The Conceptual Framework of a Green City: In Relevance to a Tier-II city of India

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Abstract: Numerous concepts exist to elucidate Sustainability, Green buildings, green architecture, and Green and sustainable cities. The notion of sustainability is firmly ingrained in our historical background. Various scholars have extensively articulated its meaning through their concepts and studies. When these theories are put into practice, the assessment of a city's sustainable approach typically necessitates a structured framework. This article presents the Green City Conceptual [GCP] framework for a Tier-II city in India, encompassing its elements, involved stakeholders, effective and transformative green development vision, as well as detailed strategies for each sustainability metric. The focus is on historical sustainability theories, their execution, and repercussions. This framework aids in comprehending the concept of green cities, elucidating potential factors influencing their measured green performances over time, establishing objectives, and monitoring progress. Tailoring to the specific requirements of individual cities can be achieved by referencing previous research data, studies, and applying them to urban areas in India. The article concludes that the integration of effective and transformative green development elements into specified metrics will undeniably facilitate Indian cities in attaining a sustainable future. Challenges such as obtaining accurate and pertinent data, access to trained personnel, political leaders' willingness in policy-making, suitable weather conditions, and economic considerations during fieldwork may emerge during implementation. Nevertheless, if all stakeholders engage proactively, adopt a positive outlook, fully implement all strategies, and regularly assess performance, the realization of environmentally friendly Indian cities becomes feasible..

Keywords: Green city model, Environment friendly city, stakeholders performance, Green buildings, sustainable development of Tier-II cities

INTRODUCTION

The Report of the Brundtland Commission in 1987 has played a significant role in initiating early global dialogues and policy formulation on sustainability in both developed and developing nations. It was one of the pioneering efforts to define sustainability as "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The report's chapter also provides a clearer definition of the concept of needs, emphasizing the essential needs of the world's poor as a top priority. It discusses the constraints imposed by technology and social organization on the environment's capacity to fulfil both current and future needs. The report highlights the interconnectedness of environmental stresses and economic development on one hand, and the influence of various social and political factors on environmental and economic challenges on the other. Thus, it underscores the equal relevance of economic, ecological, and social objectives in advancing human well-being, collectively forming the essence of sustainable development.

Achieving sustainable development at a global scale necessitates a fundamental transformation in the prevailing power structures within the international community of nations. The Brundtland Report of 1987 acknowledges that a world characterized by poverty and inequality will always remain vulnerable to ecological and other crises. UN Habitat (2003: 43) identifies the retreat of the state as the primary factor contributing to the rise in poverty and inequality during the 1980s and 1990s. Various scholars have underscored poverty as a core driver of environmental degradation, with structuralist and post-structuralist thinkers such as Davis (2006) arguing that sustainable development is incompatible with neoliberal capitalism due to its exacerbation of poverty and inequality. Harvey (2008) articulates the intricate relationship between capitalism and urbanization, positing that the surplus generated within

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the capitalist production system must be reinvested to sustain economic growth and avoid crises. He cites examples like the highway construction and post-war suburbanization in Paris and the USA after 1945. Harvey also points out China's urbanization as a key stabilizing force for global capitalism over the past two decades, driven by its demand for goods and services that buoy Western industries. However, he warns of the darker aspects of urbanization under capitalism, characterized by cycles of urban restructuring through 'creative destruction.' This process, fueled by rising land values, often leads to the displacement of marginalized communities, such as slum dwellers, as urban areas are redeveloped to maximize profits. The phenomenon identified by Harvey as 'accumulation by dispossession' bears resemblance to Sanyal's concept of 'accumulation as development' (2007), albeit with notable distinctions. Sanyal (2007: 226) posits that under postcolonial capitalism, not only does the system eradicate alternative modes during its emergence, but it also carves out a space beyond capital where the marginalized can sustain themselves. This space alluded to by Sanyal pertains to the urban informal sector, encompassing the impoverished communities dwelling in slums, engaging in economic activities that allow for survival within postcolonial capitalism's 'need economy'. The coexistence of both the accumulation economy and the need economy serves as a distinguishing feature of postcolonial capitalism when juxtaposed with capitalism in more developed economies.

Newman (2006: 286) articulates his interpretation of sustainability, defining it as the reduction of ecological footprint (energy, water, land materials, waste) alongside the enhancement of quality of life (health, housing, employment, community) while operating within the city's constraints. Concerning buildings, strategic planning of site selection, materials utilization, energy sources, water management, and waste disposal can effectively curtail environmental impacts, rendering the structure environmentally friendly. At the urban scale, there has been a growing curiosity regarding the components that render a city sustainable and the feasibility of replicating such features in other urban settings. Scholars are increasingly acknowledging that sustainable urban configurations, such as compactness, sustainable transportation, density, mixed land uses, diversity, passive solar design, green spaces, and closed-loop systems for water, energy, and waste management, are pivotal (Jabareen, 2006; Brown, 2006; Pinderhuges, 2004). Nevertheless, the practical application of these sustainability paradigms in urban planning and design is contingent upon the political landscape of planning, the values and predispositions of planners, and the conflicting interests among societal factions (Versteeg & Hajer, 2010). The 20th century witnessed a rapid and uncontrolled expansion of urban areas, resulting in the emergence of large dispersed or decompacted cities, contrasting with the more compact cities of the 19th century. Factors such as rapid industrialization, technological advancements like automobiles, and the availability of cheap land and fossil fuels played a significant role in driving this urban development model. This decentralized urban structure heavily relied on automobiles and the utilization of fossil fuels. The extensive development of transportation and other infrastructures contributed to the degradation of the urban environment globally, leading to increased city footprints, impermeable surfaces, depletion of natural resources, and diminished water quality and quantity. Moreover, it resulted in longer journey times, traffic congestion, higher fuel consumption, and more. The repercussions of this car-dependent urban sprawl prompted scholars and urban planners to explore innovative approaches to foster economic and urban growth with reduced environmental impact and natural resource utilization.

Numerous reports, concepts, theories, and methodologies have been and continue to be generated to address this issue. In the 1980s, publications like "The Limits to Growth" introduced the concept of sustainable economic growth, while "Our Common Future" illustrated the possibility of harmonizing economic growth, environmental conservation, and social development. Additionally, the New Urbanism Movement advocated for strategies to restrain the dispersed expansion of cities by promoting environmentally friendly urban design practices such as walkable neighborhoods, mixed land use, and Transit-Oriented Developments (TODs).

The integration of climate change concerns into the global political agenda in the 2000s propelled energy and resource efficiency to the forefront of discussions on sustainable development and urban sustainability. Deliberations on urban forms, encompassing energy efficiency, resource management, and environmental performance, became pivotal elements in defining and evaluating city sustainability. These recent advancements gave rise to the term "green." The heightened focus on energy, resource efficiency, and urban form in the context of climate change raised inquiries regarding the comparative sustainability of various urban forms and city designs in terms of pollution, environmental impact, and

energy consumption. Questions surrounding effective strategies to enhance the sustainability of cities and manage urban expansion amidst the challenges of climate change have become increasingly relevant. Despite ongoing discussions, there is no unanimous agreement on the optimal solutions. Scholars have pointed to the compact city model as a potential contributor to city sustainability, particularly concerning the impacts of urban expansion, energy use, resource efficiency, infrastructure development, and environmental performance. The advantages resulting from the implementation of this concept can be succinctly outlined as: shorter intra-urban travel distances, decreased reliance on automobiles, heightened levels of walking, cycling, and utilization of public transportation, diminished per capita expenses on infrastructure provision, impact on how cities produce and consume energy, as well as promoting the augmentation of urban density and the reutilization of previously urbanized land.

METHODOLOGY

A multitude of investigations have been conducted to define sustainable and eco-friendly cities, with some endeavors focusing on crafting concepts and translating them into methodologies and tools for gauging environmental and/or sustainability efficacy. Several have put forth reference manuals and frameworks to aid in pinpointing challenges and suggesting municipal-level measures to enhance sustainability and environmental effectiveness by devising criteria and policy tools. Generally, the various definitions and proposals for eco-friendly cities tackle concerns tied to the three pillars of sustainability theory and an array of other topics such as health, green spaces, resilience, and fairness. Issues related to the environment are predominantly highlighted in definitions, concepts, and methodologies of green cities. For instance, the EBRD characterizes a green city as primarily distinguished by its environmental performance, aiming to maximize social and economic advantages. This delineation is utilized to create a technique for comparing and prioritizing utilizing seventy fundamental indicators and numerous optional indicators selected in line with a Green City Pressure–State–Response (PSR) framework. The Economist Intelligence Unit, on the other hand, has conceived a benchmarking approach to evaluate cities' environmental performance per continent through a set of thirty qualitative and quantitative indicators primarily concentrated on infrastructure and environmental concerns. Zoeteman et al. employ 87 indicators to examine (causes of) disparities in sustainability performance among EU cities across the three sustainability realms of economy, ecology, and socio-cultural dimensions. Conversely, the ADB Green City Development Toolkit and Solutions for Livable Cities serve as guidance manuals for ADB personnel, consultants, and urban leaders in introducing fundamental notions of green city the formulation and delineation of a three-phase urban evaluation framework in conjunction with a compendium of existing tools and assets for environmentally friendly, habitable, and sustainable advancement.

The emergence of ecological and other urban-related concerns within urban areas has led to the formulation of multiple definitions and strategies for green cities, as briefly mentioned earlier. While some concentrate solely on environmental aspects, others encompass socio-economic, environmental, and infrastructural components, while still others incorporate policies, resilience, ICT technologies, and strategies like disaster risk management plans. The metrics recommended to gauge environmental and/or sustainability performance generally employ a plethora of indicators, rendering them challenging for policymakers to utilize, with some blending qualitative and quantitative indicators. Several indicators put forth in certain methodologies are not routinely monitored by numerous cities, particularly those in developing nations. This disparity in concepts and approaches to green cities has led to a wide variety of methodologies and indicators for assessing environmental and sustainability performance.

The aforementioned studies have indicated the existence of vastly different approaches and methodologies related to green city issues, resulting in uncertainty regarding how and which methods and metrics should be implemented in these cities to enhance their environmental friendliness. Moreover, numerous research gaps persist in this field, such as the absence of a clearly defined green city concept grounded in a straightforward green city conceptual framework, the creation of index methodologies incorporating a concise set of indicators to evaluate environmental performance based on a conceptual framework, and uncomplicated techniques to monitor cities' environmental performance progression over time. The literature review also underlined the necessity for more extensive research on how population size and GDP impact environmental performance, especially in developing countries with substantial populations. No studies proposing a methodology for evaluating green city performance were identified in the literature review. The concept of green cities was developed by assimilating key

discoveries from the literature, including aspects of the three pillars of sustainability theory, as well as other topics like energy, infrastructure, land use planning, green spaces, and density as discussed in the aforementioned literature review. The Green Cities Performance Index framework is grounded in the Green Cities conceptual framework and was devised by customizing the approach proposed in [23] to suit our requirements. It enables us to evaluate and contrast the Environmental Performance of cities on the same continent over time and comprises a limited number of quantitative indicators representing crucial components of the thematic areas of an established green city concept. The conceptual framework of Green cities encompasses fundamental elements that should be implemented in urban activities to enhance the performance of a green city. A key focus of the framework is the advancement of renewable energy and energy efficiency across all city operations. Energy is viewed as a pivotal component in promoting and guiding the attainment of resource efficiency, thereby contributing to the overall enhancement of green city performance. The concept posits that energy is intricately intertwined with various aspects of urbanization like transportation, public services, infrastructure, density, water management, land utilization, food systems, environmental quality, information and communication technologies, public health, economic progress, and climate change. Actions related to energy within these domains can have cascading effects on numerous other urban endeavors, thereby shaping the resource efficiency of the city and the Green City Performance (GCP) [13–17].

The advocacy for the widespread integration of green spaces is associated with the notion of reintroducing nature into urban areas. This endeavor seeks to establish a harmonious equilibrium between green areas and built environments through the extensive adoption of green practices. These practices include augmenting urban green spaces and parks, incorporating water features wherever feasible, implementing green roofs, green facades, green linear corridors, and so forth.
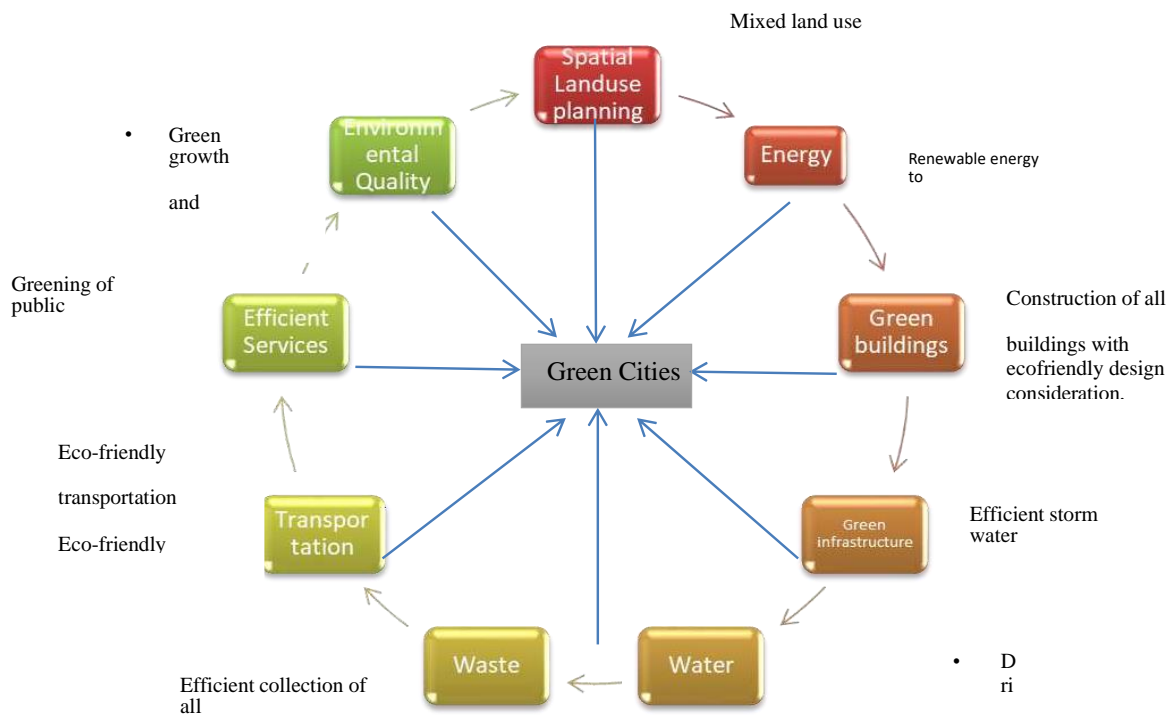

Figure 1. Green Cities Conceptual framework

The presence of vegetation plays a significant role in enhancing the quality of life for residents, encompassing aspects such as public health, aesthetic appeal, and the overall attractiveness of a city. Moreover, greenery serves as a vital tool in mitigating environmental pollution, addressing climate-related challenges, and combating urban heat islands. By creating a localized microclimate, green spaces aid in the sequestration of greenhouse gases (GHGs), reduction of urban flooding, and adaptation to changing climate conditions. The strategic planning of urban spaces to incorporate a mix of land use

and diverse social structures facilitates the development of more condensed cities through the integration of design elements like compactness, density, and green areas, as well as Transit Oriented Development (TOD) practices. This approach recognizes that compact land planning, coupled with mixed land use and social integration, can effectively reduce the necessity for extensive travel, enhance employment opportunities in close proximity to residential areas, and foster social diversity. Implementing social mixing strategies, such as constructing affordable housing units for various income brackets within the same vicinity, contributes to diminishing social segregation and promoting inclusive communities. The principles of green growth with equity emphasize the adoption of low-carbon technologies, heightened energy efficiency measures, and innovative managerial and financial strategies across all facets of urban development. By incorporating these principles into local initiatives, cities can steer towards fostering an inclusive economy with minimal adverse environmental impacts and equitable distribution of growth opportunities. The construction industry stands out as one of the leading energy consumers within urban settings, necessitating a shift towards sustainable practices that emphasize energy efficiency and the utilization of renewable energy sources. Key components of this endeavor include the implementation of low-impact development techniques in both new construction projects and the retrofitting of existing buildings, the adoption of energy-efficient building labels and certificates, integration of building energy performance standards into local or national building regulations, and the promotion of recycling and reuse practices for construction waste.

The concept of green transport and Transit Oriented Development (TOD) prioritizes enhancing the accessibility of urban spaces for individuals through the promotion of pedestrian-friendly environments, cycling infrastructure, efficient public transportation systems, and interconnected urban layouts. Emphasizing multimodal integration, affordability, and accessibility in transport planning, alongside the adoption of TOD practices, low-emission technologies, eco-friendly fuels, and intelligent transportation solutions, serves as key elements in realizing sustainable urban mobility. Green urban agriculture addresses the challenges posed by the extensive urban areas by advocating for the production, processing, distribution, and consumption of food in close proximity to consumer markets. This approach helps to shorten food supply chains, reduce energy consumption, greenhouse gas emissions, and enhance local air quality by minimizing the reliance on long-distance transportation for food distribution. Cities are utilizing novel technologies and methods to cultivate and harvest food on rooftops and in vertical green farms.

Environmental Quality and Water Security

This concept emphasizes the utilization of green techniques to maintain and enhance water, air, and soil quality as per established standards. Cities are also implementing water efficiency and conservation practices to address water security issues.

ICT and Green Technologies

This concept encompasses telecommunications technologies and intelligent tools that facilitate the utilization of public and private services, information dissemination, and the coordination of actions to enhance the Global Climate Plan (GCP). Green technologies in this context involve practices that enhance energy production, consumption, and resource efficiency.

Greening Public Services

The term "greening public services" refers to energy-efficient and renewable energy practices employed in providing services such as drinking water, wastewater treatment, energy production, and waste management. Enhancing the physical resilience of infrastructure systems to withstand future climatic events is another crucial aspect of this thematic area.

Green Infrastructure

Green Infrastructure primarily addresses stormwater systems by constructing new systems or upgrading existing ones to reduce downstream flooding and enhance water quality in receiving bodies. Key components include strategies to manage rainwater near its source, increase green spaces, enhance landscapes, create wildlife habitats, and promote the construction of green roofs and facades.

INDICATORS IN DETAIL

Land Use Pattern: Social and economic factors influence the distribution of land use in cities through human interactions over time and space. Urban areas shape their layout by deciding on land use distribution, density, and connections between residential and commercial zones, focusing on integrating land use with transportation. The rapid urban population growth has escalated the demand for land resources, exerting horizontal and vertical pressure on urban land use. Given the anticipated rise in the urban population of India to 590 million by 2030 and the fourfold projected increase in per capita income, coupled with the scarcity of land, the repercussions of persisting with the current disorganized method could have significant ramifications for the local environment and society. Hence, it is crucial to adopt a Green Growth approach for urban planning. The regulation of urban land utilization is typically overseen by statutory Master Plans that adhere to the national Urban Development Plans Formulation & Implementation (UDPFI) guidelines. These guidelines categorize urban land usage into residential, commercial, industrial, public and semi-public, recreational areas, transportation, agriculture, water bodies, and special activities. The formulation of Master Plans, serving as long-term perspective plans for steering sustainable and planned urban development, falls under the jurisdiction of town and country planning acts at the state level.

Control over the city's density is governed by Development Control Regulations, subject to periodic local revisions in coordination with the state government. The primary responsibility of development authorities includes Master planning and land use planning, with smaller cities delegating these tasks to regional offices of the state department of Town and Country Planning. Various key agencies such as City Corporations, Development Authorities, Local Planning Authorities, and District Administrations play pivotal roles in planning and establishing norms in urban areas. These entities, along with private consultants, are instrumental in developing Master Plans, with active involvement from all government departments in review/stakeholder committees overseen by the local district Collector/District Magistrate. A well-crafted Green Growth Vision envisions a vibrant and habitable city that integrates land use efficiently to minimize conflicts between green spaces and built-up areas, while catering to the diverse social needs of the community. Statutory Master Plans should aim to curb urban sprawl and steer desirable peri-urban development. Enforcement agencies should focus on utilizing existing underutilized or unused land and facilitating the transfer of development rights to preserve traditional quarters and other conserved precincts. Embracing high density through an increase in floor space index across all areas, coupled with the conversion of open land into accessible community spaces, is essential.

Additionally, promoting organized agriculture as an urban function can help alleviate distortions in land use resulting from inflated real estate demands, while fostering community engagement in the planning process. Envisioning a transformative Green Growth approach involves establishing a compact city with reduced travel times and efficient utilization of local resources, while allocating land for various purposes to ensure self-sufficiency for future generations without the need for additional land resources. Embracing a transit-oriented mixed land use strategy coupled with reliable public transport systems can help reduce dependency on private vehicles. The Master Plan must be periodically revised every three years, incorporating all available maps on a GIS platform. Guidelines should be established to regulate the development of heritage sites and ecologically sensitive areas, discouraging low-rise development along transit corridors and aiming to reduce urban sprawl. It is essential to have clear development guidelines, and active involvement of the private sector is crucial in the development process guided by the Master Plan. Urban green spaces and forests are necessary to safeguard local biodiversity, alongside a green economic policy that steers the city's economy.

Green Growth Benefits: Individual advantages encompass reduced commuting time and enhanced access to services within walking or cycling distance, along with affordable and sustainable housing equipped with public utilities. Access to clean drinking water can be ensured through wetlands preservation and efficient resource management, resulting in cost-effective service provisions. Community benefits comprise enhancements to the existing road network, reduced demand for road-based infrastructure, better management of green spaces to prevent conversion into built-up areas, improved social infrastructure, decreased levels of noise and air pollution, better overall health, reduced traffic congestion, and safer neighborhoods. National and global benefits include optimized allocation of financial resources for urban development, improved economic conditions through the efficient use of local resources, and reduced greenhouse gas emissions.

Urban Ecosystem and Biodiversity Sector and Green Growth: An ecosystem encompasses all living organisms in a specific area, interacting with each other and with the non-living elements of their environment. Biodiversity refers to the variety of life on Earth, including ecosystems, genetic diversity, cultural diversity, and the interconnectedness of all species. Urban ecosystems and biodiversity play a vital role in determining the quality of life in urban settings. Despite its overarching importance, there has been limited emphasis on urban ecosystems and biodiversity until now. However, the escalating levels of urban pollution in Indian cities necessitate a shift in approach to prioritize this sector. Implementing Green Growth strategies in this area will enhance the livability of Indian cities.

Actors Involved: At the national level, the Ministry of Urban Development, Ministry of Environment and Forests, National Biodiversity Authority, National Horticulture Board, and Ministry of Agriculture are tasked with executing Biodiversity Programs and Schemes in India. Currently, there is no national policy addressing urban ecosystems and biodiversity in India. The National Biodiversity Authority, operating independently, enforces India's Biological Diversity Act (2002), while State Biodiversity Boards at the state level offer advice to state governments following guidelines from the Central Government. Other key stakeholders at the state level include State Agriculture Departments and State Horticulture Departments. At the city level, the Environmental and Sanitation departments from city municipal corporations and municipalities are responsible for handling Urban Ecosystems and Biodiversity. There are no city-level biodiversity departments, but the district level Biodiversity Management Committees are being set up as per the Biological Diversity Act 2002.

Efficient Green Growth Vision: A city where citizens should be aware of the status and importance of local environment and biodiversity. With the involvement of citizens, the city should maintain a documented status of the sector, should have a plan in place and carries out a census and status review after every three years. The city needs to maintain greening guidelines and its implementation.

Transformative Green Growth Vision: A city with a local environment and biodiversity plan that has legal status and forms will be part of the Master Plan, and where the local environment should be unpolluted and flora and fauna needs to flourish in their natural surroundings with minimum disturbances; Maximum emission standards to be set up for vehicles and industries; local decentralized green energy generation is mandated for large consumers. The city must have a green building code with minimum mandatory criteria for all buildings and maximum voluntary criteria.

Green Growth Benefits: Personal benefits will include improved health and well-being, increase in sources of income generation from reserved crops, livestock and forestry. Community benefits will include protection of water resources; healthy ecosystems; promotion of natural balance, decreased pollution; climate stability, etc. National/Global benefits will include contribution to climate stability; controlled global warming; recovery from unpredictable events like floods and cyclones; pollution breakdown; promotion of economic development of the country; nutrient storage and recycling; protection of water resources; maintenance of ecosystems; protection of natural habitats; promotion of breeding stocks, promotion of recreation, tourism, cultural, spiritual and aesthetic values, etc.

Strategies for Green Growth in Urban Ecosystem and Biodiversity Sector: Based on the analysis of the current state and future trends, and the assessment of the existing/emerging opportunities and corresponding barriers, a number of Green Growth strategies have been outlined, that will help cities overcome the barriers and fully leverage the existing opportunities. Cities can choose the combination of either of these strategies according to the applicability to the local context and to the target vision they are striving for. Document the existing status of environment and biodiversity in the city. Involve schools, citizens and private parties in this exercise and carry out awareness activities. Declare a local policy and include in the Master Planning process a mandatory three year review of the status of environment and biodiversity. Introduce environmental resource budgeting tools such as Eco Budget, developed by ICLEI – Local governments for Sustainability. Develop a plan for maintaining the quality of the environment and conserving local biodiversity in the city by including conservation, greening, pollution reduction and treatment projects.

The engagement of the community is crucial for safeguarding local biodiversity within the framework of urban planning, while also securing financial support from the national government through biodiversity action plans. The advancement of urban areas is closely linked to the energy sector, which plays a pivotal role in urban infrastructure and daily life. Despite covering a small percentage of India's land area, cities contribute significantly to the nation's electricity consumption. The reliance on

electricity, oil, and gas is essential for the development of urban infrastructure including water supply, transportation, and information technology. Although renewable energy sources are underutilized, there is a growing need for investments in the energy sector to meet the increasing demands of urbanization. Various actors play key roles in the energy sector in India, with responsibilities shared between the Central and State Governments. Ministries such as the Ministry of Power, Ministry of Petroleum and Natural Gas, and Ministry of New and Renewable Energy are involved in decision-making and planning. Institutions like the Central Electricity Authority and Bureau of Energy Efficiency support specific aspects of energy planning and regulation. At the state level, State Electricity Regulatory Commissions and energy departments are responsible for policy implementation and regulation. Both public and private sector entities are engaged in the generation, transmission, and distribution of electricity as well as oil and gas products, with a focus on promoting renewable energy and energy efficiency initiatives.

Transformative Green Growth: A city with a stable uninterrupted 24x7 energy supply that optimizes the utilization of locally available clean energy sources, including renewables and waste, thereby achieving a high level of energy self-sufficiency. An extensive and well-planned decentralized energy grid should be implemented throughout the city, connecting various small-scale decentralized renewable energy systems that cater to neighborhoods, industrial zones, business hubs, and commercial areas within the city. This infrastructure should be incentivized by financial support for renewable energy projects of all sizes that are commercially viable. The energy network must incorporate smart grid technologies with intelligent communication, metering, and control features at both the energy generation and consumption ends. These smart technologies enhance local energy management by utilizing accurate weather and energy generation forecasts, prioritizing the use of local renewable sources over national grid imports, facilitating bidirectional energy flow for storage, and enabling energy consumption during peak demand periods. Installation of smart meters and controls in residential and commercial buildings is essential to optimize energy consumption by regulating appliance usage, reducing peak loads, minimizing costs, and allowing consumers to sell surplus renewable energy back to the grid.

Green Growth Benefits: The integration of green growth principles within the energy sector yields a multitude of advantages that extend to the urban community, individuals, as well as on a national and global scale. Individuals benefit from reduced indoor and outdoor air pollution, enhanced health and well-being, decreased energy expenses, and increased disposable income. At the community level, advantages include heightened productivity and competitiveness, improved public health, reduced local environmental harm, job opportunities, and a dependable power supply. On a national and global scale, benefits comprise lowered public spending and energy import costs, diminished reliance on fossil fuels, decreased energy wastage, contribution towards achieving millennium development objectives, enhanced energy security, heightened climate resilience, reduced greenhouse gas emissions, conservation of natural resources, and efforts towards mitigating climate change.

Strategies for Green Growth in Urban Energy Sector: After evaluating the current status, future projections, existing and potential opportunities, as well as associated obstacles, a variety of strategies for green growth have been identified to aid cities in overcoming challenges and maximizing available opportunities. Cities can select from these strategies based on their relevance to the local context and the desired objectives they aim to achieve. Encouraging energy audits and enforcing energy performance standards is essential to ensure efficient energy utilization. This involves conducting regular energy audits for key sectors and end-users to establish baseline energy consumption and promote adoption of renewable energy and energy-efficient interventions. Moreover, the endorsement of energy-efficient appliances and technologies in various settings such as commercial, residential, industrial, governmental, educational, and low-income housing sectors is crucial for reducing energy demand. This can be facilitated through incentive programs, policy mandates integrated into building regulations, and appliance retrofit initiatives undertaken by Energy Service Companies (ESCOs) and utility providers.

Promote the adoption of green energy systems: The promotion of decentralized renewable energy systems on both small and cluster scales has the potential to decrease energy demand, displace fossil fuels, and improve the energy generation capabilities within urban areas. The utilization of incentive programs and obligatory regulations can play a crucial role in encouraging the application of small-scale renewable energy technologies like solar water heaters, solar cookers, photovoltaic systems, small wind turbines, solar lighting, and solar panels on significant buildings or land use areas wherever feasible. Financial incentives or subsidies, either based on capital costs or energy generation, for larger

decentralized renewable energy systems can complement other policy and regulatory mechanisms to encourage their utilization in industrial zones, commercial clusters, IT parks, and residential complexes.

Promote the utilization of clean energy sources: The encouragement of clean fuels like natural gas for meeting thermal energy demands in households, institutions, hotels, hospitals, schools, municipal canteens, and industries can be facilitated through fiscal advantages, enhanced infrastructure, expedited approvals, and other supporting measures. The promotion of improved cooking stoves and biogas plants should be prioritized in cities where there is substantial biomass potential available. Establish an Energy Cell for urban areas: It is imperative for cities to establish a well-equipped Energy Cell equipped with a dedicated team possessing robust expertise in strategic energy planning, energy audits, project proposal development, renewable energy and energy efficiency implementation, energy modeling and forecasting, and program execution. This Energy Cell should be responsible for formulating and executing the city's energy Master Plan, establishing energy monitoring systems and protocols, conducting promotional and awareness campaigns, providing subsidies or soft loans for renewable energy and energy efficiency applications, and coordinating with municipal departments, state agencies, and central government bodies to develop and implement energy-related plans and programs. Undertake initiatives to raise awareness on renewable energy and energy efficiency: Cities should accord high importance to generating awareness through resource centers, energy parks, demonstration facilities, exhibitions, media campaigns, educational initiatives, and workshops targeting specific stakeholder groups such as students, youth, residents, municipal employees, policymakers, businesses, and industries. Encourage the development of local expertise and green energy sector: The establishment of a local industry base and skilled workforce can address the rising market demand for renewable energy and energy efficiency solutions resulting from supportive strategies and programs within the city, leading to the creation of green jobs. Measures like tax incentives, accelerated depreciation, duty reductions, financial support for green energy research, and training programs can facilitate the growth of the green energy industry. Integrate urban energy considerations into city Master Planning: Cities should emphasize the integration of urban energy aspects into the overall urban development and Master Planning processes, ensuring their alignment with urban infrastructure, services, and physical structure. This integration is essential to enhance the focus on urban energy management in local government budgets. However, the absence of economic data at the municipal level - typically centralized at the district and state levels - poses a significant challenge for Indian cities in formulating appropriate strategies to enhance the sector. The HPEC report emphasizes the correlation between higher per capita income levels and increased urbanization rates in Indian states, projecting that urban GDP share will surge to 75% by 2030. The top 100 major cities alone are anticipated to contribute around 43% of India's GDP, according to the Indian Institute of Human Settlements. The McKinsey report on urbanization in India suggests that cities could be responsible for 70% of new job creation by 2030, drive over 70% of the GDP, and lead to a nearly fourfold rise in per capita incomes nationwide. The key stakeholders in this urban domain are the District and Municipal Administrations, including Development authorities. Urban local bodies play a crucial role in issuing trade and food licenses, yet they often lack awareness on how to support business activities in the city or determine which trade operations to restrict and why. Given the economic significance, state governments have maintained control over commerce and industries. The Ministry of Commerce and Industries at the national level, along with the Commissioner/Directorates of industries and Industrial Corporations at the state level, are tasked with promoting specific trade and commerce endeavors.

Efficient Green Growth necessitates cities to offer favorable business prospects where enterprises operate with minimal resources and employ advanced technologies. Economic progress should prioritize efficient, clean, and renewable energy sources. Local economic development plans should focus on enhancing the capacity of the youth to boost productivity in existing economic sectors. Transformative Green Growth envisions an economy in cities that is both productive and socially inclusive, seeking to enhance human welfare and local resource utilization while mitigating costs, ecological scarcities, and environmental hazards. It advocates for creating business opportunities that enhance citizens' quality of life based on locally available skills and resources, aiming to establish a vibrant, secure, and eco-friendly urban environment. Development initiatives and tax policies should encourage green businesses and align with the city's legal Master Plan. Green Growth Benefits encompass various advantages. Personal gains include an improved quality of life, expanded business and job prospects, and higher per capita income. At the community level, benefits consist of enhanced productivity, competitive edge, better

public health, reduced local environmental damage, job creation, improved quality of life, local job opportunities for young individuals, and decreased migration due to job search. On a national and global scale, the benefits extend to long-term sustainable growth, risk reduction related to climate change, energy imports, water scarcity, and ecosystem service loss, increased employment, poverty alleviation, reduced energy demand leading to lower import expenses, and enhanced energy self-sufficiency. Strategies for advancing Green Growth in the Urban Economy and Business Sector are delineated based on an analysis of present conditions, future trends, existing opportunities, and barriers. These strategies are designed to assist cities in surmounting obstacles and maximizing available opportunities. The selection of specific strategies can be tailored to local contexts and aligned with the desired vision.

Investment in technology innovation is recommended for cities to enhance productivity. By exploring environmental technologies for urban retrofitting, water conservation, and smart transportation systems, cities can foster eco-efficient and smart urban environments, consequently creating job opportunities. Efforts to streamline approval processes for businesses are crucial for cities. Implementing policies that expedite clearances for key economic sectors and leveraging ICT tools for approvals can mitigate the challenges posed by lengthy regulatory processes, thereby stimulating business growth. Urban infrastructure development should be prioritized to enhance the competitiveness of cities. Ensuring the availability of affordable and reliable power, water, and land is fundamental for attracting businesses and investments. Cities should integrate local environmental and economic policies into their development plans. Spatial strategies that encourage densification while supporting business and economic activities are vital for sustainable urban growth. The promotion of local educational institutions, research facilities, and training programs can enhance the knowledge base of cities. By equipping local businesses with advanced skills and knowledge, cities can boost competitiveness and cultivate a skilled workforce. Cities are encouraged to adopt eco-budgeting practices by incorporating environmental measurements alongside financial accounts. Approaches like the Eco Budget method by ICLEI aid cities in managing and evaluating natural resource consumption, addressing critical issues within municipal boundaries. Innovative business models that consider the environmental impact of operations, suppliers, and clients should be promoted by cities. By encouraging a holistic approach to sustainability, cities can drive the adoption of environmentally responsible practices in the business sector. Cities should aim to redefine their urban economic structure by actively engaging in local economic planning and development. Establishing clear roles and responsibilities between local and state levels, and implementing supportive policies and incentives, can facilitate sustainable economic growth. To stimulate the demand for eco-friendly products and services, cities should embrace sustainable procurement practices and innovate procurement models. By creating green markets and fostering a culture of sustainability, cities can drive the transition towards a more environmentally conscious economy.

The city should have spatially well-located housing units in order to minimize travel demands and enhance accessibility to essential services like water, sewage, healthcare, transportation, education, and sustainable livelihood opportunities. The city should establish a strong local green building sector that utilizes sustainable materials sourced locally, thereby fostering the local economy. Green Growth Benefits Individual advantages: Enhanced living conditions leading to improved health, safety, and access to water supply and sanitation facilities. Community advantages: Increased access to social services for urban underprivileged communities, resulting in better education, improved health, and access to sustainable livelihoods, consequently reducing poverty. National/global advantages: Diminished vulnerability and heightened security for economically disadvantaged population segments, enabling them to invest in and upgrade their housing while being incentivized to utilize and pay for municipal services (such as metered water connections, sewerage-equipped toilets, metered power supply, etc.); reduced operational and maintenance costs for communal and free services like community toilets and standpipes; complete integration of the impoverished into society and inclusion in the property tax system, contributing to the city's revenues.

Strategies for Green Growth in the Urban Housing and Buildings Sector- Following an evaluation of the current situation and future tendencies, along with the appraisal of existing/emerging opportunities and corresponding obstacles, numerous Green Growth strategies have been delineated to aid cities in surmounting hurdles and fully exploiting available opportunities. Cities can select a combination of these strategies based on their relevance to the local context and the envisioned objectives they aspire to achieve. Accumulate precise data on housing stocks at the national and state levels gathered through

an institutional framework and ensure its accessibility. Offer incentives for buildings that prioritize energy and resource efficiency, waste reduction, pollution prevention, good indoor air quality, and natural lighting to enhance occupant well-being and efficiency. This can be achieved through the adoption of city-specific regulations and Development Control Regulations. In progressive cities, particular green building standards could also be devised. Connect households to housing financial assistance through banks or community-based credit mechanisms, such as the Community-Led Infrastructure Financing Facility (CLIFF), which was launched under the USAID-supported Crosscutting Agra Program (CAP) 44. The CLIFF within CAP facilitated access to credit for housing upgrades, like constructing toilets within residences. To prevent housing from becoming a liquid asset, Urban Local Bodies may need to establish agreements between property owners, the municipal body, and financial institutions (if credit is extended) for apartment ownership, delineating sales and transfer conditions. Simplify the processes for obtaining planning and construction approvals. Streamlined and transparent procedures such as single-window and channel processes are imperative to enhance transparency in local construction endeavours. Reassess Master Planning processes and implement necessary modifications to ensure a comprehensive evaluation of land requirements and allocate such lands for various purposes, including affordable housing. Re-densification and re-assignment of land through an increase in the FAR/FSI across various sized cities in proportion to the infrastructure expenditure that will be required.

The Green Growth and Urban Transport Sector

The necessity to transfer people, products, and services between locations gives rise to transportation. Improvements in land use, infrastructure, and services have created a need for mobility, yet this need frequently results in more cars on the road, more traffic, more pollution, etc. For transportation to be sustainable over the long run, rapid growth must be backed by a system that is safe, dependable, and efficient. Despite the fact that private automobiles are becoming more prevalent in Indian cities, the majority of them still have small, transit-friendly urban forms, at least in their central regions. Future generations living in these cities may be impacted by policy decisions made now. Indian cities should develop in a way that ensures green growth, allowing for the development of economy while maintaining environmental sustainability. Leaping to a sustainable and accessible mode of transportation is essential to achieving this, as it allows residents to transition from a car- or private vehicle-dominated system to one that uses public transportation, which lowers the costs that many developed nations currently face [45]. Given that the country's cities are still expanding and that a large portion of the anticipated investment has yet to be completed, India may benefit from global experience and make changes early on rather than having to repeat the cycle of learning by making the same mistakes, thereby reaching the desired outcome sooner.

Performers Associated with: The primary organizations in charge of the many facets of transportation are as follows:
• Municipal corporations, highway authorities, public works departments, and development authorities (or improvement trusts) are responsible for network features pertaining to roads and related infrastructure.
• For convoys of public transportation: municipal corporations, private operators, state transport operations, entities involved in PPP projects and special purpose vehicles (SPVs).
• Private operators and their associations for intermediate public transportation convoys.
State transport departments typically provide permits that govern all transportation, while local traffic police units are in charge of enforcing the regulations. Large-scale project funding typically comes from the federal government, state governments, foreign aid, banking institutions, or the private sector.

a) Effective Green Growth Vision: A city should have a formal, dependable public transportation system, or an intermodal public transportation system, that connects all areas of the city via a pre-established route network, enabling residents to travel throughout the city without depending exclusively on private transportation. The last mile link should be provided by excellent pedestrian and NMT infrastructure. All vehicle ownership should be connected to parking regulations and emission standards

to encourage the use of low-emission automobiles in urban areas.
b) Transformative Green Growth Vision: Mixed land use and reduced mobility are encouraged by a transit-oriented development policy in a city. A dependable, official, high-quality public transportation or intermodal public transportation system that serves the entire city and provides outstanding last-mile connectivity via NMT and pedestrian facilities is required to support an incremental multimodal transport plan. Emission standards and well-enforced parking regulations should be connected to the ownership of every vehicle to encourage the adoption of low-emission cars in urban areas and limit fast-moving traffic in certain zones.

c) Advantages of Green Growth
  • Individual advantages include: less time spent traveling; better health; more comfort and convenience; and lower costs for medical care and fuel.
  • Benefits to the community include less air pollution, more social interaction, support for neighborhood businesses, less noise from cars, less traffic delays, and easier parking.
  • Benefits that are felt globally include less air pollution, preservation of natural habitat, less reliance on non-renewable fossil fuels, and, in the end, less depletion of the ozone layer.
d) Strategies for Green Growth in the Urban Transport Sector: Several strategies for Green Growth have been outlined to assist cities in overcoming obstacles and taking full advantage of opportunities that currently exist. These strategies are based on an analysis of present and future trends, as well as an assessment of current and emerging opportunities, as well as corresponding barriers. Depending on which combination of these approaches is most appropriate for their particular local environment and goal, cities can decide which one to use.
  • Establish a dependable public transportation network that is suited to the city's size and population. Depending on how feasible they are, these could include rope ways, trams, metro, mono, BRT, Lite BRT, bus, minivan, and boat-jetty networks, or a combination of them. Achieve multimodal integration when creating projects and plans for transportation. Given the variety of transportation options available in Indian cities, it is important that Multimodal integration is used to finish networks, and all current modes are taken into account and included while designing new systems. Systems for communications and information should be employed to facilitate this integration.
  • Implement Transit Oriented Development concepts to reduce the amount of vehicle miles driven by combining land use and transportation.
  • Encourage the use of clean fuel-based automobiles, such as electric, hybrid, and CNG models, by constructing better infrastructure or providing subsidies.
  • Encourage non-motorized transportation (NMT) and provide a robust infrastructure and footpath network to support safe cycling and other NMT modes.
  • Limit the use of polluting automobiles in specific locations, such as city centers, squares, marketplaces, historic sites, etc these cities since they are still developing and much of the infrastructure and systems have not yet been installed.
  Prior to starting the field research, a few presumptions were made: a) That the strategies would be developed locally and applied locally. The framework would encompass eight crucial sectors, including land use and density, ecosystem and biodiversity, energy, economy and business, buildings and housing, transportation, water and sanitation, and solid waste management. It would also be applicable to Tier II and Tier III cities located throughout India. The study's scope encompasses 10 cities and involves gathering data to create a profile of each, consulting with stakeholders, and gathering secondary data about India's urban sector. All these tasks must be completed concurrently by small teams.

Strategies	Land use and density	Ecosystem and biodiversity	Energy
Mapping	Collect accurate data	Document status of environment and biodiversity	Map city level energy supply and consumption status by sectors
Planning and Prioritizing	Master plan on GIS, with Regular updates	Planning and eco budgeting processes	Incorporate energy into Master Planning process
Implementation Policy	TOD, Mixed use, TDR, Conservation regulations, fines and charges in public domain	Guidelines to protect local greenery and biodiversity in new development	Energy cell in city, develop energy use regulations, incentives for clean 1technologies

Implementation Citizens	Involve citizens to monitor implementation, e-governance systems	Involve citizens , groups, children, to document status	Carry out awareness activities, build local knowledge base
Implementation-Private	Involve builders and developers to implement plan in partnership	Involve business and institutions to implement the plan – green areas, forests, lakes rivers conservation etc.	Encourage green technologies, energy Systems e.g. ESCO based projects on street lighting, Pumping etc.

Economy and Businesses	Buildings and Housing	Transport	Water	Solid Waste Management
Document existing status in the city	Document status of buildings and housing in city	Known	Known	Known
Incorporate green businesses and economy in Master Plan	Identify pockets For densification, rejuvenation, conservation in Master Plan	Plan Exist	Plan Exist	Plan Exist
Local guidelines, taxation, procurement policy for green business including approvals	Develop city specific green DCRs, codes and Byelaws, incentives for green buildings	City parking, mixed use and TOD policy, emission norms for vehicles, restricted movement corridors	Develop city water protocol, bylaws for RWH, GW use and recycling, Charge for high usage	Policy and rules exist
Carry out awareness activities	Carry out awareness activities, involve young and youth	Carry out awareness. Involve citizens to check implementation/ enforcement	Carry out awareness. Involve citizens to implement recycling of waste water	Involve citizens to segregate waste at source, Compost organics locally
Organize businesses and economic community into registered groups with the local government, partners in action	Encourage green buildings, city level competitions involving owners, architects, designers etc.	Involve local transporters to practice green mobility Incentivize public transport and NMT	Involve large establishments to reduce water use, recycle waste water	Involve private players to Segregate and processWaste locally in groups

CONCLUSIONS

Cities in India and their local leadership can benefit from the national government's push for smart urban development, which emphasizes sustainability, competitiveness, and quality of life, by acknowledging the existing expectations for good change and progress. Thus, the Framework suggested in this research and a Green Growth approach can help Indian cities actively flourish in line with the national government's planned Smart Development goal.

The governance plays a crucial role in putting into practice the possible adjustments that have been recognized as Green expansion solutions, rather than being a distinct category through which to view the expansion of cities. Given that plans are suggested for the urban sector for an entire city, it makes sense that the government, as well as governments at the federal, state, and local levels in India, would be the intended audience or reader for these strategies.

The strategies are clearly intended to inform urban governance practices and policies. The two fundamental tasks that make up the Green Growth pathways are "fixing" tasks, which can eliminate distortions or inefficiencies that have grown to be a barrier, particularly in the areas of "Land use and density," "Ecosystem and biodiversity," "Energy," and "Economy and Businesses." These industries typically have higher demands for planning requirements and policy efforts. Certain industries, like "buildings and housing," "transportation," "water & sanitation," and "solid waste management," require both "fixing" and "providing."

It is noteworthy that these fundamental infrastructure sectors demand simultaneous attention to the fixing activities through policy or regulation and the provision activities, the commitment to secure supply, in the context of Green Growth. It is impossible to overlook either. Every city faces different

obstacles and problems, and in order to overcome these obstacles, the city's Green Growth strategy consists of a unique collection of coordinated actions and initiatives.

Funding Statement

REFERENCES

Allen, A. (2009). Sustainable cities or sustainable urbanization? Summer 2009 edition of 'palette'. UCL's Journal of Sustainable Cities. :http://www.ucl.ac.uk/sustainablecities/results/gcsc-reports/allen.pdf.

Brown, L. (2006). Designing sustainable cities. In L. Brown (Ed.), Plan B 2.0 rescuing a planet under stress and a civilization in trouble (pp. 204–224). New York: W.W. Norton & Co.

Burte, H. (2014). The 'smart city' card. Economic and Political Weekly, 49(46), 22–25

Government of India. (2014b). Ministry of urban development. Draft concept note on smart city scheme (p.46) indiansmartcities.in/downloads/CONCEPT_NOTE_-3.12. 2014 REVISED_AND_LATEST_pdf.

Government of India. (2015). Ministry of urban development. Smart city: Mission statement and guidelines (p. 43). Retrieved from: smartcities.gov.in

Government of India. (2014a). Ministry of urban development (MUD). Urban and regional development plan formulation and implementation guidelines (Vol. I, Final version). moud.gov.in/sites/uploadfiles/moud/files/URDPFI%20G uidelines%20-2014.pdf.

Government of India. (2014b). Ministry of urban development. Draft concept note on smart city scheme (p.46). indiansmartcities.in/downloads/CONCEPT_NOTE_-3.12. 2014 REVISED_AND_LATEST_pdf.

Harvey, D. (2008). Right to the city. New Left Review, 53, 23–40.

Kenworthy, J. (2006). The eco-city: Ten key transport and planning dimensions for sustainable city development. Environment and Urbanization, 18(1), 67– 8

McKinsey Global Institute. (2010). India's urban awakening: Building inclusive cities, sustaining economic growth.

Nair, S. (2014b). Farmers force Maharashtra to cut down DMIC area. The Indian Express (p. 15). August 17.

Newman, P. (2006). The environmental impact of cities. Environment and Urbanization, 18(2), 275–295.

Sanyal, K. (2007). Rethinking capitalist development: Primitive accumulation, governmentality, and postcolonial capitalism. New Delhi: Routledge.

Sharma, S. (2016). India is the world's best investment opportunity. Times of India. January 17. http://www.timesofindia.indiatimes.com/home/sunday- times 36 A. Shaw

Satterthwaite, D. (2004). Sustainable cities or cities that contribute to sustainable development? In D. Satterthwaite (Ed.), The Earth scan reader insustainable cities (pp. 80–106). London: Sterling, VA.

Shaw, A. (1999). Emerging patterns of urban growth in India. Economic and Political Weekly, 34 (16 & 17), 969– 978.

Shaw, A. (2006). Decentralization and participation in urban India: Women community workers in a small town of West Bengal. In S.

Raju, M. Satish Kumar & S. Corbridge (Eds.), Colonial and post-colonial geographies of India (pp. 241–260). Delhi: Sage Publication India.

Shaw, A. (2012). Metropolitan city growth and management in post-liberalized India. Eurasian Geography and Economics, 53(1), 44–62.

Shen, L-Y., Ochoa, J. J., Shah, M. N., & Zhang, X. (2011). The application of urban sustainability indicators—A comparison between practices. Habitat International 35, 17–29.

UN Human Settlements Programme (UN-HABITAT). (2003). The challenge of slums-global report on Human Settlements 2003. London, Sterling, VA: Earthscan Publications.

United Nations, World Commission on Environment and Development. (1987). Our common future.

Versteeg, W., & Hajer, M. (2010). Is this how it is or is this how it is here? Making sense of politics in planning. In J. Hiller & P. Healy (Eds.), The Ashgate research companion to planning theory (pp. 183–213). Surrey, England: Ashgate Publishing Ltd.

UN Habitat. Habitat III Issue Papers on Urban and Spatial Planning and Design; UN Habitat: New York, NY USA, 2015

Westerink, J.; Haase, D.; Bauer, A.; Ravetz, J.; Jarrige, F.; Aalbers, C.B.E.M. Compact city strategies in Europe compared for trade-offs. Science for environment. Science for Environment. Eur. Plan. Stud. 2013, 21473–497.

Jabareen, Y.R. Sustainable urban forms: Their typologies, models, and concepts. J. Plan. Educ. Res. 2006, 26,38–52.

Derkzen, M.L.; Teeffelen, A.J.A.; Verburg, P.H. Quantifying urban ecosystem services based on high-resolution data of urban green space: An assessment for Rotterdam, the Netherlands. J. Appl. Ecol.2015, 52, 1020–1032.

OECD. Green Growth Indicators 2014; OECD Publishing: Paris, France, 2014.

National Mission for a Green India, Draft submitted to Prime Minister's Council on Climate Change, Ministry of Environment and Forests, Government of India, 2010.

Guidelines for Greening of Urban Areas and Landscaping, Ministry of Urban Affairs and Poverty Alleviation, Government of India, 2000.

Green City Guidelines, Advice for the protection and enhancement of biodiversity in medium to high-density urban developments, UCD Urban Institute. Ireland, 2008.

Manual on norms and standards for environment clearance of large construction projects, Ministry of Environment and Forests, Government of India, 2005.

Proceedings of Session Challenges of Urban Green Development, Workshop on Climate Change Mitigation and Energy Use Optimization, International Congress on Urban Green Spaces. New Delhi, 2012.

Good Practices for Urban Greening, Environment Division of the Social Programs and Sustainable Development Department of the Inter-American Development Bank. Washington, 1997.