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COMPACT URBAN DEVELOPMENT AND SUSTAINABLE DEVELOPMENT: A LEGAL STUDY

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ABSTRACT
Compact urban development has emerged as a crucial strategy in the pursuit of environmental sustainability amidst the backdrop of rapid urbanisation. Urbanisation stands as a defining trend of the 21st century, with more than half of the global population now residing in urban areas. While cities offer economic opportunities and social amenities, they concurrently exert significant strains on the environment, contributing to pollution, resource depletion, and climate change. In response to these pressing challenges, the concept of compact urban development has ascended as a salient strategy to reconcile urban expansion with environmental sustainability. This research endeavour delves into the intricate relationship between compact urban development and environmental sustainability. Leveraging a comprehensive synthesis of literature this study scrutinises the environmental advantages, hurdles, and policy ramifications associated with compact urban development. Through an interdisciplinary approach, the study elucidates the potential of compact urban development to mitigate environmental degradation, curtail resource consumption, and fortify cities against the impacts of climate change. This research endeavour seeks to interrogate the role of compact urban development in advancing environmental sustainability. By scrutinising the environmental advantages, challenges, and policy implications entailed by compact urban development, this study endeavours to elucidate its potential as a transformative paradigm in urban planning and design.

KEYWORDS: *Compact Urban Development; Environmental Sustainability; Urban Areas; Urban Expansion..*

1. INTRODUCTION

Since the early 1990s, compact cities have emerged as prominent global models of sustainable urbanism. In the European Union Green Paper on the Urban Environment, the compact city model was heralded as the most sustainable approach to urban development. Recent reports and policy papers from UN-Habitat have similarly underscored the positive impacts of the compact city model on resource efficiency, economic vitality, public health, social cohesion, and cultural dynamics[1].

The compact city model is posited to promote sustainability through various mechanisms, including the reduction of travel distances and commute times, diminishing reliance on automobiles, lowering per capita energy consumption rates, minimising the use of building and infrastructure materials, mitigating pollution, preserving diversity in workplace options, service facilities, and

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[1] UN-Habitat, UN-Habitat Hosts Global Meeting on Planning Compact Cities, UN-Habitat (Oct. 21, 2021), https://unhabitat.org/un-habitat-hosts-global-meeting-on-planning-compactcities#:~:text=UN%2DHabitat%20has%20identified%20Planned,density%20for%20local%20development%20and.

social interactions, and curbing the loss of green and natural spaces. These outcomes are attributed to the emphasis on intensifying development and activities, imposing limits on urban expansion, promoting mixed land use and social integration, and prioritising public transportation and high-quality urban design. In essence, the compact city capitalises on the benefits of agglomeration and leverages a diverse array of environmental, economic, and social advantages through strategic planning and development initiatives. The advantages of the compact city, as evidenced by research conducted worldwide, are not unequivocal or guaranteed to materialise as intended outcomes. This aligns with the concerns raised by critics of the compact city model, which must be addressed to enhance its acceptance and adoption. Primarily, these concerns revolve around the unforeseen repercussions and unintended consequences associated with the compact urban form, encapsulated within the realm of "wicked problems" in urban planning. This term has gained prominence in the analysis of urban policy following the integration of sustainable development principles into urban planning since the early 1990s.

Given the current context of unprecedented urbanisation and heightened global uncertainty, cities in developed countries may face greater challenges in transitioning towards more sustainable configurations. The projected 70% urbanisation rate by 2050, as outlined by the United Nations[2], underscores the pivotal role of urban environmental sustainability in bolstering global resilience amidst impending changes. This indicates that city administrations in developed nations will confront substantial hurdles related to environmental, economic, and social sustainability due to the complexities arising from urban expansion. These challenges encompass heightened energy consumption, pollution, inadequate management of urban infrastructures and amenities, deficient planning processes and decision-making mechanisms, substandard living and working conditions, saturated transportation networks, chronic congestion, social inequity, and socioeconomic disparities[3]. In essence, urban expansion engenders a myriad of issues that threaten the sustainability of cities by exerting immense pressure on urban systems and depleting natural resources. Moreover, cities in developed countries are poised to experience a further decline in average densities due to sprawling development patterns, thereby diminishing the capacity of city-regions to sustain themselves unless they embrace and actively pursue more compact development strategies.

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2 United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Urbanization Prospects: The 2014 Revision*, (ST/ESA/SER.A/366), https://population.un.org/wup/Publications/Files/WUP2014-Report.pdf

3 Simon Elias Bibri & John Krogstie, *Smart sustainable cities of the future: An extensive interdisciplinary literature review* 31 SC&S 182-212 (2017)

1.1 OBJECTIVES OF STUDY

The objectives of the present research are -

1) To assess the impact of compact urban development on natural environment as compared to urban sprawl.
2) To assess the impact of compact urban development on sustainable development.
3) To elaborate the impact of compact urban development on health, infrastructure and community.
4) To evaluate the existing urban planning policies and their effectiveness in promoting sustainable development.

2. RESEARCH METHODOLOGY

The researcher has employed Doctrinal method of research. A comprehensive study of legal texts, scholarly articles, policy documents and legal doctrines applicable and relevant to the Compact Urban Planning and Sustainable Development has been done by the author.

3. DEFINITION & PRINCIPLES OF COMPACT URBAN DEVELOPMENT

The concept of the compact city is often associated with the work of Dantizng and Saaty, who aimed to develop a rational model for urban development amidst the escalating challenges of urbanisation in the United States.They outlined three primary attributes of the compact city as follows: (i) concerning urban structure, it features densely populated residential zones, decreased dependence on automobiles, and distinct delineations from adjacent areas; (ii) in terms of spatial organisation, it showcases mixed land utilisation and a wide array of lifestyle options; and (iii) socially, the compact city embodies principles of social equity, self-reliance in daily activities, and autonomous regional governance.Their proposed model envisioned the city's growth in the form of concentric zones, including the core, core edge, inner residential area, mid-plaza, and outer residential area. In addition to the master plan, attention was also directed towards the planning of transportation systems and technical infrastructure.[4] It is important to note that the model described above has not been put into practice, and the contemporary concept of a compact city lacks precise definition and has been subject to numerous interpretations.

The concept is applicable to both new urban development and retrofitting projects, including:

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[4] Dantzig, G.B. & Saaty, T.L., Compact City: A Plan for a Liveable Urban Environment, W.H. Freeman: San Francisco, 1973.

- Infill or brownfield development: Dense, infill developments capitalise on vacant or underutilised properties within already developed areas. Redeveloping brownfield sites offers opportunities to repurpose both the land and existing infrastructure, such as roads, underground utilities, and street lighting.
- Cluster development: Establishing minimum housing unit standards per land parcel can curtail the sprawl of smaller towns and villages. In less densely developed neighbourhoods, policies encouraging accessory housing units can mitigate the necessity for urban expansion.
- Compact development coupled with mass transit: Encouraging density growth along mass transit corridors promotes compact development while enhancing access to public transportation.

The compact city concept is anticipated to contribute to the promotion of Green Growth, which has emerged as a fundamental policy objective for numerous developing nations. Green Growth aims to foster economic progress while safeguarding natural resources and ecosystem services vital for our well-being. Cities represent primary arenas where Green Growth objectives can be pursued effectively. Indeed, cities confront various obstacles in realising Green Growth, such as urban sprawl, greenhouse gas emissions, and enduring difficulties in sustaining urban economic development as national economies recover from recent economic downturns. The compact city concept seems particularly suited to address these challenges.

Since the release of the 1987 Brundtland Commission Report "Our Common Future," local authorities in developed nations have increasingly adopted strategies promoting sustainable urban development. The concept of the compact city has gained significant traction as a fundamental element in shaping liveable and sustainable urban environments, thus emerging as a globally sought-after urban model. Within the compact city framework, green spaces are acknowledged for their crucial role in supporting or enhancing the high-quality densification of urban areas. Consequently, the practice of integrating greenery into cities, particularly the enhancement of densely populated urban zones with vegetation, has become a prevalent approach within the urban sustainability discourse. As a result, urban green spaces are undergoing a reassessment of their significance and function within the urban fabric, reshaping their design and purpose in alignment with the principles of the compact city concept.

Sustainability is a paramount consideration across diverse aspects of human existence, spanning industrial production, healthcare, finance, economics, and more. This expansive term encompasses various domains. The authors have undertaken a concise examination of several definitions. Sustainable agriculture, for instance, is depicted as a system capable of progressing

indefinitely towards enhanced human benefit, increased resource efficiency, and an ecological equilibrium conducive to humans and numerous other species.[5] Sustainable development pertains to the advancement of a society in which the burdens of progress are not shifted onto future generations, or at the very least, efforts are made to offset such burdens. The most prominent and universally accepted definition of sustainable development is given by the Brundtland Commission, "Sustainable development is a development that meets the needs of the present without compromising the needs of future generations to meet their own needs"[6]. The fundamental elements of sustainable development consist of social sustainability, economic sustainability, and environmental sustainability. In diverse contexts, sustainable development primarily serves as a means to ensure the equitable availability and accessibility of existing resources to all members of society.

Compact development seeks to optimise land utilisation by adopting higher-density planning strategies. Given the swift pace of urbanisation, numerous emerging cities are embracing compact development as a strategy to effectively manage limited resources essential for economic and social endeavours. Typically, compact development is complemented by mixed-use planning, integrating diverse functions such as residential, commercial, and retail spaces. Situated densely, a well-conceived mix of built infrastructure has the potential to minimise reliance on automobiles and foster pedestrian-friendly environments. However, without meticulous planning and coordination, the intensified density associated with single-use development may lead to challenges and dissatisfaction stemming from inadequate utility services.

3.1. ELEMENTS OF COMPACT URBAN DEVELOPMENT

The urban layout comprises recurring elements which, when structured according to principles of urban consolidation, can potentially enhance the sustainability of cities. Below are the components-

3.1.1 COMPACTNESS

Compactness of the built environment, recognised as a fundamental approach for attaining sustainable urban configurations, encompasses qualities such as urban contiguity, connectivity, and agglomeration. This implies that future urban development concerning changes in land use should occur in proximity to existing urban areas and structures. Thus, it advocates for the maximisation of

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5 Harwood, R., *A history of sustainable agriculture. Sustainable Agricultural Systems,* eds C.A. Edwards, R. Lal, P. Madden, R.H. Miller & G. House, Soil and Water Conservation Society: Ankeny, pp. 3–19, 1990.

6 World Commission on Environment and Development (WCED), Our Common Future, Oxford University Press: Oxford, 1987.

available building zones to facilitate future structural growth within established urban regions through inward development strategies. This concept aligns with the intensification of the built environment, a key tactic for achieving compactness by optimising land use efficiency through densification of development. The benefits of compactness include the preservation of rural landscapes, decreased reliance on car travel leading to reduced fuel consumption and pollution, bolstered public transportation, promotion of walking and cycling, improved access to amenities, streamlined utility and infrastructure provision, and the revitalisation of urban spaces[7]. The compact city concept is closely associated with the term "urban intensification,"[8] denoting various processes aimed at increasing urban density. Rural preservation stands out as a prominent and widely recognised counterpart within the framework of compact city planning.

3.1.2 DENSITY

It involves the ratio of population or housing to land area, where the concept of viable thresholds is also significant. This ratio determines whether the population of a given area is sufficient to support the necessary interactions required for specific urban functions at particular densities. Density typically serves as a crucial factor in the sustainability of cities. However, achieving a compact city involves more than simply increasing density, whether it's at a single scale or across various spatial levels; it also requires effective planning to achieve an overall more condensed urban form. This entails strategic urban development aimed at realising higher densities through densification. To plan for the city's long-term growth, it's essential to assess the potential for increased density within intermediate urban areas. Dense settlements are envisioned to emerge around strategic hubs that integrate various functions and populations, creating vibrant living spaces active throughout the day. These areas encompass a mix of functions, including residential, commercial, cultural, and recreational facilities, fostering a dynamic urban environment, complemented by excellent access to public transportation and well-connected cycling paths linking them with the broader city, thereby facilitating mobility. Overall, the objective of the densification strategy is to establish high-density nodes to promote public transportation usage, reduce reliance on cars, and curb urban sprawl. Urban density serves as a critical factor in assessing a city's liveability in terms of its design. A significant rationale for increased density, and consequently enabling more people to reside and work in various parts of the city, is that it provides a broader foundation for services, retail, public transit, and other amenities.

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7 Elizabeth Burton, *Measuring urban compactness in UK towns and cities*, 29(2). ENV. & PLAN B 219, 219-250 (2002).

8 Jenks, Mike, Elizabeth Burton, and Katie Williams. 1996. *A sustainable future through the compact city? Urban intensification in the United Kingdom. Environment by Design* 1 (1): 5-20.

Consequently, a greater mix of uses can be established across numerous locations within the city, bringing more individuals closer to shops, services, and public transportation stops.

3.1.3 SUSTAINABLE TRANSPORT

Transportation services that account for both social and environmental impacts, striking a balance between mobility, safety, and access to environmental quality and neighbourhood liveability, are referred to as "sustainable transportation." To facilitate movement, reduce travel times and distances, enhance efficiency, and protect the environment, a multi-nodal transportation system is recommended. It stands as a crucial tactic for fostering sustainable urban environments. Sustainable transportation, particularly reliant on public transit, underpins the dense, diverse, and mixed-use characteristics defining the compact city, thereby ensuring environmentally conscious, economically feasible, and socially advantageous urban development. Within sustainable transportation frameworks, the public transit system encompasses both its physical infrastructure and the quality of services extended to the populace. Moreover, mobility management represents a softer approach adopted by public transportation authorities to enhance the efficiency and efficacy of existing infrastructure. These authorities bear the responsibility of constructing, enhancing, and maintaining various components of urban transportation infrastructure while fostering ongoing dialogues with businesses, universities, and citizens regarding optimal travel mode choices for daily needs and strategies to promote more sustainable travel behaviours.

3.1.4 MIXED LAND USES

This is an essential element emphasising the diversity of functions and locations within a neighbourhood, encompassing institutional, residential, commercial, industrial, and recreational aspects. The presence of mixed land uses can decrease the likelihood of car usage for commuting, shopping, and recreational purposes, as employment opportunities, retail outlets, and leisure amenities are situated in close proximity. Land use involves the arrangement of functions and activities in physical space, categorised into different groups. Recognised for its crucial role in fostering sustainable urban development, land-use mix refers to the variety and proximity of compatible land uses, encompassing residential, commercial, institutional, and cultural infrastructure associated with living, working, and the provision of services and amenities. Regarded as a preferred approach in sustainable urban planning and development, diversity, which aligns with land-use mix in terms of the range of land uses, encompasses factors such as building densities, housing options for diverse income levels, various housing types, job-housing balance, household demographics, cultural diversity, and age distribution, reflecting the socio-cultural context of urban

environments.[9] Both land-use and social mixes are integral components of planning and development strategies, aiming to foster vibrant and enduringly sustainable cities with a harmonious blend of social, economic, and environmental considerations. The growing population and significant immigration rates in the two cities underscore the need for additional housing and workplaces. This diverse population, active across the city and utilising public spaces such as streets, squares, and parks, relies on the availability of shops, services, and facilities. There exists a clear correlation between population growth, residential density, and mixed-use development. As population density increases, the supply of urban businesses and supermarkets expands, particularly within the inner city, strategic nodes, and local centers adjacent to the inner city.

3.1.5 DIVERSITY

Numerous planning methodologies such as new urbanism, smart growth, and sustainable development have embraced the concept of diversity, popularised by Jane Jacobs. According to Jacobs, in dense and diverse urban environments, people continue to walk for various needs, whereas reliance on cars becomes more prevalent in suburban and less diverse areas.[10] She argued that without diversity in development, uniformity in built structures often leads to unattractive and repetitive urban landscapes, a lack of housing across income levels, socioeconomic segregation, and mismatches between jobs and housing, exacerbating transportation issues, congestion, and air pollution.

3.1.6 GREENING

Greening serves as a fundamental design principle for sustainable urban environments. Green spaces encompass natural elements within urban settings, encompassing trees, grassy expanses, water features, flower beds, and rock gardens. The municipalities of Gothenburg and Helsingborg employ the concept of "green structure" in their planning endeavors, which entails integrating larger green areas, water bodies, coastlines, parks, agricultural land, and natural expanses into a unified framework. Green structure plans underscore the advantages and drawbacks associated with green and natural areas. The implementation of greening practices enhances the physical environment of urban areas by mitigating CO2 emissions and other pollutants, elevates the aesthetic appeal of urban landscapes, thus enhancing their attractiveness, contributes to shaping a positive urban image, boosts economic appeal, and aids in managing stormwater runoff. According to Beatley, a city earns the designation of being green when it fulfils certain criteria. Firstly, it

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[9] S. E. Bibri, "The anatomy of the data-driven smart sustainable city: instrumentation, datafication, computerisation and related applications," 6 Journal of Big Data 59 ,(2019)

[10] Jane Jacobs, *The death and life of great American cities,* 71 YALE L.J. 1597 (1961).

endeavours to reside within ecological limits. Secondly, it seeks to operate in harmony with natural systems. Thirdly, it strives for a circular rather than a linear metabolic approach. Fourthly, it promotes sustainable lifestyles. Lastly, it prioritises the enhancement of neighbourhood and community life, urban aesthetics, and overall quality of life.[11] Ultimately, Urban Greening initiatives aim to safeguard and enrich the natural diversity of the environment.

Considering the aforementioned points, the perceived benefits of the compact city concept are broadly linked to the economic, environmental, and social objectives of sustainability. However, it is evident that these three objectives are not always equally prioritised within the compact city framework. The development of compact cities should facilitate the establishment of a coordinated institutional framework to fully capitalise on the opportunities presented by sustainable development principles. Importantly, citizens should be empowered to participate in shaping the future of their communities. The appeal of a city is not solely reliant on economic prosperity; rather, attracting residents and enhancing liveability necessitates a comprehensive approach that balances social, environmental, and economic considerations.

4. BENEFITS & CHALLENGES OF COMPACT URBAN DEVELOPMENT

Compact urban development provides various environmental advantages that aid in establishing cities that are more sustainable and resilient. Through the reduction of carbon emissions, conservation of green spaces, optimisation of resource utilisation, and promotion of sustainable transportation, compact cities actively address environmental issues and cultivate healthier, more enjoyable urban settings. Adhering to the principles of compact urban development has the potential to yield substantial environmental enhancements and bolster the long-term sustainability of cities globally. Some of the benefits are discussed below-

4.1 BENEFITS OF COMPACT URBAN DEVELOPMENT

4.1.1 REDUCED CARBON EMISSIONS AND ENERGY CONSUMPTION

One major advantage of compact urban development is its capacity to reduce carbon emissions related to transportation. By concentrating growth in denser urban areas and fostering mixed-use neighbourhoods, compact cities encourage shorter travel distances and increased use of public transit, walking, and cycling. This leads to a decrease in the number of miles driven by vehicles and a consequent reduction in emissions from cars and trucks, thus improving air

[11] TIMOTHY BEATLEY, GREEN CITIES OF EUROPE, 215-224 (Timothy Beatley, 2012).

quality and lowering greenhouse gas emissions. Additionally, compact urban development supports the implementation of sustainable transportation infrastructure, such as dedicated bike lanes, pedestrian-friendly streets, and efficient public transit systems. These investments not only cut down on carbon emissions but also expand mobility options for residents, encouraging healthier and more active lifestyles.

Apart from decreasing carbon emissions from transportation, compact urban development can also result in substantial energy conservation in buildings and infrastructure. Greater population densities facilitate more effective utilisation of energy resources since shared utilities and facilities cater to a larger number of residents. Additionally, compact cities frequently emphasise energy-efficient architectural design and adherence to green building norms, which further curbs energy consumption in both residential and commercial structures. Moreover, compact urban development fosters the adoption of sustainable energy solutions, like district heating and cooling systems, rooftop solar panels, and green roofs. These advancements aid in minimising the carbon footprint of urban areas while boosting resilience to climate change and lessening reliance on fossil fuels.

4.1.2 PRESERVATION OF GREEN SPACES AND BIODIVERSITY

Compact urban development advocates for safeguarding green spaces by restraining urban sprawl and fostering infill development within already established urban zones. Through prioritising higher densities and diverse land uses, compact cities safeguard valuable green areas from development pressures and fragmentation. Moreover, compact urban development can support the establishment of green corridors and wildlife pathways linking fragmented habitats, thus fostering biodiversity preservation and bolstering ecological connectivity within urban environments.

4.1.3 EFFICIENT RESOURCE USE

Compact urban development encourages sustainable material utilisation by embracing practices like adaptive reuse, recycling, and waste minimisation. Through the repurposing of existing structures and materials, cities can diminish the need for fresh resources and cut down on waste generated during construction. Moreover, policies that advocate for sustainable procurement practices and the adoption of eco-friendly building materials play a crucial role in conserving material resources on a broader scale.Efficient resource management is central to compact urban development, providing a route to creating sustainable and resilient cities. Through maximising land use, advancing energy efficiency, preserving water, and reducing material consumption, compact cities can yield notable environmental advantages while

improving the quality of life for inhabitants. With urbanisation on the rise, adopting the principles of compact urban development is essential for establishing vibrant and resource-conscious urban landscapes.

4.1.4 PROMOTION OF SUSTAINABLE TRANSPORTATION

Compact urban development plays a central role in advancing sustainable transportation practices within cities. By concentrating growth in denser urban areas and cultivating mixed-use neighbourhoods, compact development encourages shorter travel distances and promotes the use of alternative modes of transportation such as public transit, walking, and cycling. This transition towards sustainable transportation not only alleviates congestion and enhances air quality but also aids in mitigating climate change by reducing greenhouse gas emissions linked to traditional car-centric lifestyles.

A fundamental strategy employed in compact urban development to foster sustainable transportation is the integration of effective public transit systems. By investing in dependable and accessible public transportation networks, cities can offer residents viable alternatives to private car usage, thus alleviating traffic congestion and diminishing reliance on fossil fuels. Moreover, compact urban development often incorporates principles of transit-oriented development (TOD), which involve situating residential, commercial, and recreational amenities within walking distance of public transit stations. This approach not only enhances convenience for commuters but also bolsters the vitality of urban hubs by cultivating lively, pedestrian-friendly environments. Compact urban development assumes a critical role in advocating for sustainable transportation practices by nurturing communities that are pedestrian-friendly, transit-accessible, and conducive to cycling. By incorporating principles of sustainable transportation into urban planning and design, compact cities have the capacity to cultivate urban environments that are not only more resilient and livable but also environmentally conscientious, catering to the needs of pedestrians, cyclists, and public transit users.

4.1.5 ENHANCED RESILIENCE TO CLIMATE CHANGE

Compact urban development offers a significant advantage concerning climate change resilience by decreasing susceptibility to extreme weather events. This is achieved through concentrating development in dense urban centers and avoiding expansion into vulnerable areas like floodplains and coastal zones, thus reducing exposure to hazards such as floods, storm surges, and heatwaves. Additionally, compact urban development enables the adoption of green infrastructure solutions such as green roofs, permeable pavement, and rain gardens. These solutions aid in absorbing stormwater, minimising runoff, and mitigating the effects of urban heat islands.

4.2. CHALLENGES OF COMPACT URBAN DEVELOPMENT

Compact urban development, despite its numerous advantages, also poses several hurdles that must be tackled for its successful execution:

4.2.1 Infrastructure Overload: Concentration of a large number of people in a dense geographical setup will not only push the infrastructure to its limits but, it will also prove to be costly.

4.2.2 Housing Inaccessibility: Compact urban development entails high density of individuals living in a pre-determined area. It means that a large number of people will be living in an area not meant for such large numbers giving the developers/builders the leverage to increase price of existing and new residential buildings thus making them unaffordable for low or middle income houses which can further lead to gentrification.

4.2.3 Loss of Open Spaces: One on hand Compact Urban Development aims at protecting green spaces but on the other hand it leads to reduction in open spaces. The main facet of this is to create highly dense areas, the creation of such areas shall further lead to reduction in open spaces.

4.2.4 Social Equality: Compact urban development might lead to social inequality as it plays by focusing on a particular area while paying attention to the needs of any other area. This might lead to inequality in access to transportation, finance, healthcare, education and other services to those who are not the residents of the said compact area.

4.2.5 Traffic Bottlenecks: High density population areas translate to traffic woes. Though compact cities are characterised as having a strong network of public transport at accessible rates, walkable pathways and dedicated cycle lanes for transportation and human movement but, it is not necessary that the people living inn such cities will choose these modes of transportation by ditching their personal vehicles. At some point the traffic management system of such cities is bound to fail when unburdened leading not only to excessive air pollution but reduction in the overall productivity.

4.2.6 Public Health Challenges: In compact cities maintaining public health may prove to be a big problem. Due to excessive noise and air pollution a hug number of people will need adequate and affordable access to hospitals which as the human civilisation grows have never been enough in number as well as their capabilities.

4.2.7 Community Engagement: Making compact cities a success requires participation of people at all the stages of development beginning from selecting a particular area to deciding the facilities to be made available. Engaging the people which different backgrounds and sense of community is task which if not performed correctly might wreak havoc.

Overcoming these challenges demands a comprehensive approach involving collaboration among government bodies, urban planners, developers, community organizations, and residents. By prioritizing sustainability, equity,

and resilience, compact urban development can surmount these hurdles and create vibrant, inclusive, and sustainable urban environments for present and future generations.

5. LEGAL FRAMEWORK FOR URBAN DEVELOPMENT IN INDIA

India's urban development is governed by a complex web of laws, policies, and regulations at the national, state, and local levels. Key legal instruments include:

5.1 Constitutional Provisions

The Indian Constitution establishes the comprehensive legal foundation for urban development, with the 74th Constitutional Amendment Act (1992) being especially important. This amendment requires the transfer of powers to Urban Local Bodies (ULBs) and introduces decentralised urban governance. It gives ULBs the authority to make decisions related to urban planning, infrastructure development, and the provision of essential services.

5.2 Environmental Laws

Urban development needs to be balanced with environmental sustainability, and India has multiple laws designed to protect the environment. Key among these are the Environment (Protection) Act, 1986, the Air (Prevention and Control of Pollution) Act, 1981, and the Water (Prevention and Control of Pollution) Act, 1974, which are essential for regulating the environmental impact of urban development projects. Furthermore, the Coastal Regulation Zone (CRZ) Notification governs development activities along India's coastlines, which are especially susceptible to environmental damage.

5.3 Urban Planning Laws

Urban planning in India is largely regulated by state-level Town and Country Planning Acts, which provide the legal basis for land use planning, zoning, and the creation of master plans. For instance, the Maharashtra Regional and Town Planning Act, 1966, is a significant law that oversees urban planning in Maharashtra. Additionally, Development Control Regulations (DCRs) and Zoning Regulations are vital in managing land use and promoting structured urban development.

5.4 Housing and Real Estate Laws

The Real Estate (Regulation and Development) Act, 2016 (RERA), is a pivotal law designed to enhance transparency and accountability in the real estate sector. RERA oversees real estate projects, safeguards homebuyers, and ensures

the timely completion of housing projects. Other important housing laws include the Rent Control Acts, which regulate landlord-tenant relationships, and various housing initiatives like the Pradhan Mantri Awas Yojana (PMAY), which focus on providing affordable housing.

Although these laws establish a framework for urban development, they do not specifically encourage compact urban growth, which often leads to urban sprawl and inefficient land use.

6. LEGAL REFORMS FOR PROMOTING COMPACT URBAN DEVELOPMENT

6.1 INTEGRATED LAND USE PLANNING AND ZONING REGULATION

Integrated land-use planning entails the distribution of land for various purposes while considering economic, social, and environmental factors at national or sub-national levels. It supports decision makers and land users in selecting the best land use combinations to meet multiple needs while safeguarding natural resources and ecosystem services. Climate change, along with other challenges like population growth and land degradation, adds complexity to land use management. Adapting through integrated land-use planning aims to enhance ecosystem resilience, identify risks, and vulnerabilities, requiring a strategic, long-term approach. This includes measures such as limiting development in hazard-prone areas, fortifying built environments against climate extremes, and bolstering the resilience of natural ecosystems. Collaboration across sectors and stakeholders is crucial, and platforms like the Covenant of Mayors for Energy and Climate and C40 facilitate this cooperation. Some cities have initiated adaptation planning, often through European-funded projects, while integrating climate change into existing strategic documents remains a challenge. Integrated land-use planning offers benefits beyond climate adaptation, including reduced impacts, enhanced liveability, and recreational opportunities. Assessments show that measures like setback zones can significantly reduce future costs of coastal flooding. Additionally, land-use planning can aid climate change mitigation by preserving carbon sinks and enhancing carbon sequestration through sustainable management practices. Costs associated with land-use planning are variable and span different phases of the process, while implementation time and lifetime depend on the intervention's nature, ranging from decades to over a century. Flexible planning and periodic revisions are necessary to adapt to evolving conditions and incorporate new knowledge.

Identification of Land Utilisation Zones (LUZs) involves categorising areas based on their primary land use. These include predominantly rural and agricultural areas, areas undergoing transformation, predominantly urban areas,

predominantly industrial areas, predominantly ecological areas, landscape conservation and tourism areas, and major hazard vulnerable areas. The determination of the predominant land use considers factors like legal status, land potential, socio-economic needs, and patterns of land use changes. Efforts are made to align LUZ extents with existing administrative boundaries for easier planning and management. LUZ categories encompass various criteria such as agricultural productivity, urbanisation trends, industrial activities, ecological significance, and susceptibility to hazards, ensuring comprehensive land use planning.

6.2 TRANSPORTATION ORIENTED DEVELOPMENT AND TRANSIT INFRASTRUCTURE

In today's rapidly expanding cities, it's crucial to prioritise sustainable and efficient development. Transit-Oriented Development (TOD) has emerged as a key solution, emphasising the integration of public transport, housing, and commercial spaces. This article explores TOD principles and their application for creating vibrant, sustainable urban environments through comprehensive infrastructure integration. Transit-Oriented Development (TOD) is a planning approach focused on compact, mixed-use communities around transit hubs. It aims to enhance accessibility to public transportation, reduce reliance on cars, and promote high-density, pedestrian-friendly zones where people can live, work, and access amenities within walking distance of transit stops. TOD relies on three main pillars: proximity to public transportation, mixed-use development, and pedestrian-friendly design. By prioritising these elements, cities can boost public transit ridership, reduce traffic congestion, and foster economic vitality. Infrastructure integration is key to TOD success, involving the seamless coordination of transportation, housing, and commercial infrastructure. This includes investing in well-connected public transportation networks, integrating housing and commercial spaces near transit hubs, and implementing supportive zoning and land use policies to facilitate TOD projects.

6.3 GREEN INFRASTRUCTURE INVESTMENT AND ADAPTIVE DESIGN STRATEGIES

Implementing green infrastructure successfully demands a comprehensive approach that integrates ecological, social, and economic factors into urban planning and development. The following strategies delineate key principles and actions aimed at guiding effective green infrastructure development to bolster urban resilience and sustainability.

6.3.1 HOLISTIC PLANNING AND DESIGN

Efficient green infrastructure development commences with holistic planning, recognising the interconnectedness of urban ecosystems. Embracing an ecosystem-based approach entails comprehending natural system functions and weaving them into the urban landscape. This involves mapping green corridors, identifying biodiversity hotspots, and strategically siting green spaces to optimise their ecological benefits.

6.3.2 BIODIVERSITY PLANNING

Crafting and executing biodiversity planning strategies is pivotal for fortifying the resilience of urban ecosystems. These strategies encompass identifying and safeguarding critical habitats, advocating for native plantings, and integrating green corridors to facilitate species movement. The incorporation of ecological assessments into urban planning processes guides the design and placement of green infrastructure elements.

6.3.3 GREEN ROOF AND VERTICAL GREENING

Promoting the installation of green roofs and vertical greening in urban structures maximizes space utilisation. These features bolster biodiversity, alleviate the urban heat island effect, and enhance energy efficiency. Offering incentives to property developers to incorporate green infrastructure elements into building designs fosters a more sustainable and resilient urban environment.

6.3.4 COMMUNITY ENGAGEMENT AND PARTICIPATION

Community engagement serves as a cornerstone of successful green infrastructure development. Actively involving residents in planning, designing, and maintaining green spaces ensure alignment with local needs and preferences. Establishing community gardens, orchestrating educational programs, and fostering citizen participation enrich neighbourhood enhancement efforts.

6.3.5 PARTICIPATORY DESIGN WORKSHOPS

Conducting participatory design workshops that bring together community members, urban planners, and environmental experts facilitates idea exchange. These workshops serve as platforms for ensuring that green infrastructure projects resonate with local aspirations and cultural nuances. By nurturing a sense of ownership, communities become stewards of their green spaces.

7. CONCLUSION AND SUGGESTIONS

The compact city represents an ideal urban configuration that promotes sustainable urban development. Its goal is to address critical sustainability issues by efficiently reorganising urban space and utilising resources optimally to achieve maximum land utilisation. Embracing the compact city model offers a suitable approach for achieving sustainability, as it enables accommodating significant growth in household numbers without altering the original character of the environment. Additionally, it facilitates the revitalisation of city centers, ensuring they remain vibrant and viable. The configuration, dimensions, and population density of a city play a significant role in determining its level of sustainability. Sustainable urban forms aim to achieve several long-term objectives, including decreased energy consumption, waste generation, and pollution, as well as reduced reliance on automobiles, preservation of delicate ecosystems, and the creation of liveable, community-centred environments. However, obstacles to achieving sustainable urban growth are likely to arise. Inadequate legislation may result in overcrowding and environmental degradation, while institutional frameworks must adapt to meet the growing demand for compact, high-density areas.

Existing urban planning laws and regulations need to be reviewed and updated to address modern environmental and social requirements. Legal frameworks should support sustainable land use practices, enhance the integration of public transportation with urban planning, and prioritise environmental concerns in urban development projects. This approach will help cities manage increasing populations while reducing the environmental impact of urbanization, leading to a more sustainable and equitable future. By adopting these and the recommendations discussed under the previous heading , cities can progress toward more sustainable and resilient futures, with compact urban development playing a crucial role in advancing environmental stewardship and social equity.

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