Sustainable Urban Planning: How cities can evolve to become more eco-friendly

Sera shah, M Ritika, Siddhant kadam, K S Kirutheesh, Krishang , Prof. Krishna Reddy
JAIN (Deemed-to-be University) – Center for Management Studies

Abstract: **The analysis investigates sustainable city development strategies which target the three challenges of climate change, resource shortages, and population density problems. Our research analysis produces insights about two main solutions which include green infrastructure and eco-friendly housing. The study results show that cities urgently need sustainable systems to establish resilient places that people can live in.**

Index Terms: **sustainability, green spaces, environment, urban cities**

INTRODUCTION

A sustainable urban planning model is necessary for cities to prove their environmental commitment and fairness within human communities. Various threats endanger urban areas including resource depletion and climate change together with urban congestion. A necessary method to protect urban landscapes for future populations involves sustainable planning. The development initiatives could benefit from the following solutions according to this model:

1. Effectively Handling Climate Change:

To reduce urban overcrowding both secure housing and reasonable ownership costs must be provided to residents. Given that manufacturing and businesses do not pollute an area then it becomes possible to make housing available at affordable prices. Energy-efficient housing together with renewable energy systems joins sustainable urban planning elements that form part of climate action plans along with landscape design.

2. Improving the Efficiency of Resources:

Urban system reconstruction requires installing water recycling technology together with rainfall collection components combined with energy-efficient equipment. The main goal of sustainable urban development lies in maximizing environmental utilization. Urban areas should pursue the development of circular economic practices that promote disposal practices to foster waste reduction through recycling and reuse.

3. Build Resilience:

Sustainable planning requires urban communities to display resilience. Urban areas protect against severe weather events that include droughts and flooding and storms by developing their infrastructure beforehand. Urban gardens along with energy diversification create autonomous communities by making them less susceptible to disruption in supply chain distribution systems.

4. A better quality of life:

Human survival stands as the most essential priority for sustainable planning of cities. Every member of the community experiences higher life quality through appropriate availability of nature areas together with clean air and high-quality public health facilities and educational and transportation services. Shared residential and commercial development schemes within neighborhoods help people stay in touch while reducing congestion by letting them reach their necessities and workplace easily.

6. Encouragement of Economic Progress:

Optimizing city design with environmentally-minded strategies leads business ventures to progress economically because they adopt renewable power sources while implementing modern construction methods and gardening methods in urban areas. A right-to-order economy will attract investors to support enterprise growth while establishing conditions which result in long-term corporate achievement. The reduction of traffic congestion combined with energy conservation results in an increase of economic performance.

7. Preserving Nature and Biodiversity:

Three common examples of urban nature integration are urban parks and urban woodlands alongside waterways since these approaches enable both environmental benefits and improved living conditions for city residents. Sustainable planning uses nature preservation methods to protect urban environments from total replacement by human development.

Research Aim: To investigate urban planning techniques that enables cities to become more environmentally friendly and ways to implement them in the urban centers.

REVIEW OF LITERATURE

- Sustainable development measures through urban planning constitute the main subject of this investigation. Urban design establishes itself as an initiative to produce sustainable environments alongside urban liveability which benefits social well-being instead of focusing solely on structure construction. The authors demonstrate that sustainable urban design should decrease environmental consequences created by cities by implementing energy-efficient construction along with compact mixed-use development. The research analysis selects areas that operate independently with regard to resource procurement combined with waste management solutions to minimize dependency on external systems. The article presents sustainability-promoting design approaches which integrate comprehensive considerations of urban development over its entire lifetime.
- This research examines the relevance of local ecological knowledge (LEK) in Finnish urban land-use planning, emphasizing its significance as lay-expert knowledge. According to interviews with planning officials and local stakeholders, LEK, which was developed by nature enthusiasts and people, supplements scientific data by identifying ecologically valuable sites. Incorporating LEK into participatory planning thus presents a challenge in which subjective information should be valued. For efficient LEK utilization, some suggestions include improved stakeholder communication and technical resources.
- Several key steps are required for sustainable development advancement because of these changing views towards sustainable development. The writers dismiss conventional development models because they mainly seek immediate economic returns at the expense of future ecological sustainability. The authors state that environmental issues such as climate change demand enduring solutions and variable approaches. A new development process using restricted environment boundaries must establish limits on human activities to prevent them from surpassing natural resource thresholds. The proposed combination of strategies aims to establish sustainability within cities as well as industry and communities.
- The research explained why sustainable urban development matters to India through its identification of urbanization-related challenges. While India produces minimal global unsustainable development impacts its extensive growing population along with increased urbanization endangers international sustainability efforts. The study examines how urbanization creates economic advantages but also analyzes social and environmental negatives described by planning errors and poor governance performance. The plan requires sustainable elements to be included with legislation policies and technological solutions to achieve balanced systems responses across current and forthcoming urban situations.
- The study evaluates India's UN Sustainable Development Goal development while emphasizing its domestic projects alongside governance structures. The paper examines India's process of linking SDG targets to national aims by describing tracking entities including MoSPI which manages 306 national indicators together with NITI Aayog which supervises implementation activities. Indian performance evaluation depends on key attributes such as poverty elimination and health advancement and clean power and water availability. SDG 11 serves as the specific base for discussing how India intends to develop more inclusive and resilient cities in its urban development policies. United Nations members need to collaborate through financial assistance, technical development and worldwide support to launch complete sustainable development projects and programs.
- Sustainable urban design implements environmentally conscious building practices because these practices form the core of creating sustainable communities that resist change. The

article examines multiple environmental strategies consisting of energy-saving systems with green construction elements and renewable energy generation which collectively work to protect nature as well as strengthen neighborhoods. Sustainable design brings social advantages according to the review since it enhances community quality of life through social justice and community engagement. The Vauban area in Freiburg demonstrates concrete advantages of environmentally-friendly projects since it creates both cleaner air and decreases energy consumption among other outcomes such as better social relationships and green building practices.

- A comprehensive assessment of eco-development reveals the essential understanding needed by stakeholders regarding their definitions of "eco" elements and sustainable development foundations. The study based on empirical data presents how SSTEC residents live their lives which results in conflicting impacts on their environmental behavior. Middle-class residents choose non-eco-friendly procedures above sustainability when looking for convenience and comfort in their daily lives which raises their resource needs.
- The piece demonstrates how public transportation needs both accessibility and effectiveness and emphasizes sustainable mobility through car reduction as well as energy-saving approaches. City design for transformation from rural land to urban real estate requires management of ecological values and climate change effects. The appropriate consumption habits together with lifestyle choices need to match the environmental conditions of hot dry regions as well as humid and cold regions. Future-focused urban development projects need to fulfill present requirements while becoming standard bearers that attract citizens, businesses and services systems.
- The article explores how spatial web technology combined with Geographic Information Systems (GIS) alongside remote sensing technology improves accessibility to urban green spaces thus enhancing resident quality of life in both their health and residence environment. Advanced Land Observing Satellite (ALOS) data enables the approach to find green locations while uniting them with GIS datasets that encompass public amenities among other elements. The integration powers web-based GIS functionality for determining green walking distances thus enables resident decision-making. The case study of Tsukuba City Japan consists of three main components in its analysis.
- The study thoroughly examines the Korean u-eco-cities framework by assessing its focus on infrastructure, services and technology together with management systems for sustainable urban development. The paper analyzes research about eco-cities and sustainable development in urban contexts while stressing the importance of complete sustainability program evaluations due to climate change and urbanization consequences. The research adopts the organizational, sociological, economic and geographical quadruple-bottom-line framework to study how u-eco-cities improve urban life or function as marketing obscurities.
- A Internet of Things also known as IoT is rapidly gaining momentum in becoming a key technological enabler in the development of smart cities through solutions that lead to sustainable, operationally efficient, and quality of life improvements in the life of urban dwellers. The technological developments, applications, and difficulties in integration of IoT in smart cities have enough literature to be concerned with. The article will therefore review the critical elements of IoT pertaining to its application in urban planning and usage in sectors like transportation, energy management, waste management, and public safety and contribution to sustainable development in cities.
- The development of Smart Cities took place due to fast urbanization as well as increasing needs for efficient urban management. The Internet of Things drives the entire process by allowing cities to acquire data which helps them improve their services and infrastructure. The emergence of CoT as an integration of Cloud computing with IoT arose to handle the substantial uncontrolled data quantities stemming from IoT system architectures.
- The research publications about smart cities and IOT demonstrate city development changes to establish sustainable developments with high effectiveness and quality life standards. The combination of Information and Communication Technologies and IoT serves to grow urban

service performance while optimizing resource allocation while supporting greater citizen involvement during urban planning phases. The implementation of IoT enables effective real-time data collection that boosts service management activities including transportation systems and waste management and pollution control and congestion reduction while improving governmental-cooperative relationships through studied examples in Singapore and Barcelona.

- Mattew Lewand and his colleagues have outlined essential characteristics within the sustainable urban planning field that improve urban environments. Efficient land utilization happens when development employs compact size and mixed uses according to Cao et al. (2006) and Cohen (2017). Public transport and walking areas create vehicle independence and improve health as described by Al-Thani et al. (2019) and Hamidi and Moazzeni (2019). Biodiversity and social well-being gain an increase when green spaces are implemented according to Bera et al. (2023).
- Caused by human activities initiated by globalization together with urbanization and industrialization the environment sustained heavy damage according to literature. Soil degradation through rising consumption and deforestation and pollution has led to ecological disturbances and water and air pollution in addition to contaminated soil quality (Kissinger & Rees, 2010; Mahbub et al., 2011). Urbanization aggravates problems like soil erosion, water contamination, and the urban heat island effect. Health risks stemming from industrial and traffic-related air pollution mainly affect respiratory system and heart health according to Mage et al. (1996).
- The research presentation stresses that sustainable urban initiatives for Skopje need eco-friendly urban planning to achieve better air quality as well as lower summer temperatures and enhanced social cohesion. A parking space provided the foundation for transforming into an accessible shared area containing green zones and mixed development and walkable design elements. The environmental problems of the city will diminish as the initiative promotes walking and cycling and public transit resulting in better urban conditions and healthier living spaces. The urban strategies prove that sustainable planning practices can transition toward serving the community better while maintaining ecological practices and cities worldwide with similar environmental issues need these methods.
- Sustainable urban planning brings forward the requirement that cities adapt to becoming environmentally sustainable zones through context-specific ecological design principles. The paper "Eco-URBAN: Approach to Development Sustainable Green City" explains the necessity of environmental consideration in urban planning for addressing global climate change challenges. The approach for sustainable city creation depends on the implementation of energy-saving constructions and green transit systems and supportive community frameworks.
- The important nature of rooftop greenhouse smart farm investigation into urbanization and food security and climate change relates directly to sustainable urban planning. Rooftop crops which grow using building waste heat and CO2 on unused surfaces help make both operations more energy-efficient and cut down environmental pollution. A maximum of both urban living conditions and agricultural productivity results from eco-friendly technologies implemented in building designs. The realization of such projects faces constant barriers stemming from organizational and legal challenges.
- The study demonstrates that smart cities develop through combining modern technology with proper design that creates efficient urban areas with sustainable environmental practices. The document states that urban development extends across multiple periods demanding constant technical and innovative approaches. A necessary component includes system updates in transportation sectors alongside architecture and industry accompanied by growth in renewable power utilization. The possible implementation of urban infrastructure monitoring and management relies on five technological solutions which include IoT, 5G, AI, blockchain and big data.
- Eco-friendly residential concepts developed for single homes demonstrate methods for city-wide environmental change through sustainable municipal development planning. The key objective is focus on combining elements of green areas with renewable energy and effective

water management systems to establish balanced relations between buildings and nature. Cities that focus on using recycled building materials alongside local products and install solar power systems and implement waste management systems as a whole will develop sustainable developments.

RESEARCH DESIGN

1. Objective of the Research

- This study explores various types of sustainability strategies and what people effective ways to implement them as well barriers that we will come accross in the process of it, also to understand how much knowledge the public has about sustainability and how many of them are willing to support the initiative.
- To know how important it is to integrate green spaces in urban cities and different ways to do that and to understand what initiatives are most welcome by people and how cities can evolve into sustainable places.
- To examin how willing people are to support sustainablen spaces and how much it means to them to have eco-friendly spaces around the city they choose to live in.

2. Scope and Methodology of the Research

The scope of the study is set to 60 respondents that belongs to cities/urban areas that were randomly picked by us, because we wanted to know how much general knowledge and average person has about sustainability. This research tried to understand how sustainability can be enforced in cities effortlessly and which strategies are appreciated by people and what they would like to have in the future. The research is conducted through a survey and it helped us understand people's perspective on sustainability which will help professionals understand what they can and cannot implement in the future.

3. Limitations of the Research

- We have gotten valuable insights from our respondents which has helped us come to a conclusion about effective strategies and ways to implement them but we also have a few limitations.
- We have collected primary data from the general public but if we could have included professionals such as urban planners and policy makers, we would've been able to get more insight to the practicality and complications of each strategy.
- We have not explored various case studies on sustainable cities such as Copenhagen and Amsterdam, which would have given us substantial evidence that our strategies are appreciated.
- Our study is limited to 60 participants, which may not be enough to come to a conclusion about the topic overall eventhough it provides a lot of interesting perspectives.
- Sustainable urban planning has been our main focus for analysis but we did not provide extensive detail about technological innovations such as smart grids and green roofs together with AI-driven urban planning tools.
- The research concentrates primarily on sustainable urban planning although it might have delved deeper into important urban environmental challenges which include waste management and urban heat islands and disaster resilience.
- The research does not include information about the legalities and policies related to sustainability so we wouldn't be able to assess the effectiveness of it completely.

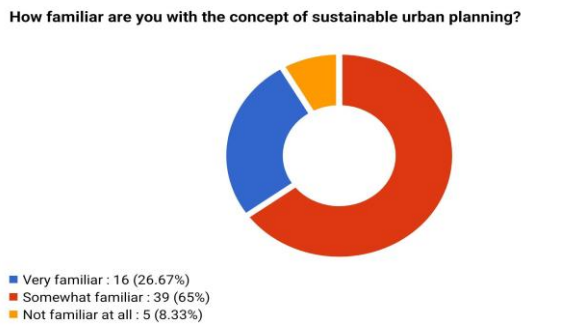
Our research offers useful data about sustainable urban planning and demonstrates essential aspects which cities need to strengthen their environmental sustainability results. Subsequent studies should work on expanding their research scope using both bigger sample pools and expert opinions together with technological capabilities to create more detailed sustainable assessments.

DATA ANALYSIS

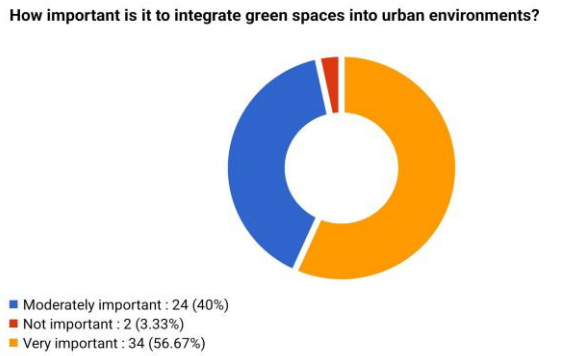
We have collected primary data by conducting a survey on general awareness of sustainability and possible ways of implementation of sustainability among individuals that are above the age of 18. The goal was to know the perspective of the general public and to figure out the best ways to implement sustainability in urban areas. We included multiple choice questions, open ended questions, and likert scale questions to collect specific information that we want. It also helped us understand how much knowledge participants had on this topic prior to the survey.

We have used a convenience sampling method to reach out to as many people as we can. We have 60 responses in total and all of them are living in urban areas, and will be moving to different cities in the future for work or studies. This helped us in the survey. Additionally we made sure their personal information is confidential so they will answer questions without any apprehension and we got their consent prior to the survey.

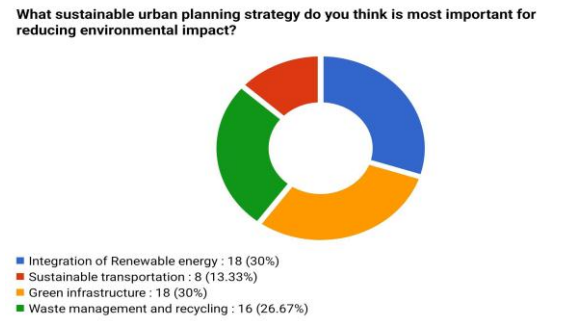
Survey results:



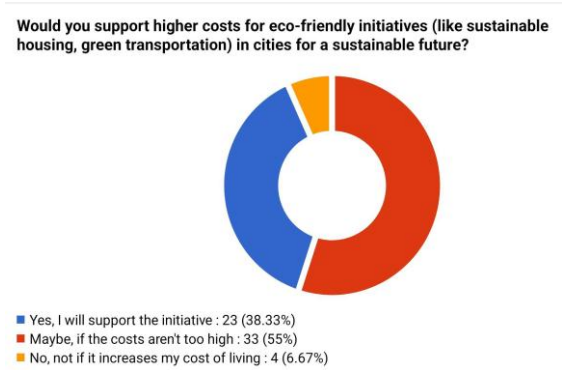
26.7% of the respondents were very familiar with sustainability which means they are reasonably informed or believe in sustainability themselves. 65% of participants were somewhat familiar, so they are aware of the concept but don't have in-depth knowledge about it.



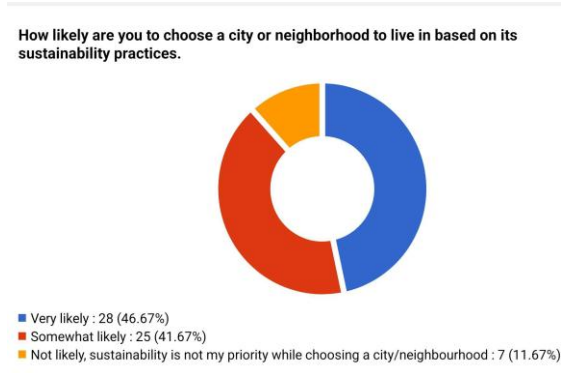
56.7% of participants think it's very important to integrate green spaces into urban environments which means they consider it a high priority and 40% of them think it's moderately important which further reinforcing the point that people want more green spaces in cities.



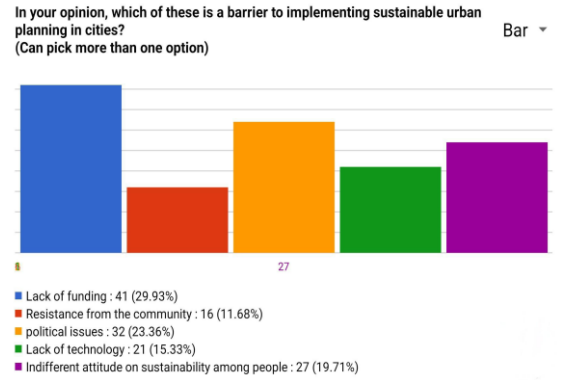
Integration of Renewable energy and green infrastructure were the popular choices among the participants with both of them gathering 18 votes each. Waste management and recycling also has 16 votes, this indicates that people want a combination of them for a sustainable future.



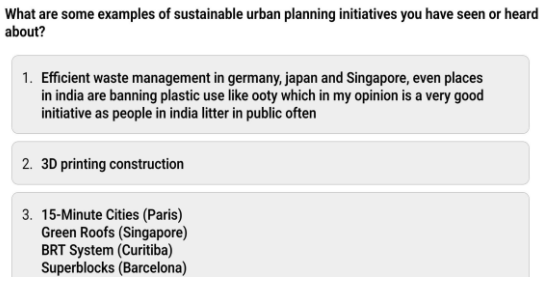
People are willing to support eco-friendly initiatives but somewhere they are concerned about the cost it would accumulate and affect their cost of living. That's why 55% of them said maybe. While 38.3% said Yes, it could mean that they can afford the increase in costs, but they may not represent the majority of the urban population.



Most of the participants are very likely or somewhat likely to choose a city/neighborhood based on its sustainability practices, this shows that people have a positive outlook on cities that are sustainable and appreciate places that aren't congested and has green spaces.



People think that lack of funding and political issues are the main reason why cities lack sustainability, with both of them getting 41 and 32 votes accordingly. This shows lack of trust in governing bodies. Next comes lack of technology with 21 votes and indifferent attitude towards sustainability with 27 votes, and at last there's resistance from the community which is the least popular option.



These are some of the answers that were gathered for the last question, we wanted to know how aware people were or the sustainability practices in urban areas around the world. Although we received a lot of answers, some of them also said they don't know of any. While others tried their best to list out places which included swachh bharat, waste management systems, Ahmedabad City planning, Delhi metro and ev bikes.

SUMMARY OF FINDINGS

- Most people in urban cities are aware of sustainability and its impact on the environment and that's 80% of them are concerned about the city they pick to live in, since most of them are going to be moving cities in the future for work, this shows that they expect certain standards before considering moving to other cities. While the 20% are in the minority and sustainability is not their top priority.

- This survey shows that 90% of the people are generally aware of sustainability but don't have in-depth knowledge about it which makes some of them indifferent towards the concept, as they are unaware of the impacts it can have in the future. Upto 75% of the participants have a preference for green spaces which means they want more parks, greenery and less pollution in cities that they live in.

- While many people like the idea of having sustainable spaces, 33 out of 60 of them are hesitant due to the cost it will acquire, this is true in many other industries as well, and people tend to buy clothes that aren't sustainable because it's cheaper. 6% of them were against the increase in cost, although they might seem like minority here, on a larger papulation, they will be bigger in number.

- The problem in implementing sustainability according to participants seems to be political issues with 32 votes and lack of funds with 41 votes which means, about 45% of the population is apprehensive about how governing bodies would take up this initiative and this lack of trust leads to less interest in the topic as a whole when there is no hope.

SUGGESTIONS AND RECOMMENDATIONS

- A mass educational initiative targeting public awareness of sustainability should be launched because 65% of respondents properly understand its long-term values. Educational institutions along with work environments must add sustainability programs into their educational content. The spread of sustainability awareness happens through social media by sharing humanizing content which includes brief video segments alongside infographics with real achievements.

- Urban planners should make green infrastructure and renewable energy their top choices since these options demonstrate the most public preference. Solar panel programs together with rainwater collection methods and energy-efficient construction receive governmental incentives that can accelerate their national spread. The development of urban green spaces including parks together with vertical gardens and rooftop greenery needs to increase for better city environment development.

- The majority of respondents (55%) avoided backing sustainability programs because of cost factors thus affordability needs attention in sustainability operations. Eco-friendly projects gain financing through public and private partnerships that lower financial strain on people. Tax benefits and subsidies should be implemented to motivate consumers toward using sustainable items and services.

- The low level of community resistance stands as the least critical challenge because public participation produces successful results in sustainability projects. The implementation of community-driven waste management along with eco-friendly housing societies alongside volunteer clean-up drives generates ownership within citizens. Citizens should attend workshops in order to present their opinions about urban sustainability planning.

- Conclusion:

The research shows that most people are aware of sustainability as a concept but don't have in-depth knowledge about it and they are willing to support the initiative if it does not impact their livelihood. Majority of the population knows that there has to be some initiative towards a better future.

As urbanization speeds up around the world, more than ever, cities need to embrace sustainable urban planning. This planning strategy allows urban areas to meet future environmental and social issues while improving the health of current and future generations. Sustainable urban planning is not only a visionary decision; it is imperative to develop strong, inclusive, and prosperous urban society in an interconnected and changing world.

Initiatives like compact development, smart growth, green building strategies, and community resilience planning are the pillars on which this strategy is based, creating urban areas that are lively, accessible, and less dependent on cars, with active transport encouraged and green spaces given top priority. All these strategies help sustainable urban planning achieve healthier living, deepen community ties, and improve overall quality of life.

BIBLIOGRAPHY

[1] Yli-Pelkonen, V., & Kohl, J. (2005). The role of local ecological knowledge in sustainable urban planning: perspectives from Finland. Sustainability: Science, Practice and Policy, 1(1), 3–14.

[2] Nazanin Tangestanizadeh, & Piri, I. (2017). Sustainable urban design with an approach in sustainable urban development. The 4th International Conference Sustainable Architecture & Urbanism.

[3] Pankaj Bahadure, & Sarika Bahadure. (2012, June 22). Sustainable Urban Development in India: Challenge & Approaches.

[4] Omole, F. O., Olajiga, O. K., & Olatunde, T. M. (2024). SUSTAINABLE URBAN DESIGN: A REVIEW OF ECO-FRIENDLY BUILDING PRACTICES AND COMMUNITY IMPACT. Engineering Science & Technology Journal, 5(3), 1020–1030

[5] Flynn, A., Yu, L., Feindt, P., & Chen, C. (2016). Eco-cities, governance and sustainable lifestyles: The case of the Sino-Singapore Tianjin Eco-City. Habitat International, 53, 78–86.

[6] Addanki, S. C., & Venkataraman, H. (2017). Greening the economy: A review of urban sustainability measures for developing new cities. Sustainable Cities and Society, 32, 1–8.

[7] Lwin, K. K., & Murayama, Y. (2011). Modelling of urban green space walkability: Eco-friendly walk score calculator. Computers, Environment and Urban Systems, 35(5), 408–420.

[8] Yigitcanlar, T., & Lee, S. H. (2014). Korean ubiquitous-eco-city: A smart-sustainable urban form or a branding hoax? Technological Forecasting and Social Change, 89, 100–114.

[9] Sharma, S., None Subodh Sharma, None Akash Sahu, & None Akshay Sharma. (2024). Internet of Things (IoT) and Smart Cities. Deleted Journal, 2(08), 2526–2531.

[10] Roy, S., & Debabrata Sarddar. (2016). the Role of Cloud of Things in Smart Cities. 14(11).

[11] Abdullahi Abdirahim Bashiir, & Kiu Publication Extension. (2024). Smart Cities and IOT for Sustainable Urban Development. 3(1), 23–27.

[12] Mani, S. (2024). A Review of Sustainable Urban Planning Integrating Eco-Friendly Practices. International Journal of Science and Research (IJSR), 13(2), 391–400.

[13] Radmila Tomovska, & Fejza, A. (2019). Sustainable urban strategies applicable in the dense urban matrix of the city of Skopje. Vol 1(Issue 3), 26–36.

[14] Putra, R. W., Anisa, L., Betha El Sherra, Edison, F., & Indra Catri. (2022). Eco-URBAN : Approach to Development Sustainable Green City. 1(2), 54–62.

[15] Sun, Y. (2024). Sustainable Smart Cities Planning in Conjunction with Environment Governance. Advances in Economics,

Management and Political Sciences, 112(1), 62–69.
[16] Lee, J., Lim, E., Byun, N., & Shon, D. (2024). Eco-Friendly Technology Derivation and Planning for Rooftop Greenhouse Smart Farm. Buildings, 14(2), 398.
[17] Choudhary, S., Hasan, M., & Suthar, M. (2022). Design Features of Eco - Friendly Home for Sustainable Development. IJIREEICE, 10(1).
[18] https://scholar.google.co.in/scholar_url?url=https://eprints.qut.edu.au/65971/1/Maintext_IJEST_revision2_20131208.pdf&hl=en&sa=X&ei=TAMVZ-jBE7a56rQPudbVsAI&scisig=AFWwaebTsqBCVcF0pnQuMTRH2afS&oi=scholarr