PARADOXICAL CITYSCAPE:
Quest for Sustainable Cities

Eco Club, TERI SAS, is excited to present "Paradoxical Cityscape: Quest for Sustainable Cities," the fifteenth edition of *Vasundhara*, focused on urban sustainability. This edition covers key topics like renewable energy, smart city initiatives, gender inclusion in urban planning, and the needs of slum residents, along with urban farming, housing, public transport, and biodiversity.

We are honored to include insights from Ms. Jaya Dhindaw, Executive Program Director at WRI India Ross Center. Special thanks to our dedicated team, contributors, and students of TERI SAS for their invaluable input. Let this edition inspire us to create cities that are sustainable, inclusive, and just for all.

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In This Issue

FROM THE VICE CHANCELLOR'S DESK

As we try to understand the complexities of urbanization in India, this edition of Vasundhra Magazine focuses on exploring the intricate components that come together to define a city. Cities are considered as hubs of opportunity, attracting populations from surrounding areas for better future.

Cities must carry the responsibility of shaping societal norms and values that will cater country's future development.

How city-dwellers build, maintain, and care for urban spaces will directly reflect on the nation's path towards growth, sustainability, and the overall quality of life.

The articles included in this edition highlight diverse voices in urban planning. In addition to the renewable energy, technological advancement and creative infrastructure, this edition also focuses on the pressing issue gender equality for effective urban solutions. We must understand that when women are empowered and included in decision-making, it will lead to more resilient urban ecosystems.

Furthermore, this edition also reflects on the importance of engaging slum dwellers in the planning process for inclusive, bottom-up solutions addressing real needs that include but are not limited to public health, exploration of urban farming's potential for well-being and promotion of environmental sustainability.

Let us envision and work together to make cities not liveable but also hubs of diversity and opportunity, aligning with our Sustainable Development Goals. I invite you to engage yourself in these discussions with insightful thoughts for shaping a sustainable urban future.

Prof. Suman Kumar Dhar
Vice-Chancellor, TERI SAS

EDITOR'S NOTE

As India embarks on its journey towards becoming a developed economy by 2047, the challenges and opportunities of urbanisation are more significant than ever. With a population of 1.4 billion, the next two decades will witness the construction of nearly 70% of the urban infrastructure needed for this growth. However, this expansion occurs against the backdrop of intensifying climate change impacts and requires reconsidering our approach towards urbanisation. According to Sustainable Development Report 2024, India's overall ranking improved from 121 (in 2022) to 109 (in 2024). Yet, despite progress on many SDG goals, the performance on SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action) has worsened.

This is understandable, as rapid urbanisation and economic growth have led to an increase in emissions and strain on urban systems. In fact, 12 of the 15 most polluted cities in Central and South Asia are in India, underscoring the urgent need for sustainable urban solutions. Hence, SDG 11 becomes a critical goal, focusing on making cities inclusive, safe, resilient, and sustainable. As cities grow and climate hazards become more frequent and severe, how different communities experience these challenges varies widely due to social, economic, and political disparities. It is not just about technological advancements for climate mitigation but also about addressing these challenges through an equity lens. We must ensure that our cities grow in ways that are just, equal, and resilient.

In this issue, we explore key themes of urban sustainability, from renewable energy in urban areas and smart city initiatives to the inclusion of gender in urban planning and the pressing needs of slum residents. We examine urban farming, housing infrastructure, public transport, and biodiversity conservation. We are also honored to have insights from Ms. Jaya Dhindaw, Executive Program Director, Sustainable Cities and Director, WRI India Ross Center, in this edition, adding depth to our discussion on equitable cities. I would like to extend my heartfelt thanks to the dedicated team members, guest contributors, and students from TERI SAS, whose stunning photographs and creative title suggestions have enriched this edition. Let this edition serve as inspiration for reimagining cities that are not only protective of the environment but also just and inclusive for all people.

ANUJA RAMUGADE
EDITOR-IN-CHIEF, VASUNDHARA 15TH EDITION

Scrutinizing Urban Penetration of Renewable Energy

An Indian Narrative

Energy has become the latest talk of the town, gaining traction from multiple stakeholders across the globe, with renewable energy being at the forefront of conversations in India and elsewhere. India has witnessed significant turbulence in its energy dynamics over the years; nevertheless, the nation has certainly been able to achieve some of its energy transition targets in the recent past. This can be attributed to the acknowledgement of energy concerns by the central government coupled with effective policy measures acting as a nudge. However, considering the rapid population growth and fast-paced urbanization coming into play, certain concerns persist. Therefore, India needs to chart its trajectory to create a narrative that uniquely addresses its dynamic challenges.

According to the International Energy Agency, there has been a substantial rise in energy consumption in India in the past couple of decades, resulting from two factors: an expanding population and robust economic growth. Over 10% of the upsurge in the world's energy demand since 2000 has found its source in India. The per capita energy demand in the country has increased by almost 60% since 2000; nonetheless, regional and socioeconomic disparities remain substantial. Considering per capita statistics, India's carbon dioxide (CO2) emissions witnessed a rise from about 15% of the global average in 1990 to nearly 40% in 2019, predominantly due to a spike in per capita coal demand, which surged from 25% of the global average to almost 60% during the aforementioned period.

It is intriguing to note that the way we perceive India's energy dynamics entirely changes based on whether we are discussing absolute numbers or per capita figures. In terms of absolute numbers, India certainly ranks among the world's leading energy consumers; however, there is a contrasting narrative in terms of per capita figures since India remains one of the better performers concerning international standards. When it comes to India's urban and rural divide, energy demand and consumption are significantly higher in urban areas—particularly the metro cities and other tier-1 cities—than in lower-tier cities and rural areas. In fact, since 2000, the industrial sector of India, predominantly concentrated around urban belts, has been the primary driver of growth in demand for energy within end-use sectors. Coal accounts for roughly half of this demand. The requirement for energy in transportation witnessed an upsurge of almost 3.5 times, while residential energy demand has soared by 40% since 2000, primarily due to rising appliance ownership and improved accessibility of contemporary cooking fuels due to the advent of urbanization.

The critical transition to sustainable energy is essential. Solar and wind power, as renewable sources, are quickly taking over from coal and hydropower in India's energy industry. Over the past five years, solar and wind capacity have increased significantly by 60% and 10%, surpassing the overall capacity growth of 7%. This shift towards sustainable energy sources marks a pivotal moment in India's energy landscape, propelling the country towards a cleaner and greener future.

One policy that has helped increase the use of renewable energy is reverse auctions, where prices keep going down. Lower corporate taxes also benefit developers, and rules like renewable purchase obligations make sure that utilities buy a certain amount of renewable power. In addition, investments in transmission infrastructure and support for solar parks reduce risks in building new projects and make it easier to acquire land. These steps have especially boosted renewable energy use in cities and India's growing tier-1 and tier-2 smart cities.

Irrespective of the significant achievements in the urban penetration of renewable energy over the last few years, multiple challenges need to be addressed to prevent hindrances in the growth and transition trajectory. Development across various renewable technologies has been highly disparate, with solar energy receiving the most attention. Certain key issues include the unstable financial standing of numerous state distribution corporations, bottlenecks to financing and property acquisition, grid congestion, and the unpredictability surrounding the construction of grid infrastructure. Moreover, owing to rising expenses and a dearth of consumer-friendly financing options, rooftop solar growth has fallen behind utility-scale project growth.

The government has undertaken crucial policy efforts in this regard, including the offshore wind policy, the green hydrogen policy, encouraging the use of electric vehicles, the development of a green day-ahead market, and the relaxation of terms for open access to green energy procurement. India's energy supply is at present predominantly imported, especially coal and crude oil, leaving its economy vulnerable to fluctuations in the price of energy. In addition to solar panels and advanced chemistry cell (ACC) batteries, the government ought to contemplate implementing production-linked incentives (PLI) in other renewable products to build domestic capabilities along the clean energy value chain.

Moreover, the establishment of carbon markets tailored to India will encourage the use of sustainable energy and technology. In peri-urban and lower-tier areas, decentralized energy resources (DERs) must be utilized to address last-mile concerns. Stability will be ensured by integrating DERs alongside the national grid, which may also open up a slew of opportunities for households and MSMEs. Bolstering legislation that establishes a framework to democratize the energy sector and facilitates the production and use of solar electricity is an essential catalyst for DERs. International collaboration and cooperation are essential for India to realize its potential in the technological development of renewables, particularly non-solar innovations, as well as address financial bottlenecks.

India experiences certain impediments in institutional aspects, socio-economic dynamics, the prevalence of extreme poverty conditions, regulatory mechanisms, and capacity constraints. Consequently, energy affordability and large-scale penetration of conventional energy sources will certainly act as deterrents in the transition journey. This is perhaps something that is going to be a major challenge in the penetration of renewable energy across the nation, not only in urban cities, until the benefits outweigh the costs and significant structural reforms take place. However, looking at the aggressive approach by the central government to promoting renewable energy with multiple support mechanisms as well as ambitious energy targets that are being realized to a considerable extent, it is an indication that things will certainly be improving shortly. This is just the beginning of India's energy transition journey, and we are indeed heading towards the most exciting phase of the nation's urban sustainability and overall sustainable development.

Authored by Pritish Kumar Acharya

From Margins to Mainstream: Gender Inclusion as a Catalyst for Sustainable Urban Growth

In the bustling, vibrant urban landscapes of India, where ancient traditions collide with rapid modernization, a silent revolution unfolds—to position women at the center of sustainability and urban planning. For a long time, the perspectives and experiences of women have been sidelined in critical discussions of urban development. However, as cities expand, there is a need for gender-inclusive strategies in urban planning, not just for equality but for the efficacy and sustainability of urban environments.

A critical aspect of gender inclusion is the development and implementation of safe public spaces. Safety is an important aspect that affects women disproportionately, influencing their mobility, employment opportunities, and active participation in society and civic life. According to the National Crime Records Bureau's "Crime in India," Delhi was reported to have the highest rate of crimes against women among stall metropolitan cities in India in 2021. A focus on safety increases their access to job opportunities that were previously out of reach owing to security reasons. This not only empowers women but also stimulates economic growth and well-being.

Innovations in Indian cities are beginning to embed gender equality deeply into their processes of urban development. In some cities, such as Surat and Bhubaneswar, there have been great steps taken towards integrating gender concerns within their urban policies and programs, which should act as examples for other cities, thereby demonstrating practicality alongside the benefits associated with inclusive city planning. These actions are not only about creating more inclusive spaces for women, but also about transforming the urban fabric through an understanding that women's issues are urban issues. They make certain that social justice is at the heart of any urban planning process, thereby ensuring fairness in all aspects of city life. By bringing women from the periphery to the center, cities not only improve their services for half of the population; they also gain wide-ranging economic, ecological, and social benefits.

This transformative gender-inclusive metropolitan planning can no longer be compared with looking at the city as just physical structures but rather as a living system where every part should work well for all people. This imagining calls for alternative participatory methods that will involve every person in decision-making processes during the planning stages while increasing empathy among designers. It calls us to listen more carefully to those who were ignored before because they can become agents of change if given a chance, thus making them active players in shaping our towns.

Public transport systems are one key area where women's daily lives can be greatly affected by planning with a gender lens. Good public transport, which is safe and efficient, has the potential to increase women's access to education, enable them to take part in community activities, and contribute towards their involvement in income-generating activities. For example, this can entail things like providing well-lit bus stops or increasing surveillance in waiting areas in cities like Delhi and Mumbai. Moreover, another thing that can be done is to provide parks with stroller-friendly sidewalks while at the same time creating safe parks with good lighting since this would make them more usable by females, thereby fostering not just safety but also wellness and avenues for social interactions. The creation of such inclusive green spaces is not just about highlighting beauty; they are important social infrastructure that promotes community engagement and improves the well-being of all urban residents.

Women, who are usually primary caregivers, use these spaces the most, and their contributions can result in designs suitable for families with children as well as elderly people, hence making them truly communal and functional places. For example, in Pune, "Saras Baug" has wide walkways and abundant lighting, among other things. This provides an environment for a woman to exercise at any time she pleases without being afraid of her security. People can also sit on benches under trees while talking about community issues or organizing events like concerts, which are mostly led by ladies' clubs.

Kolkata's Eco Park has large gardens and lakes that offer peace and calmness. To ensure women feel secure throughout their visit, some guards walk around the park all day long. Mothers can also bring their kids with them since there are some private areas designed specifically for families where they can relax without disturbance from other people. Workshops are held frequently within this location to promote cultural diversity among the different communities living in this region, empowering them individually too.

In the city of Jaipur, Central Park was established to provide recreational facilities for mothers and grandmothers who find it difficult to move around town because of having small children who need constant attention or of old age, respectively. There is a section dedicated purely to meditation purposes where elderly females can go early in the morning while still dark outside, feeling safe, knowing very well that they will not be disturbed by anyone else at such hours. All these examples show how important good planning combined with thinking about others first when designing public spaces such as parks should be everywhere across India.

In addition to physical infrastructure, policy frameworks are also of equal importance as physical infrastructure in enabling these inclusive changes. The Smart Cities Mission of the government, designed to create sustainable cities with equal opportunities for all citizens via the overall development process is an example that can be used to integrate gender-based methods into planning. It is a must that there be policies specifically aimed at eliminating gender gaps while at the same time enhancing women's leadership qualities within planning processes. For instance, when women are involved at the grassroots level in the decision-making organs of urban local self-governments, it ensures that they consider their unique requirements and views.

Similarly, technological solutions also give women in cities a chance to be safer and enhance their mobility. Women can take control of their movement sand feel more secure by using apps that report emergencies, make it possible for them to network with the community, and track public transportin real-time, among others. These technologies, if combined with conventional urban planning, can transform cities into inclusive spaces.

However, change cannot occur in isolation. There needs to be joint efforts from authorities at all levels—local, state, national, or international—as well as NGOs, private sector corporations involved in development projects within cities worldwide, etc. Urban planners must engage with organizations outside the government sphere so that they may gain insight into what challenges exist and how best to address them. It is also important to run educational campaigns to create awareness about gender inclusivity in urban planning because people need to educate their minds first before accepting anything different from what they have been used to seeing around them.

Thus, the movement from margins to mainstream, from exclusion to inclusion, is not merely a fulfilment of a social obligation but a strategic imperative for sustainable urban development. It is a recognition that when women flourish, cities flourish—and in this flourishing, there lies the hope for more resilient, vibrant, and equitable urban futures.

Authored by Abhiniti Gupta

DOMAIN-SPECIFIC SMART CITIES IN INDIA: TAILORED STRATEGIES FOR SUSTAINABLE URBAN FUTURES

India's urban landscape is marked by complexity and driven by rapid urbanization. Balancing modernization with environmental sustainability has become a key challenge. In response, the Indian government initiated the Smart Cities Mission in 2015 to enhance urban livability and stimulate innovation. However, the diverse nature of Indian cities has resulted in a varied approach to smart city development, leading to the emergence of domain-specific smart cities. Let's delve into this emerging trend, highlighting various cities in India that excel in specific domains rather than pursuing a comprehensive smart city model.

Ahmedabad is a standout example of prioritizing green urban living, focusing on sustainable transportation, extensive green spaces, and efficient waste management, alongside investments in solar energy and green buildings. Similarly, Surat has leveraged robust transportation systems, integrating public transport networks and smart traffic management to enhance commuter experiences and safety. Pune has distinguished itself through smart governance initiatives, employing digital platforms for public services, and participatory decision-making. Meanwhile, Bhubaneswar's community-centric focus includes pedestrian-friendly zones and cultural hubs, promoting resident well-being

The integration of cultural heritage with modern technology is exemplified by Jaipur, which implements smart infrastructure while preserving its rich history. Visakhapatnam has prioritized coastal resilience, utilizing smart technologies to monitor weather patterns and ocean conditions. Chennai addresses water scarcity through rainwater harvesting, recycling, and desalination projects, whereas Indore leads in waste management, implementing efficient waste segregation and recycling programs. Coimbatore excels in tech-integrated public services, including digital health initiatives and safety monitoring systems. Bhopal's smart city initiatives revolve around environmental sustainability, promoting lush green spaces and biodiversity.

The domain-specific approach underscores the significance of tailored strategies that cater to local needs and leverage regional strengths. These cities demonstrate that focusing on specific domains can yield substantial benefits, from enhanced quality of life to improved resource management. To integrate domain-specific approaches across Indian cities, several strategies are proposed, including knowledge sharing, inter-city partnerships, standardization of technologies, and cross-domain initiatives.

However, realizing the benefits of smart city development requires overcoming challenges such as infrastructure disparities, regulatory hurdles, data privacy, resource constraints, and community engagement. Immediate benefits can be seen through knowledge sharing and collaboration within a year, followed by tangible improvements in specific domains over three to five years. Achieving holistic and integrated smart city development may take a decade or more, necessitating policy alignment, resource allocation, and collaborative efforts across government levels and society. In addition, to facilitate the exchange of ideas, dialogue, and mechanisms for inter-city collaboration in smart city development across India, a comprehensive model can be established.

A model aimed at creating structured platforms and mechanisms that enable knowledge sharing, capacity building, and collaborative initiatives among cities with a focus on domain-specific strategies can be structured.
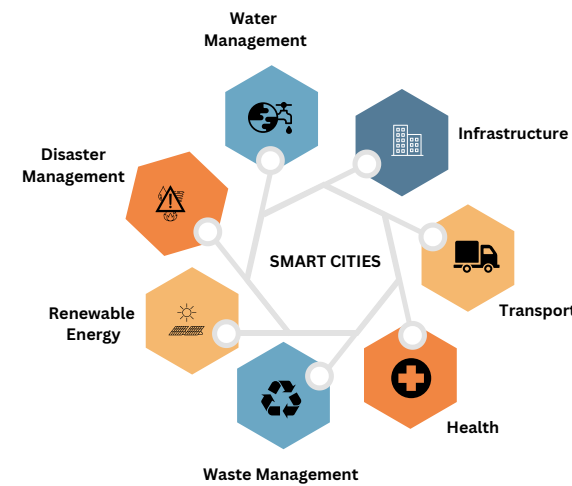
A pivotal component of this model should be the establishment of a National Smart Cities Network (NSCN) that connects smart city leaders, urban planners, policymakers, and stakeholders from different cities across the country. The NSCN will serve as a centralized platform for sharing knowledge, best practices, and innovative solutions in domain-specific smart city development. Through regular conferences, workshops, and seminars organized under the NSCN, cities can engage in meaningful dialogue, fostering collaboration and collective learning.

Within the NSCN framework, domain-specific working groups can be formed, focusing on key areas such as green urban living, transportation systems, smart governance, water management, waste management, and public services. These working groups will comprise representatives from cities excelling in respective domains, facilitating deeper collaboration and expertise exchange. Periodic meetings and webinars will be organized to discuss challenges, strategies, and lessons learned, encouraging cross-learning and solution-sharing among cities.

To promote deeper collaboration, the model advocates for inter-city partnerships and twinning programs. Cities with complementary strengths or similar challenges can establish formal collaboration agreements to exchange knowledge, technologies, and expertise. Joint pilot projects and initiatives can be implemented to test integrated domain-specific solutions and assess their scalability, fostering mutual growth and innovation.

A critical aspect of the model can be the development of a centralized knowledge repository and resource hub under the NSCN. This repository will contain case studies, research papers, reports, and toolkits related to domain-specific smart city development. Participating cities will have access to this repository, facilitating informed decision-making and the implementation of best practices.

The standardization of core technologies and protocols is another key focus area. The model proposes defining standardized protocols and guidelines for data management, communications, IoT integration, and cybersecurity to ensure the interoperability of smart city solutions. This will facilitate the seamless integration and scalability of innovative technologies across cities.

Additionally, capacity-building and training programs will be designed and implemented to enhance the skills of city officials, urban planners, and technical staff in domain-specific smart city technologies and practices. Collaboration with academic institutions, industry experts, and international partners will ensure the delivery of certified courses and hands-on training sessions.

Advocacy for policy reforms and regulatory frameworks that support domain-specific smart city initiatives will be integral to the model. Collaborative efforts with government agencies, think tanks, and industry associations will lead to the drafting of policy recommendations and guidelines based on best practices.

The importance of monitoring, evaluation, and impact assessment should be emphasized. A robust framework should be established to track the progress and impact of domain-specific smart city initiatives. Periodic assessments will measure key performance indicators (KPIs) such as environmental impact, citizen satisfaction, economic growth, and resource efficiency. Sharing evaluation findings and success stories will inspire and guide other cities in their smart city journeys, fostering continuous improvement and collective advancement towards more sustainable and resilient urban futures.

In conclusion, the domain-specific approach holds promise for enhancing smart city development in India. However, success depends heavily on overcoming challenges and sustaining long-term efforts. Future research directions can explore the scalability and replicability of these strategies, assessing their impact on economic, social, and environmental aspects of urban living. It is perhaps common knowledge that continued research and innovation will be essential for advancing smart city development and addressing evolving urban challenges in India.

Authored by Vaishnavi Pandey

BEYOND TOP-DOWN SOLUTIONS: WHY SLUM RESIDENTS NEED A SEAT AT THE TABLE

As Smruti Jukur Johari aptly suggests, poverty may affect affordability, but it does not diminish the innate aspirations of individuals striving for a better quality of life, especially in the rapidly urbanizing landscapes of Asia and Africa. Imagine a scenario where half of us live in cities, and it is expected that this number will grow to two-thirds by 2050. Asia and Africa will be the centre of such a boom. India is set to become much more city-centric in the coming decades. The urban population is also expected to explode to 600 million by 2031 and to more than 800 million by 2051.

The 2011 census of India identified a vast slum population. Over 65 million people, living in nearly 14 million households, were found to be residing in slums across 2,600 cities and towns throughout the country. This means a significant portion of the urban population in India lives in overcrowded and underdeveloped areas. While the government has launched numerous initiatives to address the issue, a crucial element that is missing is the voices of the very people these initiatives are brought into the picture for.

Urban poverty can be traced back to the moment in the Indian economy; that coincided with the economic reforms of the early 1990s. People started migrating from rural to urban areas in search of better jobs and higher living standards, as agriculture was becoming unprofitable, creating a pull factor. This rapid influx of people outpaced the development of infrastructure and affordable housing in the cities, leading to a massive increase in overcrowded slums and inadequate basic services, giving rise to urban poverty. Urban poverty and slum development are pressing issues in India that can be attributed to rapid urbanisation and lopsided economic growth.

WHAT IS A SLUM?

The United Nations defines a slum based on the lack of one or more necessities such as safe water, sanitation, sufficient living space, durable housing, and security of tenure. These are informal settlements that are overcrowded with little to no basic services. Such arrangements make the vulnerable prone to eviction and displacement.

Urban poverty and the conditions in slums create a series of interconnected challenges. Living in these areas presents numerous difficulties combining to form a complex web of adversity. Overcrowding and unsanitary conditions contribute to the spread of infectious diseases, while limited access to clean water and proper sanitation worsens the situation. Additionally, obtaining nutritious food at an affordable price is often difficult, leaving children susceptible to malnutrition and its long-term effects on their health and development. The mental strain of poverty is also significant.

Moreover, poverty can contribute to increased crime rates. Without access to quality education or formal employment opportunities, young people, in particular, turn to illicit activities for their survival. However, the consequences of these challenges extend beyond individual households. The substantial amount of waste generated in slum areas, coupled with inadequate waste management, leads to pollution that affects everyone. Furthermore, as cities struggle to cope with rapid urbanization, existing infrastructure becomes strained, exacerbating these issues further.

In essence, it is a chain reaction—a cycle of interlinked challenges that impact not only the residents of these areas but also the entire community and the city as a whole.

GOVERNMENT INITIATIVES:

The government of India has launched several initiatives to address slum development and urban poverty, such as –the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Rajiv Awas Yojana (RAY), Pradhan Mantri Awas Yojana, the Deen Dayal Antyodaya Yojana-National Urban Livelihood Mission, PM AWAS YOJANA, Smart Cities Mission (SCM),
Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Food Security Act, 2013 (NFSA), Public Distribution System (PDS), Skill India Mission (SKM), and Jal Jeevan Mission (JJM). Slum programs in India show mixed results. Early efforts focused on infrastructure and shifted later to creating shelters and upgrading existing slums, but faced challenges that included land ownership issues, funding issues, and a lack of comprehensive slum data.

CASE STUDY:

Internationally, a remarkable example worth considering is the Mukuru slum in Nairobi, Kenya, which has long faced challenges related to poor living conditions, inadequate infrastructure, and tenure issues. What the authorities followed was a community-led approach to slum upgrading. In 2017, the Nairobi City County declared Mukuru a Special Planning Area (SPA). This designation facilitated a massive project to build thousands of new homes and upgrade essential services like water and sanitation.
What makes this project unique is the extensive community involvement. People in Mukuru actively provide information about the challenges they face. Over 30 different organizations are working together to find solutions. This teamwork has the potential to completely transform Mukuru, making it a healthier and safer place to live in. It could even serve as a model for other cities struggling with similar issues. This project shows the power of people working together. By speaking up about what they need and collaborating with others, the residents of Mukuru are taking charge of their future.

RECOMMENDATIONS:

1. Improve access to affordable housing - Build or renovate homes for slum dwellers, making them accessible financially.
2. Enhance access to basic services - Ensure proper water supply, sanitation, and waste management in slums.
3. Promote employment opportunities- Provide skill development and job training to empower slum residents economically. Special training sessions should be conducted for women empowerment through ASHA clinics and self-help groups.
4. Facilitate inclusive decision-making - Include slum dwellers in decision-making processes for their communities.
5. Initiate PPP Projects- Collaborate with private companies to leverage resources and expertise for slum development.
6. Provide financial assistance – Microlending and credit facilities should be provided.

CONCLUSION:

Let us aim to build a better future for everyone, especially in our cities. The world has set 17 SDG goals, which can be compared to a giant to-do list, to ensure that everyone gets a fair chance at leading a healthy and happy life. But our cities, especially the sprawling ones with myriad problems, are making it tough to reach these goals. The slums in these cities are extremely crowded, usually run-down areas that affect everything from the environment to how people move around. To address these issues, it's crucial to understand the factors that lead to the formation of slums and how aligning our efforts with the SDGs can help target these root causes. By tackling these challenges together, we can create cities that not only work better for people but also benefit the planet.

Authored by Vaishnavi Gupta

HARVESTING HEALTH:
The Intersection of Urban Farming and Public Wellness

The global population is expanding, and healthcare systems are facing strain due to the ageing population, particularly in the Global North. The COVID-19 pandemic has increased demand for the utilization of the environment for mental and physical wellbeing. Urban farming, or producing, processing, and distributing food in urban areas, uses techniques like vertical farming, hydroponics, aquaponics, rooftop gardens, and edible landscaping to improve local food production, food security, community resilience, and sustainability.

This approach aims to integrate nature into healthcare, addressing the funding crisis and the need for support. Urban farming benefits society as a whole, mitigating climate change, promoting community cohesion, protecting ecological services, and ultimately improving health and welfare. This highlights the importance of integrating nature into healthcare to address the growing pressures of the post-pandemic era.

Urban agriculture has become a vital aspect of public health in the modern era. Let's take a look at some of the important benefits it provides.

Nutrition and Food Security
Urban agriculture can improve overall health outcomes and reduce the occurrence of chronic diseases related to food by providing fresh, locally farmed products. Public health systems are promoting farmers' markets and community gardens to support urban agriculture efforts.
The Rush Health System in Chicago has investigated Food as Medicine initiatives and the USDA has established an Urban Service Centre to assist urban farms. The Public Health Institute of Metropolitan Chicago is promoting research and development through the City Farmers programme.

Physical Activity and Mental Health
Urban agriculture offers chances for social contact and physical exercise, which helps enhance mental and physical well-being. Public health systems can encourage the creation of green areas and community gardens in nursing homes and other healthcare facilities, thereby supporting urban agriculture.

Environmental Health
Urban agriculture significantly improves environmental health by reducing the urban heat island effect, improving air quality, and reducing the environmental impact on food production. Public health systems can experience cost savings and improved results by encouraging urban agriculture growth, leading to greater nutrition, increased physical activity, and a cleaner environment

Economic Development
By preserving money in the local economy, fostering job possibilities, and allowing land ownership, urban agriculture supports economic growth. Urban agriculture projects are receiving support from public health systems, which are encouraging farmer training for organic and food safety certifications and refocusing their food purchasing to prioritise local urban farmers. Despite its advantages, urban farming also indicates some potential environmental health risks. Potential public health issues related to urban food growing are covered further.

Is Urban Farming safe on city soil?

Healthy soils are rich in nutrients, have good drainage and water absorption capacity, and have a neutral pH, which promotes maximum nutrient absorption. However, city soils can contain harmful pollutants, which can be ingested by humans through skin contact, inhalation, or consumption of polluted soil or plant tissues.

Urban settings can potentially expose people to contaminated soil through:
- Brownfields, or abandoned commercial or industrial land
- Activities like trash disposal, traffic, and industrial pollutants. Pollutants like microplastics can alter soil characteristics, disrupt plant functions, and be consumed by humans and animals.
- Pollutant accumulation can also be influenced by building construction and residential uses, such as lead-based paint, which can contaminate fresh produce by seeping into nearby soils.

- Food safety may also be threatened by past or present pesticide usage or misuse as they seep into underlying soils or remain in crops.
- Using treated wood for raised beds or planters may release creosote into the soil.

Impact of pollution on produce

Urban areas often have contaminated soil, but not all contaminants will contaminate food. The consumable plant portion as well as soil-related variables like pH, drainage, and the presence of organic matter affect the uptake of pollutants. Leafy vegetables and root crops store lead better than fruit plants, while tomato leaves absorb cadmium in fields near busy roads.

Fertilizer use can also contribute to the accumulation of cadmium in crops. Despite high lead levels in soil, recent studies show negligible lead uptake in vegetables collected in urban settings. Adding compost can help dilute the lead in the soil.

Is the water pure enough?

Rainwater collection in rain barrels is crucial for preventing soil contamination and growing nutritious food. However, high demand for water infrastructure during the growing season and climate change-induced water shortages can pose challenges. Rainwater safety can be significantly impacted by its collection and storage systems, which could contain biological or chemical contaminants. Animal and avian excrement may contain bacteria, cyanobacteria, fungi, and protozoa, which can flourish in rain barrels in ideal conditions. For example, coliform levels in Ohio's rainwater exceeded US standards for secondary recreational water quality. However, rainwater collected in Guelph, Ontario, showed lower levels of coliform contamination. Chemical pollutants can also erode roof materials into rain barrels or soil.
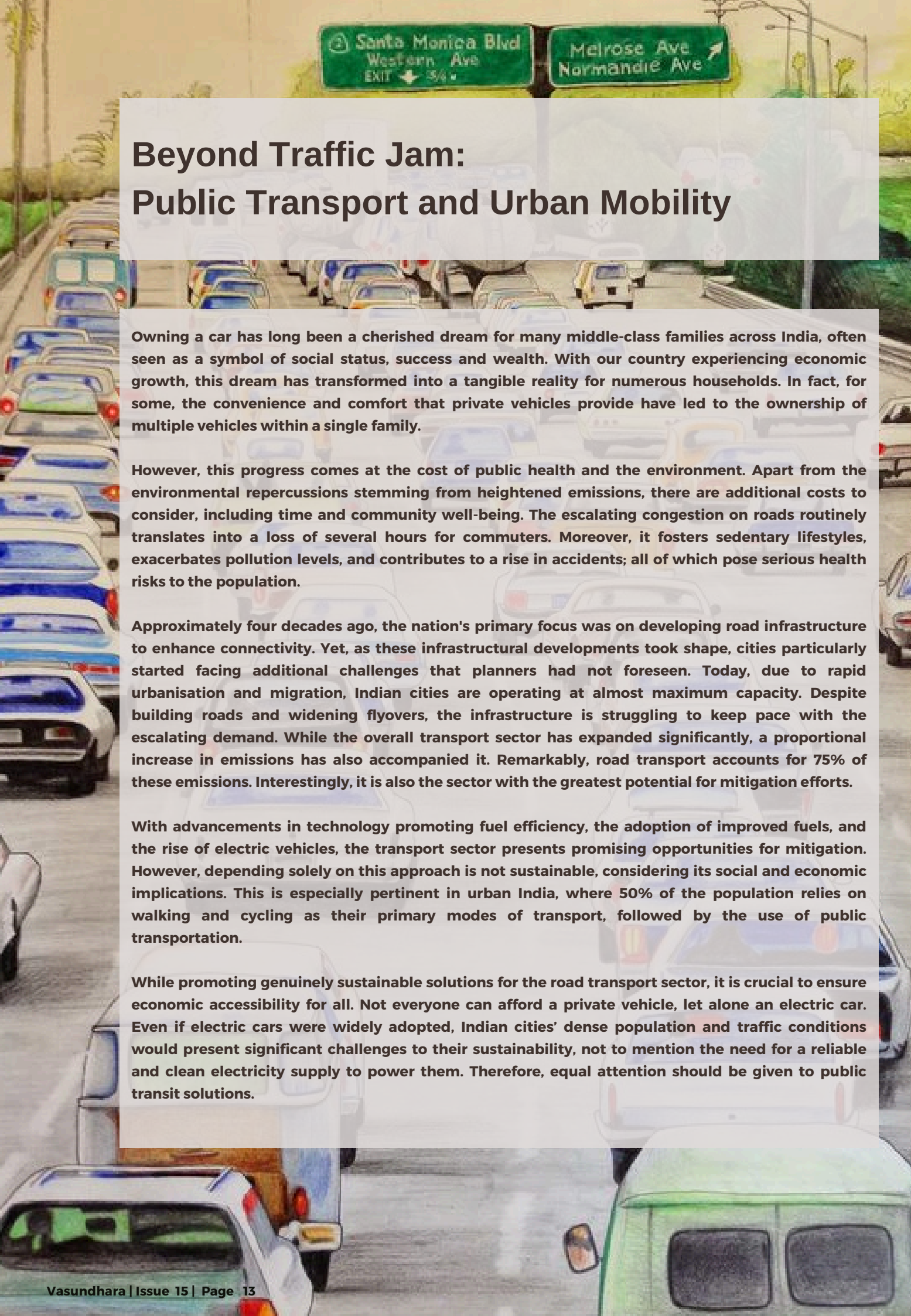
Contaminant levels in water can also be impacted by the slope, surface roughness, coating, age, and maintenance history of a roof. Heavy metals like lead and zinc are often found in rainwater collected from roofs in North America, but they are much below US federal irrigation criteria. Heavy metals were absent from Puget Sound roof runoff in another scenario. The minimal amounts of heavy metals in rainwater collected near Guelph, Ontario, suggest that assessing the potential dangers of these pollutants is essential.

Urban farming is gaining popularity in metropolitan areas because it enhances the social and cultural diversity of neighbourhoods, promotes community and economic growth, and provides healthy meals to city dwellers. It also offers environmental benefits like enhanced biodiversity, pollinator habitats, and nutrient-rich soils. Resolving the hazards urban agriculture poses to public health will shift the scales in favour of these advantages.

Public health specialists can be valuable in urban agriculture due to their community relationships, knowledge of health-related matters, and ability to work with urban planners. However, to avoid excessive strain on urban services, natural areas, and human resources, careful resource management is required throughout the food production cycle.

Authored by Purvi Gupta

Beyond Traffic Jam:
Public Transport and Urban Mobility

Owning a car has long been a cherished dream for many middle-class families across India, often seen as a symbol of social status, success and wealth. With our country experiencing economic growth, this dream has transformed into a tangible reality for numerous households. In fact, for some, the convenience and comfort that private vehicles provide have led to the ownership of multiple vehicles within a single family.

However, this progress comes at the cost of public health and the environment. Apart from the environmental repercussions stemming from heightened emissions, there are additional costs to consider, including time and community well-being. The escalating congestion on roads routinely translates into a loss of several hours for commuters. Moreover, it fosters sedentary lifestyles, exacerbates pollution levels, and contributes to a rise in accidents; all of which pose serious health risks to the population.

Approximately four decades ago, the nation's primary focus was on developing road infrastructure to enhance connectivity. Yet, as these infrastructural developments took shape, cities particularly started facing additional challenges that planners had not foreseen. Today, due to rapid urbanisation and migration, Indian cities are operating at almost maximum capacity. Despite building roads and widening flyovers, the infrastructure is struggling to keep pace with the escalating demand. While the overall transport sector has expanded significantly, a proportional increase in emissions has also accompanied it. Remarkably, road transport accounts for 75% of these emissions. Interestingly, it is also the sector with the greatest potential for mitigation efforts.

With advancements in technology promoting fuel efficiency, the adoption of improved fuels, and the rise of electric vehicles, the transport sector presents promising opportunities for mitigation. However, depending solely on this approach is not sustainable, considering its social and economic implications. This is especially pertinent in urban India, where 50% of the population relies on walking and cycling as their primary modes of transport, followed by the use of public transportation.

While promoting genuinely sustainable solutions for the road transport sector, it is crucial to ensure economic accessibility for all. Not everyone can afford a private vehicle, let alone an electric car. Even if electric cars were widely adopted, Indian cities' dense population and traffic conditions would present significant challenges to their sustainability, not to mention the need for a reliable and clean electricity supply to power them. Therefore, equal attention should be given to public transit solutions.

A multifaceted approach is being tried out to encourage people to shift from private vehicles to public transport, including economic measures like congestion pricing and increased parking fees. Though these are effective in theory from a demand-supply perspective, it's crucial to ensure that viable and accessible alternatives exist for the public. A reliable and connected public transport system is a prerequisite for such measures to succeed. Investing in expanding and improving public transport infrastructure, enhancing its frequency and coverage, and ensuring affordability are essential steps. Examples like the Mumbai Local and Delhi Metro highlight how public transport can be both affordable and accessible to everyone while providing excellent connectivity and reliability.

It is important to consider that constructing rail-based public transport systems demands substantial investment, land use change, and often involves starting from scratch. Given that cities already have well-established road networks, enhancing road-based public transport like the Bus Rapid Transit System (BRTS) can be a more feasible and cost-effective alternative. Focusing solely on a single mode of transport, even if it's as efficient as BRTS, can undermine the effectiveness of a public transit system. Integration with diverse transit options is essential for ensuring the viability and success of public transportation networks. Hence, enhancing road-based intermodal transport systems can offer a viable alternative for urban mobility. This approach was envisioned in the National Urban Transportation Policy, 2014 (NUTP).

Intermodal transport entails coordinating various players in the intermediate public transport or paratransit sectors like auto rickshaws, tuk-tuks, e-rickshaws, while at the same time promoting walking, cycling, and limited use of private vehicles so passengers have more flexibility and convenience in their journeys. These modes should function in a complementary rather than competitive manner, ensuring seamless last-mile connectivity. Successful examples of this approach include feeder shuttles for metro services or shared auto-rickshaws. Such a system holds the potential to prioritize moving people efficiently rather than simply focusing on vehicles, aligning with the objectives outlined in the NUTP.

Setting aside the integration of the vast informal network of paratransit momentarily, one readily available opportunity for reducing emissions and enhancing public health lies in promoting non-motorized transport like walking. Walking offers unparalleled flexibility and complements other public transportation systems. However, the condition of pavements in India is often dismal. When they're not encroached upon by hawkers, they're often broken or littered with pet waste, making them unpleasant to use. It's time to put an end to the hypocrisy of promoting sustainability while investing in high-emission infrastructure. Instead, we should align our actions with our words and invest in improving public transport and pedestrian infrastructure.

Authored by Anuja Ramugade

GREEN LIVING

Unpacking the Financial and Global Advantages of Sustainable Housing

In today's world, the concept of "green living," or living sustainably, has surpassed mere buzzwords to become an essential component of responsible living. As the impact of climate change becomes increasingly unavoidable, individuals and communities are turning towards more sustainable lifestyles, especially in terms of housing. A sustainable home is not just about reducing environmental impact but also about creating economic and social value for its inhabitants and the broader community. In this article, we will delve deeper into the financial upsides of going green and the different strategies adopted by countries around the world that promote sustainable housing.

One of the most immediate financial benefits of sustainable homes is the reduction in utility bills. Energy-efficient appliances, solar panels, and superior insulation can drastically cut costs associated with heating, cooling, and electricity. For example, solar panels can significantly reduce electricity bills or even eliminate them with a net-zero energy system.

Sustainable homes often utilize high-quality, durable materials that are designed to last longer and require less maintenance than conventional materials. For instance, bamboo flooring is not only sustainable but also more durable than traditional hardwoods. Green roofs extend the lifespan of roofing materials by protecting them from the harsh elements, potentially doubling or tripling the life of the roof.

Governments around the world are offering various incentives to encourage the adoption of sustainable practices in housing. These incentives often take the form of tax credits, rebates, or deductions. Different countries have adopted diverse strategies to integrate sustainability into their residential sectors, drawing on local resources, cultural preferences, and economic conditions.

Japan faces unique challenges due to its limited space and high risk of natural disasters. As a result, its sustainable housing practices focus on innovation in compact living arrangements and earthquake-resistant construction. The Smart House concept in Japan integrates technology to maximize energy efficiency and manage energy consumption effectively. These houses use advanced technology like home energy management systems (HEMS) to optimize energy use, a critical feature in a country that has faced energy shortages.

Australia's sustainable housing market heavily focuses on water conservation, reflecting the country's chronic water scarcity issues. Techniques such as rainwater harvesting, greywater systems, and water-efficient landscaping are commonplace in Australian homes. Additionally, the Australian government supports sustainable housing through initiatives like the Nationwide House Energy Rating Scheme (NatHERS), which provides homes with a star rating based on their energy consumption potential.

In the UAE, sustainability has become a part of its luxury real estate market. Projects like Masdar City in Abu Dhabi are built on the concepts of zero carbon and sustainable living. The city uses solar energy extensively and features an automated transport system to minimize urban sprawl and pollution. This approach reflects an integration of traditional Arabic architectural elements with modern technology to achieve sustainability in a harsh desert climate.

By reducing operational costs, increasing property values, and offering various incentives, sustainable homes present a financially viable and environmentally responsible alternative to traditional housing. The global perspective on sustainable housing shows a vibrant array of practices, each tailored to local needs and conditions, proving that sustainability in housing is not only possible but also profitable and desirable across different cultural and climatic contexts.

India's housing sector is under enormous pressure due to the country's burgeoning population and rapid urban migration. Major cities like Mumbai, Delhi, Bengaluru, and Kolkata are experiencing exponential growth, leading to the rise of slums and unplanned settlements with poor living conditions. According to a 2019 report by the Ministry of Housing and Urban Affairs, India faces a shortage of about 18.78 million housing units. Moreover, the energy consumption related to housing is substantial, contributing significantly to the country's carbon footprint due to its reliance on non-renewable energy sources.

India can take a cue from global practices by enforcing stringent building codes that mandate energy efficiency. These codes should focus on reducing energy consumption in residential buildings by using advanced materials for better insulation, promoting natural lighting and ventilation, and incorporating renewable energy sources like solar panels. The Indian government can encourage developers to adopt green building standards by offering tax rebates, subsidies, and faster permit processes for projects that achieve certification.

Water scarcity is a significant issue in many parts of India, especially urban cities that have now started facing this issue. Sustainable housing policies should enforce the integration of water conservation methods, such as rainwater harvesting, greywater recycling, and the use of water-efficient plumbing fixtures, to mitigate this problem.

India's journey towards sustainable housing needs a multi-faceted approach involving stringent policies, incentives for green practices, and mass awareness. As the country continues to develop economically, the shift towards sustainable housing can lead to enhanced living conditions, better health outcomes, and a significantly lower environmental footprint. The time is ripe for policymakers, developers, and citizens to come together and embrace sustainable housing practices that pave the way for a greener, more sustainable future. By doing so, India can not only address its housing challenges but also contribute significantly to global environmental goals.

Authored by Sana Grover

Our environment is directly influenced by attitude and we will in fact only achieve success in farming and living when we improve the quality of our thinking through conscious practices.

BLUE GREEN INFRASTRUCTURE: PIONEERING SUSTAINABLE INFRASTRUCTURE DEVELOPMENT FOR INDIAN CITIES

The development of infrastructure focuses on three key aspects of sustainable development: Environment, Social, and Governance. It also integrates blue elements, such as seas, rivers, lakes, and wetlands, with green elements like trees, parks, gardens, and forests. These water bodies and green spaces are interdependent, helping to build infrastructure that can respond to climate hazards like droughts, cyclones, forest fires, heat waves, and floods.

This approach helps prevent economic, biodiversity, and infrastructure losses, especially for poor and minority groups in cities. By being resilient and adaptable, blue-green infrastructures can replace grey infrastructures. Grey infrastructures use artificial solutions like wastewater treatment plants, pipelines, and dams, which rely on hard surfaces like concrete, asphalt, and steel, harming the environment. In contrast, blue-green infrastructures focus on climate change, health, and urban resilience.

What are cities doing?

Indian cities are working towards decarbonizing energy supplies and reducing energy demand through more efficient heating and cooling systems. They are also improving waste management by reducing waste at the source, optimizing waste pickup routes, promoting recycling and composting, and investing in new public transportation systems to encourage people to reduce the use of personal vehicles, thereby cutting emissions. However, urban areas still account for about 70 percent of global CO2 emissions, with transport and buildings being the largest contributors (IPCC, 2022), and these sectors are also more vulnerable to the impacts of climate change. The decreasing presence of green and blue features in cities like Bengaluru, Mumbai, and Ahmedabad, as shown by land use cover assessments (Fig. 1), is a significant concern.
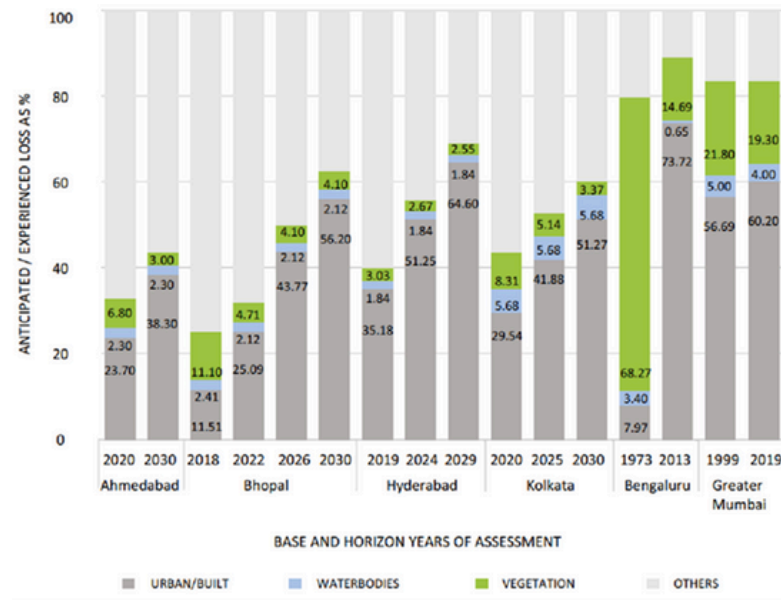
Figure 1
Source: Prepared based on data from Ramachandra et. al. (2016),17 (2017),18 and Shantaram et. al. (2020).

Green Infrastructure for Effective Runoff Management

Our current stormwater systems are insufficient to manage the various impacts of stormwater runoff on our daily lives. During floods, stormwater mixes with sewage, containing harmful bacteria, viruses, and microorganisms, bypasses wastewater treatment, and flows into nearby water bodies. This combined sewer overflow poses a significant public health concern. The solution lies in stormwater green infrastructure, which comprises natural and engineered systems integrated into the built environment. These systems promote natural hydrological processes by absorbing runoff, slowing it down, and allowing plants to release it back into the atmosphere. In cities, the vast expanse of impervious rooftops that shed water quickly exacerbates runoff. This issue can be addressed by creating "green roofs" with selected plants that can survive and thrive in extreme conditions. For roofs unsuitable for green roofs, bio-retention planters can be used to slow down and delay runoff discharge.

Other examples of green infrastructure include rain gardens, permeable pavements, constructed wetlands, and vegetated swales, which can significantly reduce the impact of storm surges and reduce flood footprint in urban areas such as Mumbai, (which lost INR 14,000 crore over a decade 2005-2015) to flooding, and Hyderabad.

Delhi's Blue-Green Approach to Urban Development

Delhi has emerged as a pioneer among Indian cities by incorporating a blue-green policy focus into its 2041 masterplan. The Delhi Development Authority (DDA) has adopted a practical approach, implementing a comprehensive strategy for its integration.

A key step involves the creation of a detailed digital map encompassing the various agencies responsible for managing specific water and land bodies. Additionally, the DDA plans to clean up 50 major drains, currently under the jurisdiction of different agencies, by treating pollutants and preventing untreated waste from being dumped into water sources. This initiative is critical, considering Delhi's significant sewage generation of about 3,800 million litres per day, half of which is discharged untreated into water bodies. The cleaned areas alongside the drains will be transformed into buffer zones and green corridors, featuring amenities like walking and cycling paths, gardens, exercise areas, yoga gardens, and open-air theatres.

To overcome the challenges posed by multiple governing agencies, the DDA is collaborating with these entities to establish a common rulebook for the integrated development of blue-green infrastructure in Delhi. Successful implementation of the blue-green policy and the broader masterplan hinges on effective coordination among Delhi's municipal authorities, the DDA, the state government, and development agencies.

Bengaluru's 2050 Master Plan

Bengaluru faces challenges in resiliency planning, with water and sanitation vulnerabilities affecting its livability, as highlighted in a 2014 report. The Bangalore Water Supply and Sewerage Board (BWSSB) is addressing these issues by reducing water leakages, increasing revenue, and enhancing sanitation standards. In collaboration with the Indian Institute of Human Settlements and local stakeholders, the BWSSB developed a blue-green action plan in 2014. This plan aims to secure resources, enhance climate resilience, transition to a low-carbon economy, and protect ecosystems.

As part of this initiative, the Master Plan 2050 for Water Supply and Sewerage Management was introduced, focusing on population growth, water demand, and climate change. This masterplan, funded through foreign loans, includes short-term and long-term targets such as technical implementation, climate adaptation, and stakeholder engagement to improve water supply and sanitation infrastructure in Bengaluru.

The Green Credit Program for Sustainable Development

The effective implementation of the Green Credit Program launched by the Government of India is vital for restoring ecosystems. This program engages individuals, communities, private sector industries, and companies in activities such as increasing biodiversity-based afforestation through remote sensing to find degraded land, water management, sustainable agriculture, waste management, air pollution reduction, and mangrove conservation and restoration. The Ministry of Environment, Forest, and Climate Change plays a key role in ensuring proper governance and administration of these activities. By fostering collaboration among various stakeholders and ensuring sound environmental management practices, this approach contributes significantly to creating a conducive environment for the development of blue-green infrastructure.

Through meticulous data collection and monitoring, steadfast institutional commitment, and unwavering public support, cities can advance towards a net-zero future. While initiatives like the Smart Cities Mission (SCM) and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) have made significant strides in this direction, much more effort is needed to fully realize this vision.

The implementation of blue-green infrastructure, particularly in areas such as transportation, water management, and housing, holds the key to unlocking a myriad of ecosystem services. From essential provisioning to critical regulation, from supportive to culturally enriching, these services not only enhance the environment but also elevate the quality of life for urban residents. As we strive for sustainable urban development, it becomes increasingly clear that embracing blue-green infrastructure is not just an option but a necessity for building resilient, liveable cities for generations to come.

"Blue-green infrastructure is nature's symphony, harmonizing water and land to create resilient, sustainable cities where every drop of rain and breath of air is a gift to be cherished."

Authored by Ishaa Mahakud - MSc ESRM
(External Contribution)

HARMONY IN THE CONCRETE JUNGLE: HARNESSING GREEN INFRASTRUCTURE AND BIODIVERSITY CONSERVATION FOR URBAN SUSTAINABILITY IN INDIA

In the cacophony of teeming Indian cities, where concrete structures appear to stretch indefinitely, the concept of urban sustainability shines as a beacon of hope. Amidst unrelenting, unprecedented expansion, maintaining nature's fragile balance has become crucial. Across the twenty-first century, urbanization is rapidly increasing across the Global South. By 2030, over 5 billion people will live in cities, with more than 80% of them in developing countries. Asia and Africa's urban population is highly likely to double from 1.7 billion to 3.4 billion between 2000 and 2030. However, over the last decade, a paradigm shift has been occurring, with green infrastructure and

biodiversity conservation emerging as powerful tools for building resilient and vibrant Indian cities. Green infrastructure, a well-planned network of natural and semi-natural spaces integrated into urban settings, includes urban parks, forests, green roofs, permeable pavements, strategically planted trees, bioswales, and rooftop gardens. These elements not only enhance aesthetics but also serve as functional components that contribute greatly to urban sustainability. They act as natural filters, removing pollutants and improving overall air quality.

To address issues with urban growth, the Indian Smart City Mission was established in 2015 to meet sustainability criteria in urban design. The primary tactics include fair distribution of material and social services (housing, transportation, and water supply) among all residents, utilizing contemporary technologies for efficient infrastructure, and transforming decaying regions through pan-city solutions, greenfield growth, retrofitting, and redevelopment. The mission aims to develop inclusive, effective, and sustainable cities throughout India.

Furthermore, restoring urban water bodies and riparian zones not only improves aesthetics but also enhances water quality and provides critical habitat for aquatic animals. Encouraging decentralized wastewater treatment solutions, such as built wetlands and biogas digesters, ensures effective resource usage and reduces pollutant discharge into water bodies, thus protecting human health and the environment. Bioswales and rain gardens help regulate stormwater runoff, reducing floods and replenishing groundwater. Wetlands serve as natural water treatment systems, improving water quality. Green infrastructure also minimizes the urban heat island effect, which occurs when cities experience much higher temperatures than surrounding rural areas.

The shade produced by trees, bushes, and greenery lowers air temperatures through naturally induced evapotranspiration, creating cooler microclimates. This not only improves thermal comfort for occupants but also saves energy required for cooling buildings. Urban biodiversity, supported by a network of green areas, can help with natural pest management, reducing reliance on chemical pesticides, and improving public health.

In such cases, vulnerable groups frequently bear the burden of environmental deterioration due to a lack of access to critical green infrastructure services. Prioritizing the fair distribution of green areas and biodiversity conservation activities is critical for building inclusive and resilient urban communities. Engaging individuals in participatory urban planning procedures allows communities to express their needs and preferences, ensuring that green infrastructure projects reflect local priorities while also improving social cohesion. Investing in community-based programs like urban agriculture and community gardens enhances food security while also providing leisure activities and strengthening social ties among neighborhoods.

Green areas play a crucial role in urban growth by serving as natural stormwater drains and barriers during catastrophic events like floods. This promotes climate adaptation initiatives and reduces the risk of climate change-related disasters in urban areas. As a soft engineering technique, urban green landscapes are especially beneficial for low-income nations like India, offering vital ecosystem services directly related to disaster risk reduction and climate change adaptation.

Vibrant urban ecosystems also offer valuable opportunities for leisure, stress relief, and connection with nature, improving overall well-being and social cohesion. Beyond reducing energy use, green infrastructure also provides financial benefits. Investing in biodiversity protection and green infrastructure offers India's sustainable urban growth a long-term, affordable option. By carefully incorporating nature into the urban fabric network, cities can mitigate the effects of climate change, foster a sense of community, and provide healthier living conditions. Building a more sustainable future for everyone depends on prioritizing green infrastructure and biodiversity protection as India's urban landscape evolves.

In conclusion, coordinated creativity and a commitment to natural solutions are critical pathways to urban sustainability. By addressing urgent environmental issues like pollution, loss of biodiversity, scarce water supplies, and social and gender injustice, these natural solutions provide comprehensive strategies that improve ecological resilience, environmental quality, and the general well-being of city dwellers. Incorporating green infrastructure and biodiversity protection into urban development policies can transform Indian cities into vibrant centers of human and ecological well-being, ensuring a more sustainable and healthy future for generations to come. Cultivating a culture of sustainability among citizens, transcending socioeconomic boundaries, and encouraging collective action toward a greener, more equitable future will be essential.

Authored by Srija Majumdar - MSc ESRM
(External Contribution)

Q. With over two decades of experience as an urban planner and having had the opportunity to live in various cities, which city stands out as your favorite and why?

Having experienced life in close to a dozen places so far, this is a tough choice. But I'll say Kolkata—for being fairly walkable and public transport friendly and bearing good examples of urban planning and ecological preservation. The city also offers great food, cultural richness, and, of course, nostalgia.

Q. In light of the migration from rural and semi-urban areas to cities, what role do you believe cities play in shaping our nation's sustainable development journey?

Cities are central to India's sustainable development, occupying only 3% of land but contributing 60% of GDP, while facing poor quality of life and climate risks. While cities will remain hubs of economic growth, innovation and social progress, they also need to manage their natural and physical resources well.

For instance, cities must integrate nature-based solutions with grey infrastructure, ensure access to basic services—especially for low-income, vulnerable, and migrant populations—reduce emissions through circular economy solutions, and encourage behaviour change.

Building resilience to climate hazards requires data-driven preparedness and awareness. Cities must also ensure equitable outcomes through access to services, economic opportunities, and digital inclusion.

Achieving these goals will require new growth pathways, systems thinking, stakeholder collaboration, and understanding trade-offs, as there are no silver bullets.

Q. Delhi encounters a range of extreme weather conditions, from intense heat waves and cold winters with dense smog to recent instances of flooding. What comprehensive strategies can be employed to enhance a city's resilience to these challenges?

Earlier this year, Delhi experienced heat stress, water scarcity, and flooding within a month, all while grappling with severe pollution that impacts populations, especially children.

Climate change and poorly managed urbanization are worsening these issues, and without change, they will intensify.

To address this, we need integrated, systemic solutions. Some key strategies include:

Urban planning with compact city designs that promote walkable neighbourhoods, local economies, co-located services, and robust public transport, while integrating blue-green infrastructure and sustainable building codes.

Data-driven climate action plans and resilient infrastructure with baselines for emissions and pollution, and hybrid solutions like rainwater harvesting and natural flood management.

Empowered governance at regional and local levels to better manage resources, engage citizens, and protect ecosystems.

Implementing these, cities can tackle heat, drought, flooding, and pollution, creating more livable, resilient urban environments.

Q. How essential are social cohesion and equality in the pursuit of sustainable urban development? What measures can be taken to strengthen this aspect in diverse and dynamic urban populations?

Ensuring equity and social cohesion is vital for sustainable urban development. Some populations are more vulnerable to risks like climate change, unplanned growth, and poor development decisions. Acknowledging this allows for mechanisms to offset these risks, ensuring all citizens have access to services and opportunities for their well-being and that of the environment.

1. Participatory planning: Involve citizens from all socio-economic backgrounds, especially minorities and historically excluded groups, in urban planning. Use public consultations, workshops, and forums to ensure their needs are addressed.
2. Access to services: Ensure basic services, like affordable housing, healthcare, and education, are accessible to all. Design public spaces that are safe and welcoming, especially for vulnerable populations and gig workers. Provide reliable and affordable public transport for access to jobs and livelihoods.
3. Equitable resource distribution: Develop policies to ensure services aren't concentrated in specific areas. Promote mixed-use, mixed-income development to bridge employment gaps and support inclusion. Ensure all communities have clean air, water, green spaces, and protection from environmental hazards.

These measures reduce disparities and foster a just, resilient society.

Q. While cities are often viewed as hubs of economic productivity, the concept of degrowth emphasizes the need to reduce consumption and production for environmental sustainability. How can we effectively balance the principles of degrowth with the imperative of development to ensure fair and equitable growth, particularly in rapidly urbanizing regions?

In the current economic order, balancing the principles of degrowth with the need for development, especially in rapidly growing regions is a complex challenge. However, it is becoming critical to consider for planetary, environmental and societal good.

Degrowth, in essence, emphasizes the need to reduce consumption and production to prioritize well-being, social equity, and ecological balance and is a movement that is gaining momentum within many community groups.

Here are a few ways to approach this:

- Redefining metrics of societal and national growth and well-being: Shift from GDP growth to indicators of ecological balance and human equality, including the contribution of the care economy and unpaid work.
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Interview Conducted By: Anuja Ramugade and Rajlakshami Chaodhary

'Inclusive Cities:
For Every Climate and Community'
With

Ms. Jaya Dhindaw

Jaya Dhindaw is a renowned figure in the verticals of sustainable urban planning and natural resource management with a rich and diverse experience of over two decades. At present, she is working with the World Resources Institute (WRI) India by serving as the Executive Program Director, Sustainable Cities and Director, WRI India Ross Center. She is an alma mater of prestigious institutions such as University of Pune, Indian Institute of Technology, Kharagpur, and University of Cincinnati. She has extensively contributed as a researcher alongside providing invaluable strategic leadership across leading organisations including WRI India, and Centre for Infrastructure, Sustainable Transport and Urban Planning (CISTUP), among others. She has authored multiple blogs and has some critical publications to her name that delve deeper into the themes under urban sustainability, highlighting key aspects such as nature-based solutions, sustainable livelihood, climate vulnerabilities, and urban mobility. Furthermore, she runs a podcast on WRI India's YouTube page with the name, "The Urban Q", wherein she holds engaging conversations with experts of the urban development domain ranging from eminent thought-leaders, businesspeople, practitioners, innovators, as well as academia.

- Integrating nature and natural assets in infrastructure development: Promote compact, connected growth that incorporates green spaces and respects ecological systems, reducing greenhouse gas emissions. Use materials that minimize carbon footprints and enhance resilience.
- Mainstreaming circular, shared, and local economy: Support circular economy principles where resources are repaired, reused, and recycled, reducing waste. Encourage local businesses and collective use models to lower environmental impacts.
- Enabling just transition towards a green economy: Develop policies and incentives for green industries like renewable energy and sustainable building materials. Support skill development for workers transitioning from traditional industries.
- Nudging behavior shift: Encourage sustainable practices, demand for local, low-carbon products, and minimalist lifestyles.

Balancing degrowth with development involves rethinking economic models to prioritize sustainability, equity, and well-being, leading to regenerative and resilient urban growth.

Q. How has your journey been within the domain of urban sustainability, and what challenges have you faced and overcome along the way? As we conclude, do you have any final thoughts or advice for our readers?

The challenges of shifting discourse, policy, practice and behavior towards low-carbon, equitable and resilient growth have a long gestation period and are slow to move, however, it is encouraging to see good models gain traction and pockets of excellence that are being delivered and discussed. The journey within the urban development domain has been challenging but rewarding in its own way.

Here are a few things I've learned along the way:

- There are no perfect solutions, only trade-offs. We must manage unintended outcomes with complementary mechanisms.
- Always prioritize people in development decisions. Involve them in planning, and design for the most vulnerable—it's often the smartest choice.
- Change takes time. Systems change needs strong delivery mechanisms beyond policy, especially given political economy challenges.
- Be flexible—one size does not fit all. Socio-cultural and economic contexts vary.
- Collaboration and ownership are key. Partnerships are essential to solving large-scale challenges.
- Embrace ambiguity. We live in a VUCA (volatility, uncertainty, complexity, and ambiguity) world, where change is non-linear, and paradigm shifts require deep thinking.
- Scaling solutions in India is complex. Flexibility in design helps overcome barriers.
- Balancing stakeholder interests is crucial. Negotiation is necessary for systems change.
- Resource constraints are a given. Solutions must optimize for this.
- Technology can be a game-changer. Data and tech are essential for scaling solutions.
- Urban problems are 'wicked' and require persistence. We need staying power to see the impact of positive actions across systems.

Aligning SDGs with

UNION BUDGET 2024
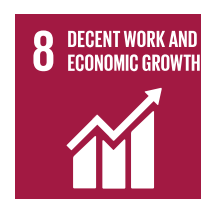
The Union Budget 2024 presented by Finance Minister Nirmala Sitaraman focuses on 4 castes namely Women (Mahila), Youth (Yuva), Poor (Garib) and Farmer (Annadata). Here are the highlights of the budget in line with Sustainable development goals.

• Agricultural Support (SDG 2 & 13)

With plans to create large-scale vegetable production clusters and encourage natural farming among one crore farmers, ₹1.52 lakh crore has been allocated for agriculture. Projects aimed at developing local oilseeds to lessen reliance on imports and promoting climate-resilient agriculture methods were emphasized.

• Health and Education (SDG 3 & 4)

Ayushman Bharat healthcare coverage for all Anganwadi workers and financial support for loans for higher education were announced. By utilizing the current infrastructure, more medical colleges will be built.

• Women Workforce Participation (SDG 5 & 8)

For the benefit of women and girls, more than ₹3 lakh crore has been allocated for programs including establishing working women's hostels, developing skill-building initiatives specifically for women, and encouraging market access for women-owned small and medium-sized businesses (SHGs).

• Employment Schemes (SDG 8)

Three employment-linked incentive programs are included in the budget; they emphasize EPFO enrollment and give new hires immediate benefit transfers. Furthermore, ₹7.5 lakh in financial assistance for skilling loans and skilling programs for 20 lakh youth were announced.

• Rural Development (SDG 8 & 11)

₹2.66 lakh crore is allocated for rural development initiatives, including support for rural infrastructure and employment generation.

• Economic growth and Infrastructure (SDG 8 & 9)

With a focus on infrastructure development which is essential for both economic growth and the generation of jobs the budget has set aside ₹11.11 lakh crore for capital expenditures. Among the MSMEs' initiatives are a ₹100 crore guarantee fund and term loans for the purchase of equipment. There were announcements about new SIDBI branches and technology support packages for MSMEs.

• Green Energy (SDG 7 & 13)

With investments in renewable energy and the extension of the PM Surya Ghar Muft Bijli scheme for rooftop solar panels, the budget places a strong emphasis on green growth. Also, in order to facilitate the seamless integration of renewable energy, The Pump Storage Policy will be introduced to support pumped storage projects for the storage of electricity.

Credits: Suvarna Mishra (MA SDP) and Sanjana Gupta (MA SDP)
(External Contribution)

SCRUTINIZING URBAN PENETRATION OF RENEWABLE ENERGY: AN INDIAN NARRATIVE

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