather and play with children, friends and family with adequate green open space facilities.

Table 2. Potential Land Area of Public Green Open Space in East Jakarta City

No	Subdistrict	Potential Area (Ha)
1	Makasar	575.30
2	Cipayung	319.19
3	Cakung	211.53
4	Pulo Gadung	81.56
5	Pasar Rebo	61.85
6	Duren Sawit	61.13
7	Ciracas	42.49
8	Jatinegara	32.88
9	Kramat Jati	15.68
10	Matraman	0.85

(Setiadi & Kusumawati , 2022)

Data on environmental parks from the DKI Jakarta Parks and Forest Service in 2022 shows that there are 224 parks spread across East Jakarta, with the smallest number of

parks being in Cakung District and Pasar Rebo recorded as having only 7 parks and the highest number of environmental parks being in Duren Sawit District. a total of 84 parks. In fact, the existence of green open space is quite important, especially in densely populated and industrial areas because green open space can reduce surface temperatures and absorb heat. While the trend of increasing temperatures is dominated by built-up areas and empty land, this research shows that areas with vegetation cover tend to have lower temperatures. This is in accordance with previous research findings which show that areas with high levels of infrastructure density have higher air temperatures (Sasmito & Suprayogi, 2018). Apart from that, areas such as densely populated residential centers, office centers, government centers show high temperature trends (Fadlin et al., 2020). This can cause discomfort related to stress which can be caused by a significant increase in air temperature (Imran et al., 2022).

Table 3. Land area in DKI Jakarta in 2022

Regency /City	Area (km^2) (A)	Spacious of Space Open Green (km^2) (B)	% of Outdoor Green (B/A)
Regency. Adm.Kepulauan Seribu	8.70	2.90631	33.41
City Adm. Jakarta Pusat	48.13	0.8375	1.74
City Adm. Jakarta Utara	140.00	0.83113	0.59
Kota Adm. Jakarta Barat	124.40	0.02241	0.02
Kota Adm. Jakarta Selatan	141.27	3.2688	2.31
Kota Adm. Jakarta Timur	182.70	0.00914	0.01

(SIPSN, 2022)

3.3 Stress factors in urban areas

Urban stress is a psychological condition caused by the development of the city environment and life in it, which causes stress for a person as well as the lack of cities that are designed taking into account the psychology of the population. Therefore, city places and facilities that can provide urban psychological benefits must be able to accommodate and reduce urban stress (Pratiwi, 2018). There is something in our everyday environment that can easily be perceived as annoying, disruptive, disturbing, and uncomfortable. These are known as urban stressors. Physical environmental conditions such as workplace, residence, social interactions, and so on are referred to as urban stressors. Noise, air pollution, traffic jams and crowding are some potential threats to cities (Halim, 2008). Gascon (2018) states that green spaces can protect adults from depression and anxiety, partly due to lower air pollution and noise exposure.

Stress factors in urban areas can originate from a variety of complex and often interconnected elements. One of the main factors is high population density. Intense competition and high life pressure can create a stressful environment. Stress can also be caused by environmental discomfort, such as noise from the main industries around the East Jakarta area and the lack of open green space. These stress factors can be exacerbated by feelings of social isolation and lack of interaction in the midst of busy cities. Other factors that can cause stress also include high job demands, financial problems, and a rapidly changing city lifestyle. An imbalance between a person's physical and spiritual desires can cause stress.

According to Ridho & Saputra (2022), there is a strong relationship between space and human mental health. This is due to the fact that architecture can help the healing process of certain diseases by releasing hormones from the human brain as brain medicine. All of these components combine to create an urban environment that can lead to long-term stress and negatively impact the mental and physical health of its residents. Therefore, sustainable urban planning and the development of green open spaces are needed through a platform that can be accessed by the entire community to overcome and help relieve

stress, namely by creating public spaces. It is hoped that this will help reduce tensions in urban communities and improve public health.

3.4 Benefits of green open space in reducing stress

Combining findings indicates a positive correlation between being in green spaces and experiencing lower stress levels, improved mood, decreased depressive symptoms, enhanced emotional well-being, better mental and behavioral health, and reduced psychological distress among adolescents (Zhang et al., 2020). According to Cohen-Cline et al. (2015), green open spaces are considered to have positives impact on mental health because they allow, they allow people to meet, allow people to build social relationships, increase physical activity, and reduce stress and fatigue. Green open spaces in urban areas significantly benefit residents in reducing stress levels and improving their mental well-being because they give people the opportunity to escape from the noise and density of the city and create an environment of calm and relaxation. Physical activity such as walking or exercising in green open spaces also helps reduce levels of stress hormones such as cortisol, providing a positive effect on mental health, this is in line with research conducted by Koohsari et al. (2018), the existence of natural green open space can provide several benefits for a person. This is because green open spaces can facilitate social interaction between users in addition to facilitating activities and sports. In society, interaction and socialization can have a positive impact on people's social ties. Every positive activity carried out by people who live in a green environment can help reduce their stress. Green areas offer room for outdoor sports and opportunities for physical activity. The amount of time spent in these green spaces has an impact on diminishing stress levels (Palencia et al., 2019).

Green open spaces create space for recreation and social interaction. Places such as parks and public gardens provide gathering places for city residents, creating opportunities to socialize and build positive relationships, which has been shown to reduce social isolation and improve emotional well-being. As stated by Mashar (2021), several activity patterns in Green Open Spaces are considered to reduce stress in urban communities: a) 30.6% eating and drinking; b) 27.58% were involved in social activities, such as talking, sitting relaxed, discussing, or just accompanying children to play; c) 18.79% exercised, such as jogging, cycling, gymnastics, or brisk walking; d) 12.12% have hobbies, such as taking photos, skateboarding, painting, or dancing; and e) 10.91% sleep under a tree. This activity pattern is truly a characteristic of visitors to Green Open Spaces in Indonesia. Green Open Space serves as the primary location for Indonesians to engage in activities such as exercising, walking, eating, and socializing. The presence of green spaces plays a role in shaping adults' perceptions of loneliness, safety, and happiness. Studies, as indicated by Maas et al. (2008), demonstrate that despite limited contact with those around them, adults experience lower levels of loneliness when residing in environments abundant with green spaces, encompassing parks, farmland, and forests.

According to (Schipperijn, Jasper et al. 2009), it is hoped that increasing the use of Green Open Space in Urban Areas will result in improved health and well-being of urban communities because Green Open Space in Urban Areas is considered a tool that can help reduce boredom or fatigue, reduce mortality rates, and reduce stress level. Chen (2021) emphasized that people who are dissatisfied with their surrounding environment for reasons such as lack of green space or other reasons have worse mental health compared to people who love their surrounding environment and that the closer the residence is to green space, the lower the stress felt by its residents. Green open spaces also provide an opportunity to connect with nature, bringing positive benefits to mental health. Exposure to nature, including green views and other natural elements, has been shown to improve mood and positive emotions. People who have easy access to green open spaces tend to experience increased happiness and life satisfaction. Because of its affordable price, green open space can be an alternative place to relax or unwind that can be accessed by all city residents. Individuals dealing with mental health disorders find outdoor recreation to be a

valuable therapeutic outlet. The emotional advantages of engaging in outdoor activities encompass enhanced mood, diversion from mental health issues, strengthened coping mechanisms, heightened resilience in the face of challenges, the cultivation of emotional maturity, and an increased sense of self-acceptance (Mashar, 2021).

3.5 Sustainability strategy of green open space in East Jakarta

Green open spaces with complete facilities can make people's minds fresh and clean again, making people want to spend time there to use the existing facilities and come back again. Because people face daily situations that tend to be monotonous and boring, such as working under pressure, facing traffic jams and pollution, the human mind becomes bored and stressed, people need a good place to relieve fatigue and boredom from daily activities. According to Adhisty (2022), if employees experience stress at work, they lose enthusiasm and get bored with work so that their performance decreases and they become depressed and unable to complete the tasks given. However, if employees are motivated to work, they can produce new ideas and innovations to advance the company. Therefore, people need a good place to relieve fatigue and boredom from daily activities through the development of green open spaces. Green open space can be developed through the application of appropriate architecture. The application of recovery architecture or healing architecture is a concept for creating a care environment that combines physical and psychological aspects with the aim of accelerating the stress recovery process in urban communities.. This architectural treatment can be applied to the outdoor space or landscape of the building to be investigated. Outdoor space not only functions as a garden but can also be used to relieve stress. A healing garden is often referred to as a healing garden. Good and well-organized garden and location arrangements provide a cool and calming atmosphere. Neat green setting with benches and small tables for relaxing. Green spaces play an increasingly important role in people's lives.

An increasing number of urban policymakers are integrating green spaces into city planning and exploring synergies between green spaces and buildings to optimize the health advantages offered by green areas. The planning and design of urban green infrastructure play a crucial role in the formulation of policies related to urban green spaces. As defined by David Ross, a scholar in Landscape Architectural Planning, green infrastructure refers to an ecological network of interconnected green spaces created by blending elements of both the natural and built environment (Choumert & Salanié, 2008).

In addition, in facing the challenges of increasing urbanization, developing green open spaces in East Jakarta is a very relevant sustainability strategy for improving the quality of life of residents. The first step is to create diverse green open spaces by combining natural elements such as parks, lakes, urban forests and recreation areas. The utilization pattern of locations with natural elements, such as city parks, is intricately linked to an individual's stress level (Asahiro et al., 2023). By using efficient and sustainable reforestation methods, this development must consider environmental sustainability. For this reason, it needs to be designed by prioritizing visual and physical comfort. A healing environment is a natural environment that is considered capable of providing positive energy to human psychology, providing comfort and relaxation to the human mind. The concept of environmental healing can provide a positive signal for the psychological health of stress sufferers (Mashar, 2021). The Healing Environment concept must be able to stimulate the five human senses of sight, smell, sounds and texture through positive suggestions. The Healing Environment concept applies to the exterior and interior design of buildings. The main concept is to adapt every aspect of the design to create an atmosphere that can stimulate the five human senses. To implement these ideas, there are several principles that must be followed (Kurniawati, 2007): a) Design must be able to help a person's physical and mental recovery; b) Gain access to nature; c) Carrying out outdoor activities that have a direct connection with nature. The placement of these components should be planned to create a calming and refreshing atmosphere for visitors while reducing stress levels. By using this approach, East Jakarta can create green open spaces that not only serve as a source of environmental

resilience but can also heal and rejuvenate the soul, significantly improving the quality of life of city residents. Efforts to maintain and develop green open spaces must also involve the active participation of local communities.

According to Janeczko et al (2023), it is not easy to connect with nature, especially in big cities. Many new ideas about urban greening have emerged because of climate change and the recent increase in urban populations. These ideas aim to make the environment where humans live healthy and resilient. The spectrum of services offered by urban greening ecosystems is increasingly recognized as they grow. Urban greening not only organizes, provides, and supports goods and services, but also provides educational values, recreational and aesthetic experiences, and more (Maury-Mora et al., 2022). When evaluating the quality of green open spaces, it is essential to go beyond assessing whether the greening rate meets standards. Accessibility and user comfort during actual usage are also critical factors to consider. Firstly, community green open spaces represent the most frequently utilized areas by residents. Ensuring their consistent use requires the creation of public green spaces that are highly appealing to residents. Consequently, the design of community green open spaces should prioritize attractiveness, aiming to increase residents' utilization frequency. Secondly, the greening design should effectively integrate with the community space structure and align with residents' behavioral habits to guarantee the availability and accessibility of green spaces, thereby minimizing any adverse impacts on residents' living comfort (Chen et al., 2021).

| Puring Park – South Jakarta | Sambas Asri Park – South Jakarta |
| Menteng Park – Central Jakarta | Tebet Eco Park – South Jakarta |

Fig. 4. An example of a green open space in Jakarta that adopts the concept of a playground

To be able to accommodate all activity patterns that can reduce stress, according to research by Tambunan, et al., (2021) shows that several facilities in Green Open Space can help reduce stress, namely: a) 32.74% of the sitting area under trees; b) 26.79% of children's play areas equipped with playgrounds; and c) 22.79% children's play area. The results of this survey can be implemented into planning for the development of green open spaces by selecting vegetation that is able to absorb more CO2, create shady conditions and add to the aesthetics of the green open space itself. Apart from that, green open space with the addition of play rides, develops the concept of a playful and healthy city as is the hope of the DKI Jakarta Parks and Forestry Service to develop green open space which can make

people increase their happiness index, bring people to interact more intensely and not always need tools for carrying out activities adopted from green open spaces that have been developed in the Central, South and surrounding areas of Jakarta. The following are several examples of green open spaces in Jakarta that have adopted the playful garden concept (Fig. 4).

It is important to integrate the playful concept with an emphasis on play elements that support creativity and relaxation. The construction of innovative and multi-purpose playgrounds, equipped with art installations and recreation zones, can provide residents with facilities to cope with daily stress and increase happiness levels. It is important to establish safe and connected pedestrian and bicycle paths throughout the East Jakarta area. Environmentally friendly transportation facilities, such as bike lanes and comfortable sidewalks, not only have a positive impact on physical health, but also create opportunities for social interaction, reduce stress, and create a more relaxed urban atmosphere. This is in line with research conducted by Janeczko et al (2023) which measured the psychological state of participants, including vitality, emotions and mood, both before and after exposure to green plants (pre-posttest). According to the analysis by Janeczko et al (2023), exposure to various types of green plants in the city environment increased participants' psychological relaxation. And it was concluded that urban greening has restorative power because most of the analyzed psychological coefficients changed significantly after being in a certain environment compared to before the test. Urban areas with lots of greenery and no noise are comparable to forests, a more natural natural ecosystem, helping society.

Within the framework of the healthy city concept, it is necessary to promote healthy lifestyles through educational programs and social activities. This can include sports training, nutrition workshops and mental health awareness campaigns. Thus, green open spaces not only function as places for physical activity, but also as community centers that support holistic health. Involving the community in the planning and development process of green open space is also key. The active participation of local residents can ensure that the design and function of green open spaces are in accordance with the needs and desires of the community, thereby increasing the sense of ownership and concern for the surrounding environment.

4. Conclusions

East Jakarta is under huge pressure regarding resources and space. The massive industrial sector causes increased air pollution, noise and environmental discomfort, all of which can be stressors for city residents. In addition, with the largest population in DKI, East Jakarta experiences a prevalence of emotional mental disorders of 4.4%. Green open space has a very important psychological function to reduce crowds, density and chaos which can cause stress or tension. Green Open Space is an open place in nature with a green garden filled with shade plants and ornamental plants that provide coolness for visitors. The area of public green open space required based on the population in East Jakarta City until 2039 is 10,812. This number is still far from the current implementation of green open spaces in East Jakarta. The existing facilities in East Jakarta should be designed using a garden concept that carries the concept of a playful, healing environment and architecture, supporting facilities such as a parking park, culinary garden, and performance park by adopting designs such as Taman Puring and Tebet Eco Park in areas that have the greatest potential need for green open space based on the area, namely Cakung District, Cipayung District and in Makasar District as a gathering point and relieve stress in urban areas because green open space has ecological and economic benefits which is significant for creating a physically and mentally healthy urban environment.

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