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Exploring Attitudes Toward Urban Sustainability: A Comprehensive SLR Pertinent to SDG 11

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ABSTRACT

This paper provides a thorough analysis of India's efforts to achieve sustainable development using a systematic review methodology. This comprehensive analysis comprises forty scholarly articles that cover sustainable development in relation to India, all of which are taken from various academic journals. The present research highlights the dearth of scholarly works about sustainable development initiatives in India, particularly those pertaining to specific Sustainable Development Goals (SDGs). The goal of this paper is to provide a scholarly contribution to the ongoing discussion on sustainable development (SD). It aims to give a more thorough explanation of the paradigm and any potential ramifications for how people behave and think about sustainable development. This study's primary objective is to provide a thorough evaluation of the corpus of existing literature in order to facilitate the analysis of writing pertaining to the ideas of smart cities and environmental sustainability. The purpose of this study is to conduct a thorough examination of the most recent academic studies on smart cities and its potential to advance sustainable development. In addition, the scope of the current study would yield valuable data for academics and decision-makers seeking evidence to support further study and the implementation of rules.

Keywords: Sustainable development, Sustainable Smart Cities, Citizen perception

Introduction

City governance is crucial for achieving sustainable development goals, resource management and allocation, and policies related to urban climate because more people are expected to move into cities in the coming years. The world is becoming more urbanized as more people relocate to cities. Cities produce 75% of the world's greenhouse gas emissions, 85% of the world's GDP, and 55% of the world's population. By 2050, 6.5 billion people are expected to live in cities worldwide. If sustainable development is to be achieved, urban areas cannot be constructed or managed as they currently are. As a result of population growth and migration brought on by rapid urbanization, cities have become more crowded, especially in developing nations. Slums have also become a significant issue for urban life. Concerns about global sustainability must be addressed by prioritizing urban sustainability. Additionally, building resilient communities, robust economies, and safe, affordable housing are necessary for building sustainable cities [1,2]. At the municipal size, there is also a significant possibility for coordination and collaboration across various industries. Furthermore, government officials have a critical opportunity to comprehend the connections and requirement for collaboration among the parties in charge of developing sustainable development strategies [3].

After underlining the importance of cities, the United Nations General Assembly (UNGA) resolved to add "sustainable cities and communities" as a goal within the 2030 Agenda for Sustainable Development in 2015. According to statistics gathered from 911 cities in 114 nations in 2020, smaller cities are urbanizing more quickly than larger ones, and smaller cities are urbanizing at a rate that is significantly faster than population growth as a whole. Particularly, between 2000 and 2018, the percentage of individuals living in slums worldwide decreased from 39.66% to 29.25%. However, according to the World Bank in 2021, this percentage decline is comparable to an increase of about 80 million people.[4] This fact shows that care must be taken in order to prevent disastrous outcomes. The Sustainable Development Goals (SDG) 11th target, "Sustainable Cities and Communities," aims to "ensure inclusive, safe, resilient, and sustainable urban and human settlements" (Franco et al. 2020). It accomplishes this through removing slum-like circumstances, providing inexpensive transit alternatives, minimizing urban sprawl, boosting urban management, and improving the protection of cultural treasures. SDG-11 also outlines a number of significant sectoral interlink-ages and urban synergies, as well as potential innovations and effective strategies to improve the coherence of city policy. SDG-11 may not be accomplished despite global improvements in guiding and leading all activities toward sustainable development because of large knowledge gaps and challenges. The United Nations Human Settlements Programme published "The United Nations Human Settlements Programme" which served as the foundation for the New Urban Agenda of UN-Habitat, which emphasizes the advantages of concentrated concentration at the city and neighborhood levels. It also accomplishes long-term development objectives and directly and

materially raises people's standards of living. The global goals outlined in SDG-11 must be integrated with local development agendas to ensure successful implementation and produce appreciable improvements in people's daily lives [5].

The Brundtland Commission (1987) looked into the concept and helped to pave the way for it to become a significant worldwide concern. Sustainable development, according to their definition, is the "ability to meet present needs without compromising the capacity of the future generation to meet its own needs. The World Commission from 1987 since then, experts, the UN, and other organizations have conducted extensive research on sustainable development. The European Environmental Agency stated that one goal of sustainable development was to minimize the consumption of space and natural resources [6]. It is characterized by coordinated ecological, economic, and social action as an adaptive process of facilitating and maintaining a virtual cycle between ecosystem services and human well-being. [7]

SDG-11 and the subject of sustainable urbanization are critical for the majority of countries, given the rising rates of urbanization and the projected future share of the urban population [8]. For instance, the population of the European Union (EU), which totals 320 million people, resides in urban regions including cities, towns, and suburbs. Over 80% of Europeans are anticipated to reside in urban settings by 2050. Therefore, for the welfare and quality of life of their inhabitants, sustainable cities, towns, and suburbs are essential [9]. In addition, cities account for 60-80% of global energy consumption and 75% of global carbon emissions despite taking up only 3% of the surface of the world [10]. In order to bring about long-term, significant change, cities all over the world are learning from one another as they incorporate the SDGs into their current planning procedures, bridge data and communication gaps brought on by administrative silos, and take the initiative to identify and solve local needs. Therefore, the impacts of similar restrictions in the cities may have an influence on the entire globe. There are numerous things to take into account when developing sustainable smart cities that emphasize SDG-11. Planning for work, leisure, and social interactions has greatly changed as a result of the development of information and communication technology (ICT). A wide variety of novel products, services, and business models are now conceivable thanks to the strength, affordability, and small size of a drop-in computer. For the global development of ICT and the smartening of cities, two significant trends may be mentioned. The changeover of cabled to wireless services, including internet and phone, is the first. The second trend is linked to the development of devices with Internet access and the shift to the "Internet of Things. [11] Understanding how smart cities could improve sustainability is also crucial. This study was created to understand and investigate the current conditions of Indian city SDGs, their interrelationship within SDGs as well as with some other city performance frameworks, SDG effectiveness, and drawbacks, as well as policy recommendations to mitigate the adverse effects [12]. Renewable and green energy, energy efficiency, air quality, environmental monitoring, and water quality monitoring are crucial research fields in the development of smart cities.

Literature review

Over the course of recent years, a limited number of scholarly articles pertaining to this subject matter have been published. Patel, (2017) have developed a collaborative co-production initiative for the urban Sustainable Development Goals (SDGs) in partnership with scholars and local government officials from five cities, namely Kisumu, Greater Manchester, Bengaluru, Cape Town, and Gothenburg conducted a distinct investigation wherein they assessed eleven objectives related to urban sustainable development. The study used data collected from five cities located in Europe, Africa, and Asia. The study investigated the correlation between data and governance with respect to Sustainable Development Goal 11 in the context of Cape Town. [13] Koch (2018) conducted a study that employed case studies of cities in Germany and India to assess the advancement made towards achieving an inclusive, safe, resilient, and sustainable urban environment, utilising the framework of Sustainable Development Goal-11. [8] In their study, Zinkernagel et al. (2018) investigated the establishment of metrics to monitor sustainable urban development by leveraging the Sustainable Development Goals (SDGs). The researchers determined that the adoption of SDG indicators has the potential to yield a more comprehensive and cohesive approach to monitoring urban sustainability. [14]

According to Suelen Bebber (2021), a city's capacity for sustainable development is closely correlated with the conditions surrounding urban transportation.[15] Public and private management alike must have a thorough understanding of how urban residents view their mobility. In keeping with the sustainable characteristics mentioned in ISO 37120, ISO 37122, and the UN Sustainable Development Goals, this project aims to build and assess a mobility evaluation scale. With the help of objective measurement methodologies, the Sustainable Mobility scale (SMob scale) was created to pinpoint the subjective attributes linked to public opinion. Finding a gap in the characteristics of urban mobility for people with limited mobility was another achievement. Wornchanok Chaiyasoonthorn, and others (2019) traced the projects of Thailand 4.0, which was introduced in 2016. For such Smart City projects, citizen adoption of the new technology is essential and necessary. [16] Looked into and expanded the Technology Acceptance Model in order to comprehend the factors impacting the real mass acceptance of new technology as part of the deployment of Smart Cities. Bhagya (2018) one idea used in smart cities is the Internet of Things (IoT). The need for innovative ways to manage urbanisation with the least amount of negative influence on the environment, citizen life, or government is growing as the population and urbanisation continue to grow.[17] Information and communication technology (ICT) was incorporated into municipal operations early on, which aided in the development of concepts like digital city, information city, and telicity. The notion of the Internet of Things ultimately resulted in the creation of smart cities, which intelligently and with little human intervention support municipal operations. The exponential rise in urbanisation and population has given rise to the need for smart cities as a response to these problems. However, the idea of the "smart city" is still in its infancy and has not yet gained widespread recognition due to legislative, financial, and technological obstacles. According to Huma H. Khan et al. (2020), there are a number of technological, economical, and infrastructural issues that come with building sustainable smart cities. The importance of sustainability themes in the development of smart cities has been highlighted in numerous studies.[18] Still, not much has been studied on the challenges of developing sustainable smart cities. The primary objective of this study was to provide a conceptual framework describing the key issues that company and governmental institutions need to resolve in order to build sustainable smart cities. A total of seventeen respondents—representing the executive, management, and operational levels of commercial businesses and state institutions involved in the

development of smart cities—answered the case study on Pakistan.[18] Public service delivery systems are an essential component of social structures in industrialised countries, and historical processes have given them specific configurations, according to Stephen Ackroyd (1995). Notwithstanding its breadth, this perspective is seen to offer a strong foundation for understanding contemporary development. [19]. By using such research to demonstrate the various stages that public service supply in Britain has undergone, for example, one may be able to pinpoint the beginning of a new period in the institutional arrangements for the delivery of public services in recent years.

In a recent study conducted by Sharifi (2021), a bibliometric analysis was conducted to examine the evaluation of urban sustainability on a global scale. The analysis was based on data obtained from the Web of Science spanning the period from 1991 to 2020.[20] Wiedmann and Allen (2021) did a bibliometric literature study on the relationship between cities and the Sustainable Development Goals (SDGs) spanning the years 1990 to 2020, utilising data obtained from the Web of Science. The researchers reached the determination that in order to enhance the significance of monitoring Sustainable Development Goals (SDGs) and evaluating cities for the purpose of designing sustainable urban lifestyles, it is necessary to employ benchmarking methods that consider planetary boundaries, social thresholds, and consumption-based accounting (footprint). [21] The motivation behind the "localization" of the Sustainable Development Goals (SDG) as discussed by Fox and Macleod (2021) stemmed from an action research project conducted in the city of Bristol. Schraven et al. (2021) conducted a comprehensive bibliometric analysis on 35 city labels sourced from Scopus, spanning the years 1990 to 2019. The objective of the study was to examine the occurrences and associations of these city labels in the context of sustainable urban development.[22] Engström et al. (2018) argue that the evaluation of potential global impacts resulting from cities' Sustainable Development Goal (SDG) initiatives is of utmost importance.[23] Masuda et al. (2021) developed an analytical framework to support the integration of the Sustainable Development Goals (SDGs) at the local level.[24] This framework was subsequently implemented in the regions of Shimokawa and Kitakyushu. Metropolitan regions have a crucial role in the context of globalisation, as evidenced by the findings of Roy et al. (2022), who conducted recent research highlighting the interdependencies between globalisation and the utilisation of environmental resources.[25] Singh et al. (2021) conducted a comprehensive analysis of municipal plans, grey literature, and peer-reviewed research in order to identify potential strategies for climate change adaptation in 53 Indian cities with populations above one million individuals. [26] The achievement of sustainability remains a distant goal, as indicated by the fact that significant proportions (67%) of these adaptation measures are currently in the process of being implemented. While the concepts of "smart city" and "smart growth" were initially coined in the United States, there is an increasing level of concern among businesses, governments, organisations, and academic institutions over these concepts. Undoubtedly, the implementation of globalisation and trade liberalisation policies by many nations has expedited technical progress and elevated worldwide consumption, both of which exert a direct influence on corporate productivity. The transformations in business transformation have had a substantial impact on urban development.

The study conducted in 2017 by Margarita, and his colleagues examines the potential of smart city practises and tools in facilitating ecologically sustainable urban growth. Further investigation is required to enhance comprehension of the correlation between intelligent and sustainable urban areas, with a particular focus on pragmatic applications that could provide valuable insights into the topics, design principles, and classifications under consideration.[27] The objective of this study is to address the existing gap in research. Additionally, this study explores the potential of these applications in supporting the implementation of the "zero vision" strategy, a complex problem within the framework of smart cities. Richard (2012) has developed a thorough and user-friendly set of guidelines for the application and evaluation of structural equation models (SEMs). Acquiring knowledge and employing Structural Equation Models (SEMs) in research necessitates a comprehensive comprehension of the intricate statistical methodologies that underpin them, in a manner that harmonises with the fundamental principles, ideas, and hypotheses that researchers aim to investigate. [28]There is indeed substantial backing for the expansion of public discourse and the facilitation of stakeholder endorsement for the sustainable transport paradigm, as highlighted by David Bannister (2008). Active and assertive participation from all parties would yield greater success in the realm of persuasion compared to the typical approach of passivity.[29] Therefore, it is imperative for the interconnected disciplines of advocacy, engineering, public health, ecology, land use, transportation, and urban affairs to form inclusive alliances that encompass a diverse range of experts, scholars, professionals, decision-makers, and advocates. The absence of partnerships undermines the credibility of discussions pertaining to sustainable transport. Tania (2020) Facility accessibility emerges as a vital prerequisite in the development of sustainable smart cities inside emerging nations. The development of the Smart Sustainable City Development indicator (SSCDI) has been undertaken for three smart cities located in India. The index was built in a hierarchical manner, incorporating many indices that encompass social, economic, environmental, cultural, and lifestyle factors. [30]The purpose of this index is to evaluate the performance of the three case study towns by analysing the results of many variables. Developing nations have the potential to employ the South-South Cooperation for Sustainable Urban Development Initiative (SSCDI) as a conceptual framework for the purpose of strategizing and assessing their sustainable urban development endeavours. Ernest Boakye-Dankwaa, et al. (2018) In contrast to seniors residing in Brisbane, those from Hong Kong reported experiencing a higher level of accessibility to various places and engaging in a significantly greater number of minutes dedicated to walking. The proportion of older persons who possessed the ability to travel shorter distances and had access to a diverse range of locations shown notable disparities across different cities. [31] According to Selena Candia (2019), the consideration of urban safety and security should be interconnected with the concept of sustainable transportation. The authors established a connection between the notions of security, safety, and sustainability. In contemporary times, the focus on urban safety and security predominantly revolves around addressing the issue of traffic accidents, with an emphasis on innovative and imaginative approaches.[32] While the latter aspect has utmost importance, it is imperative to exercise caution in order to avoid neglecting a comprehensive strategy towards ensuring security and safety. Several variables can influence the perceived level of safety in a given location, including the crime rate, social instability, and environmental degradation. The purpose of this study is to propose a novel method that takes into account a comprehensive understanding of the urban safety and security issue inside the Sustainable Urban Mobility Plan (SUMP). The present study employs a methodological approach to examine the current status of the Sustainable Urban Mobility Plans (SUMPS) toll system, utilising the SWOT (Strengths, Weaknesses, Opportunities, and Threats) framework. Ester (2006) employed multilevel confirmatory factor analysis to develop the measurement models for the NEWS and NEWS-A. A total of five factors were identified at the block group level, while six factors were identified at the individual level. There exists a favourable

correlation between walking and various factors such as the presence of diverse destinations, residential density, pedestrian infrastructure, aesthetic appeal, traffic safety, and crime rates. There was a correlation observed between walking behaviour and factors such as residential density, the presence of mixed destinations, and aesthetic qualities.[33]

According to Daniel (2018), the concept of smart and sustainable cities has garnered significant attention in recent years, primarily due to the severe implications of climate change. Assessing smart and sustainable cities presents a formidable task due to their inherent complexity, dynamic nature, and intricate characteristics. The implementation of contemporary monitoring and evaluation approaches to facilitate evidence-based governance, urban planning, and policymaking in diverse urban contexts poses significant challenges.[34] This study integrates the concept of knowledge-based development with strategic and sustainable urban planning in order to tackle this issue. The concept of "knowledge-based development" is characterised by its emphasis on knowledge as the fundamental building block of the development process. In a study conducted by Shay-Wei Choon (2011), the selection of sustainable development indicators is inherently linked to the assessment of a sustainable urban environment. Despite the intricate interdependencies among sustainable development concerns, Malaysia is currently deficient in its implementation of comprehensive projects that amalgamate several metrics from different sectors to establish an integrated index. [35] In order to ascertain the optimal number of indicators required for index construction, a comprehensive evaluation of several contemporary indices and indicators has been undertaken. The objective of this article is to establish a comprehensive framework consisting of criteria, measurements, and indices that can be utilised to assess the level of sustainability in the major cities of Malaysia. The primary emphasis of this study revolves around the state indicators, for which an indicator framework has been developed. A selection of thirty indicators was made based on their availability and rationale. Based on the findings, the indices' scores exhibit a range between 0.45 and 0.72. Frank Chuanga conducted a study in 2020 and the objective of sustainable development is to establish a long-term interaction between individuals and the environment. Nevertheless, it is vital to examine the rationale behind our decisions, comprehend the intricate dynamics of social and natural environments, and adapt our lifestyles accordingly. The importance of addressing climate change necessitates a focus on sustainable mobility.[36] Consequently, we expand the notion of worldviews to encompass thinking and cognition within the realm of transportation. In this study, we want to examine the correlation between three distinct worldviews, namely individualism, hierarchy, and egalitarianism, and individuals' attitudes towards sustainable mobility. To achieve this, we employ the theoretical framework of Cultural Theory and analyse data obtained from the British Social Attitudes survey, which encompasses a sample size of 1,120 participants. Initially, the process of factor analysis is employed to extract the three distinct British worldviews or lifestyles. Antonello (2020) activity of transporting individuals and goods holds significant importance in terms of sustainability due to its substantial energy use. The adoption of technology, such as electric vehicles (EVs), and the subsequent monitoring of their usage, is customary practises in the realm of electric mobility concerns. In order to make informed judgements, it is necessary to conduct a quantitative ex-ante evaluation of transport services with regards to trip demand.[37] The objective of this study is to propose a decision-making framework that facilitates the optimisation of specific transport services while simultaneously decreasing reliance on renewable energy sources. Transport System Models (TSMs) constitute the fundamental framework for the development of transport networks that integrate electric vehicles. The impact of neighbourhood architectural form on community sentiment was studied by Sarah French et al. (2013) in Perth, Western Australia. There was a prevailing belief that the presence of pedestrian-friendly infrastructure in a neighbourhood would contribute to the enhancement of communal bonds among its residents. The present study employed multivariate linear regression models to examine the associations between walking behaviour and the perception of community. Ultimately, these models incorporated a comprehensive assessment of both objective and subjective attributes of the community. The perception of community was found to have a favourable association with walking as a means of transportation and favourable evaluations of the neighbourhood's overall quality.[38] However, a negative relationship was observed between residential density and the sense of community. According to Leal Filho (2017), the Sustainable Development Goals (SDGs) offer a unique opportunity to revive the worldwide research focus on sustainability. The importance of incorporating sustainable development ideas and practises cannot be emphasised, as they have wide-ranging benefits for policy-making, cities, regions, the international business community, and enterprises in general. Despite the progress made in scientific discoveries, humanity has persistently pursued the expansion of knowledge and utilisation of natural resources.[39]

Several notable research gaps have been identified in the field. Firstly, there is a lack of studies that utilise the complete SDG framework for examining urban sustainability. Secondly, the majority of research, excluding SDSN reports, focuses on only one or a few SDGs. Thirdly, a significant portion of studies on urban sustainability concentrate on a singular topic, such as climate change. Fourthly, prevailing analyses are predominantly employed in existing studies, neglecting the incorporation In light of these limitations; our objective was to conduct comprehensive research that could address all of these areas, despite the current lack of data in the analysis of urban Sustainable Development Goals (SDGs).

Materials and methods

In this review, we adhered to the guidelines proposed by Moher (2009) and Tranfield, Denyer, and Smart (2003) on the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA) criteria. [40][41] The acquisition of secondary data was expedited through comprehensive examination of pertinent scholarly articles, conference presentations, and digital resources. After conducting a comprehensive search using a range of keywords and themes connected to sustainable development (SD), relevant resources were identified in the databases of Elsevier, Web of Sciences, and Scopus. Consequently, a total of 1473 papers were identified. After conducting a comprehensive evaluation of all the submissions, a total of 61 papers that specifically address the topic of sustainable cities and communities were chosen. The papers that were chosen for publication were featured in different academic journals, encompassing a range of disciplines such as management, engineering, and urban studies. This phenomenon demonstrates the interdisciplinary appeal of smart cities among scholars. The discussion revolved around the aims of sustainable development, which comprise ecological, social, and financial sustainability, as well as the relationship between development and sustainability. The search was conducted without imposing age constraints to underscore the significance of materials that make notable contributions to the current discourse on sustainable development,

irrespective of their age. In order to uphold the precision and growing significance of the subject matter, meticulous attention was given to integrating a significant body of current academic research. The research design employed in this study is characterised as exploratory, primarily centred on conducting a comprehensive literature review. The primary objective of this study is to elucidate the interrelationships between environmental sustainability and smart cities through an exhaustive analysis of existing literature. Moreover, a diverse range of scholarly publications have been referenced to collect data for the research, which is of a qualitative nature and involves a systematic examination of the literature. A comprehensive analysis was conducted on a corpus comprising *sixty one* significant literary works. The statistical software tool R will be utilised for the analysis of the literature. The objective of this study is to provide a thorough examination of existing academic literature focused on the notion of smart cities and their potential contributions to sustainable development. An endeavour was undertaken to create a word cloud encompassing the frequently utilised terms pertaining to the advancement of smart cities and sustainability.

Books that lack relevance to the topics of sustainability and development were excluded. In order to minimise the risk of neglecting significant scholarly works, a comprehensive evaluation of each citation within the selected articles was conducted to identify essential resources related to the topic at hand. A crucial aspect of the review process entailed examining multiple sources, including scholarly papers and articles, in addition to their respective titles and abstracts. The examination contained items that satisfied predetermined criteria for inclusion and exclusion, and were deemed pertinent to the subject matter under investigation. The study's inclusion criteria comprised three essential components: relevance, authority, and currency. [42] Relevance refers to the extent to which knowledge has contributed to the discourse surrounding sustainable development (SD). In contrast, the concept of authority pertains to the extent to which the text has been subjected to evaluation by peers, professional editing, or publication through a reputable source. Nevertheless, it is worth noting that the inclusion of citations underscores the continued importance of the currency notion within the discourse around sustainable development. This is one of the factors that led to its selection. [42] A comprehensive search yielded a total of 1154 citations based on the initial search parameters. Following the screening and eligibility methods described before, a total of 61 publications were chosen for complete retrieval of their full texts. Out of the total, a total of 26 papers were identified to meet the final inclusion criteria, as illustrated in Fig. 1.

Selection of material

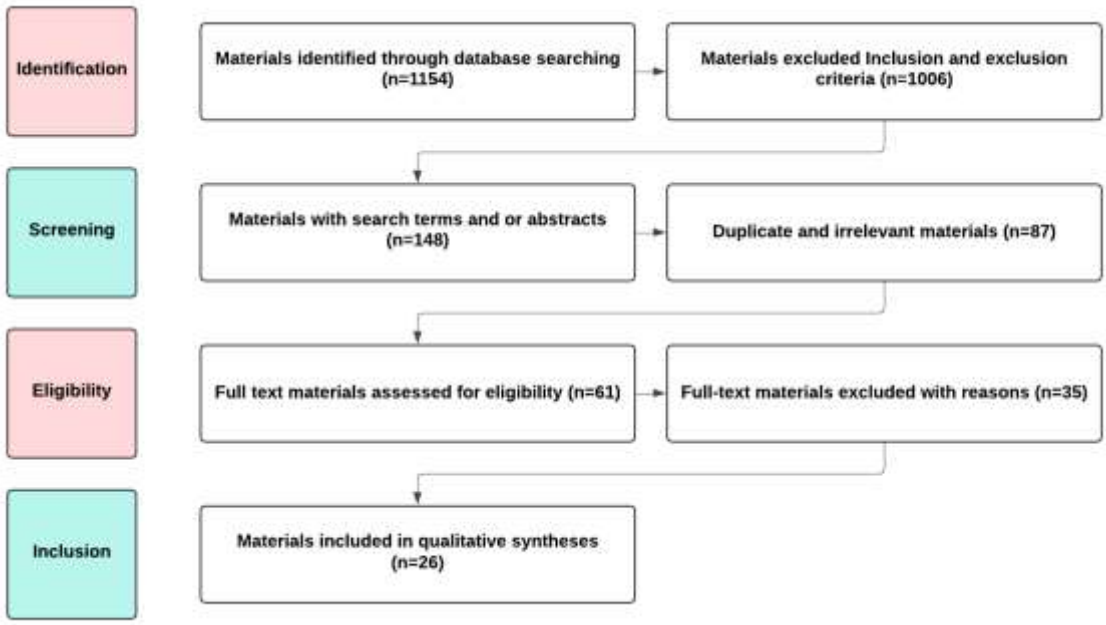

Fig. 1

The data was evaluated with a blend of qualitative content analysis methodologies, as outlined by Leshan (2012), Mayring (2000), Hsieh and Shannon (2005), following a thorough examination of each text to extract the relevant information. The resources were organised based on topical categorization and written notes rather than use coding techniques. The relevant information was consistently restated by utilising the specified terminology and phrases provided earlier as a reference.[43][44][45] The technique of summarization was employed by individuals to reduce unnecessary information and inconsistent discoveries, with the aim of identifying the core findings related to each perspective of incoming data. In order to prevent any oversight on the rationales behind excluding particular elements from each summary, the preparatory phase entailed meticulously documenting the justifications for each omission. A more concise, coherent, and user-friendly representation was generated by integrating, linking, and condensing the material derived from the summaries. Considerable effort was dedicated to preserving the integrity of the data by carefully combining the different themes. The result produced a concise and organised summary of the relevant academic literature about the main issues, as described in the following section.

Analysis

The R programming language's Text Analytic function was employed to perform a comprehensive analysis of the literature review. According to Fox (2009), the aforementioned open-source data analysis tool offers benefits for both qualitative and quantitative research. The R-Studio programme evaluated a corpus consisting of 27,227 words as part of the text data extraction process. In the present analysis, the removal of special characters, stop words, and blank spaces was implemented.[46] The software made an effort to produce a word cloud, a graphical depiction of frequently used terms associated with the subject matter. The dataset provided was applied to construct the word cloud depicted in Figure 2. Furthermore, the dataset was juxtaposed with terminologies sourced from the internet, encompassing both positive and negative connotations. According to the findings of the comparison analysis, the literature review text contained a total of 167 keywords categorised as negative terms and 76 keywords categorised as positive phrases. Upon conducting an extensive analysis of many scholarly sources, it has been ascertained that certain phrases exhibit consistent usage across academic literature, news articles, and TED conference presentations. The study yielded a compilation of significant terms, encompassing "smart city," "development," "sustainability," "technology," and "government." An in-depth analysis of the text suggests that the construction of an effective smart city necessitates the prioritisation of urbanisation, technology-driven services, efficient governance, and public welfare by governmental authorities.

Frequently used words

Fig. 2

After conducting an extensive review of various scholarly sources, it becomes apparent that theoretical frameworks are predominantly utilised in India to enhance the implementation of smart cities, particularly in the realm of digitalization. Nevertheless, it is imperative to acknowledge that the attainment of effective governance and the conversion of a city into a smart entity heavily rely on the establishment of prosperous public-private collaborations. The progress of smart cities is reliant on the establishment of infrastructure, particularly in developing countries like India, where densely populated urban regions provide significant obstacles. The task of ensuring widespread availability of modern comforts and necessities poses a substantial barrier in the formulation of policies and establishment of governmental institutions. During the analysis of the aforementioned research publications, the following significant elements pertaining to smart cities were identified in the domain of infrastructure.

1. **Infrastructure technology for drivers** refers to the physical and technological systems and facilities that support and improve the experience and safety of drivers on the road.

This infrastructure includes:

1. Roads and Highways
2. Traffic Signals and Signs
3. Street Lighting
4. Parking Facilities
5. Gas Stations and Service Areas.
6. Toll Roads and Electronic Toll Collection7. Intelligent Transportation Systems (ITS)8. Road Safety Measures 9. Emergency Services

These infrastructure elements work together to create a safe, efficient, and convenient road environment for drivers, promoting smooth traffic flow and reducing the risk of accidents.

2. **Alternative routes** refer to alternative paths or detours that drivers can take to reach their destination instead of following the usual or designated route. These routes can be chosen to avoid traffic congestion, road closures, accidents, or other obstacles that may hinder or delay travel.

There are several ways to find alternative routes:

1. GPS Navigation Systems:
2. Online Mapping Services
3. Local Knowledge
4. Traffic Reports
5. Apps and Community Platforms

When considering alternative routes, it is essential to evaluate factors such as distance, time, traffic conditions, road conditions, and personal preferences. Alternative routes may take longer or involve challenging terrain, so drivers should consider the trade-offs before choosing an alternative path.

3. **Walkability"** refers to the measure of how suitable an area or neighborhood is for walking. It is the extent to which a location is pedestrian-friendly, with features and infrastructure that make walking a practical and enjoyable mode of transportation.

Walkability is typically assessed based on factors such as The presence of sidewalks, crosswalks, proximity to amenities, safety, connectivity of streets, and overall pedestrian infrastructure. A walkable neighborhood is one where people can easily walk to everyday destinations such as shops, schools, parks, and transit stations. On the other hand, areas with limited or no pedestrian infrastructure, high traffic volumes, long distances between destinations, or unsafe conditions may have low walkability.Walkable neighborhoods are considered more livable, as they offer convenience, environmental sustainability, and better public health outcomes by encouraging walking as a mode of transportation

4. **Attractive environmental quality** refers to the overall aesthetic appeal and visual attractiveness of a given environment. It encompasses various aspects that contribute to the beauty and desirability of a particular space, such as landscaping, architecture, cleanliness, and overall design.
5. **Infrastructure transportation and services** refers to the physical structures and systems that support the movement of people, goods, and vehicles within a transportation network. It includes various elements such as roads, highways, bridges, tunnels, railways, airports, seaports, public transportation systems, and related facilities.
6. **OVERALL SAFETY**

SAFETY:

Safety in the context of infrastructure transportation refers to measures and practices put in place to protect the well-being and security of individuals using the transportation system. It encompasses various aspects, including

1. Road safety
2. Public transportation safety
3. Security against accidents and incidents
4. Emergency preparedness.

TRANSIT SAFETY: Transit safety refers to the measures and practices implemented to ensure the security and well-being of passengers using public transportation systems. These systems can include buses, trains, trams, subways, ferries, and other modes of public transportation.

Includes

1. Security personnel and surveillance,
2. Lighting and signage,
3. Maintenance and inspections,
4. Training and qualification,
5. Passenger information and education,
6. Accessibility and inclusivity,
7. Emergency preparedness

7. **Alternative transportation infrastructure** refers to any form of infrastructure that supports and encourages the use of sustainable and alternative modes of transportation, such as walking, cycling, and public transportation, as an alternative to private cars. It includes the

design and development of various types of infrastructure, including roads, pathways, bike lanes, pedestrian zones, transit systems, and parking facilities.

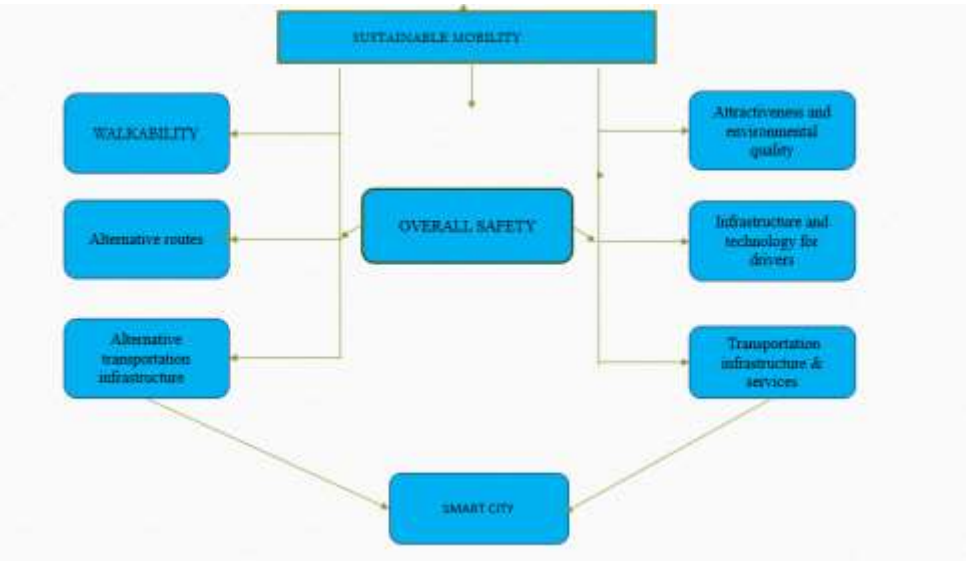

Fig.3

The concept of an appealing environmental quality pertains to the whole visual and aesthetic allure of a particular region. The visual attractiveness and desirability of a particular area are determined by a range of factors that collectively constitute the concept of spatial aesthetics. The aforementioned attributes encompass a range of factors, such as the general layout, level of tidiness, architectural elements, and the quality of the surrounding outdoor environment. An environment characterised by elevated levels of attractive environmental quality is one that exhibits effective maintenance, thoughtful design, and aesthetically pleasing aesthetics. Urban settings encompass a diverse array of components, such as well maintained green spaces, aesthetically pleasing architectural structures, publicly accessible art displays, and a harmonious integration of both natural and artificial elements. Furthermore, factors such as cleanliness, the absence of waste or environmental contamination, and well-maintained infrastructure can enhance the attractiveness of a particular environment. Favourable environmental circumstances can lead to a multitude of advantages (Fig.4). Enhancing the overall aesthetic attractiveness of the community, both for residents and tourists, contributes to the formation of a positive perception and fosters a sense of communal pride. Empirical research has demonstrated that individuals' mental well-being can be enhanced through exposure to aesthetically pleasant situations, leading to increased levels of happiness and overall life satisfaction. Moreover, it is crucial to bear in mind that an aesthetically pleasing environment possesses the capacity to allure investment, tourists, and foster economic growth. The underlying cause for this phenomenon is that individuals have a natural inclination to be drawn towards environments that are meticulously cared for and aesthetically pleasing.

Source: Central Pollution Control Board, 2011.

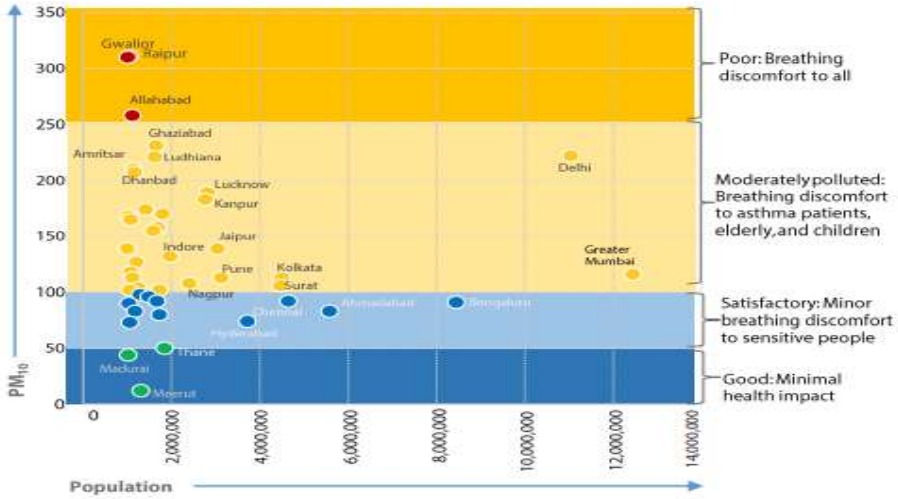

Fig. 4

Conclusion

The global demographic composition has already experienced substantial transformation. The proportion of old individuals among the demographic composition is seeing rapid growth. Urbanisation is a subject of considerable global concern, eliciting widespread fear across various regions. The participation of women residing in urban areas in the employment market is progressively increasing. The aforementioned alterations have exerted a substantial impact on the dynamics inside families, as well as the demographic composition of these households. There is a need for an innovative social protection plan that optimises social benefits, reduces the financial burden on the government, and safeguards ecological resources. It is imperative to consider the requirements of the ageing population while making adjustments to the work market and infrastructure. Further investigation is required to have a deeper understanding of the intricate interplay among the five primary dimensions of sustainable urban development, namely social, economic, environmental, governance, and peace and security. The recognition of pertinent concerns and the acquisition of necessary resources are crucial in establishing the groundwork for smart city concepts, hence facilitating the realisation of smart city objectives in India and other emerging economies. Based on the ongoing discourse and scholarly investigations, it has been ascertained that the attainment of a sustainable smart city necessitates the alteration of socio-behavioural patterns, the cultivation of environmental consciousness, and the assurance of economic viability. The primary determinant of a city's level of intelligence is its access to fundamental utilities, encompassing electricity supply, sanitary infrastructure, potable water, and a well-established transportation network comprising roadways, railways, and air travel facilities. Greater emphasis should be directed towards the formulation and implementation of urban policies that specifically target the socio-economic and environmental implications associated with the phenomenon of urban ageing. These policies should encompass a wide range of areas, including but not limited to social protection, education, employment, health, food security, housing, elderly care, and welfare services. There is a requirement for the development of indexes that specifically address the domains of sustainable cities and urban ageing. These indexes are crucial in enabling effective planning, implementation, monitoring, evaluation, and research endeavours related to the urban ageing population and sustainable cities. The implementation of policies and programmes is crucial in facilitating the continued involvement and participation of older individuals in the workforce, community development, and decision-making procedures. Nations should fully capitalise on this exceptional opportunity.

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