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Can a city be dense and green?

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1 Introduction

Can a city be dense and green? At first glance, high-density urban living appears to contradict the ideal of a green lifestyle, particularly when contrasted with single-family homes on large plots surrounded by abundant vegetation. Yet, this apparent contradiction is largely perceptual. In reality, cities need not choose between density and environmental quality. When thoughtfully designed, compact urban environments may represent one of the most effective pathways toward a sustainable and environmentally responsible future. This view is supported by McDonald et al. (2023), who argue that denser cities can enhance ecosystem services depending on design, and by Madureira and Monteiro (2021), who explore the compatibility of density and green infrastructure performance.

This argument begins with the observation that the concept of “green” is inherently multidimensional (e.g., environmental impact, energy efficiency, carbon emissions, resource use, biodiversity, and human health and wellbeing). Public perception, however, often privileges the dimension that is most immediately visible: the personal experience of living close to nature. In doing so, we risk overlooking the collective nature of sustainability—the reality that individual lifestyle preferences can carry broader environmental consequences beyond our immediate surroundings.

At the Bioeconomy Science Institute (BSI) in New Zealand, we previously explored related ideas in a conceptual framework for circular bio-based cities (Elustondo et al., 2023). That work suggested that urban circularity is often translated into context-specific actions shaped by local cultural, geographic, and socioeconomic conditions. While this flexibility is valuable, it also reveals a challenge: without a shared overarching objective, it becomes difficult to determine which interventions generate the greatest systemic benefit.

2 Main dimensions of green cities

Before starting this discussion, it is useful to briefly examine the main dimensions through which the idea of a “green city” is commonly interpreted:

2.1 Integrating nature into urban environments

The term “green” naturally evokes healthy ecosystems and environmental wellbeing (McHarg, 1969). Over time it has evolved from a simple descriptor into a broader label for green policies, technologies, and practices aimed at protecting or restoring nature (Dryzek, 2022). In urban planning, green cities seek to integrate natural systems into the built environment in ways that enhance nature experience (Beatley, 2011).

For example, the Bioeconomy Science Institute (BSI) building in Rotorua, New Zealand, was intentionally designed to integrate with its surrounding redwood forest environment (Figure 1). The colored glass façade of Te Whare Nui o Tuteata filters incoming light to reflect the forest canopy, producing a dappled lighting effect that evokes the experience of being within the forest. This design approach illustrates how architectural elements can emphasize the immediate sensory dimension of "green," reinforcing perceptions of proximity to nature.

Urban vegetation provides multiple ecological benefits, especially if balanced with ecological and social needs (Haaland and Konijnendijk van den Bosch, 2015). Trees, parks, and green roofs cool cities by shading surfaces and promoting evapotranspiration, thereby mitigating the urban heat-island effect (Kumar et al., 2025; Vogt, 2025). Nature-based stormwater solutions—such as bioswales and permeable pavements—help absorb rainfall and reduce flood risk. Vegetation also improves air quality by trapping pollutants and sequestering carbon, while supporting biodiversity by connecting fragmented habitats (Kumar et al., 2025). As Bolund and Hunhammar (1999) and Tzoulas et al. (2007) emphasize, green infrastructure in cities provides critical ecosystem services such as air purification, climate regulation, and recreational opportunities.

Beyond these environmental functions, green spaces contribute significantly to human wellbeing (Ulrich, 1984). Parks and gardens encourage physical activity, reduce stress, and foster social interaction (Kaplan and Kaplan, 1989). Even modest interventions—such as street trees, pocket parks, or green walls—can transform dense neighborhoods into healthier and more pleasant urban environments.

2.2 Making cities environmentally sustainable

Urban sustainability has emerged as a defining challenge of the 21st century. More than half of the world's population already resides in urban areas, and this proportion is projected to approach 70% by 2050 (Haksevenler et al., 2025). As cities continue to expand, the pursuit of sustainability increasingly converges with the question of how urban environments are designed, governed, and inhabited.

Developing urban systems that are environmentally responsible is therefore central to global sustainability agendas. In this context, the concept of the "green city" has gained prominence as a framework for minimizing ecological impacts. Achieving this vision requires coordinated strategies that integrate transportation systems, water and energy management, land-use planning, and pollution mitigation (Hadjichambis et al., 2022). Such solutions are inherently political, often reflecting competing interests, governance structures, and power dynamics within cities (van der Jagt et al., 2020).

Rather than relying solely on simplified surface level indicators—such as green space per capita—urban sustainability should be evaluated in terms of how effectively cities function as integrated socio-ecological systems. From this perspective, urban ecosystems must be understood for their capacity to regulate carbon, sustain biodiversity, optimize energy use, and manage materials flows (Raut and Deshpande, 2026).

2.3 Providing social wellbeing and quality of life

The contemporary understanding of green cities extends beyond environmental performance to include governance, social inclusion, and urban resilience. Early definitions emphasized environmental quality and human wellbeing, but the concept has gradually expanded into a broader framework (Hadjichambis et al., 2022). Today, green cities are understood as urban systems that integrate environmental stewardship, infrastructure planning, and public policy to reduce ecological impacts while improving quality of life. These cities strive for low ecological footprints while providing clean air, safe public spaces, and equitable access to environmental amenities (Kumar et al., 2025).

Sustainable urban policies in transportation, energy, waste management, and climate adaptation often operate as interconnected systems designed to reuse resources and minimize environmental burdens (Hadjichambis et al., 2022; Raut and Deshpande, 2026). When successfully implemented, such approaches allow environmental sustainability and social wellbeing to reinforce each other, creating urban environments that are both liveable and resilient.

2.4 Social inequality: an uncomfortable reality

Despite great ambitions, the pursuit of greener cities often reveals significant social inequalities. Urban parks and tree-lined streets can improve liveability, but they may also increase property values and accelerate displacement. As a result, the environmental benefits of urban greening frequently accrue disproportionately to more affluent populations. This challenge extends beyond issues of fairness to the way greenness is measured (Raut and Deshpande, 2026). This phenomenon, often termed "green gentrification," has been documented in both the Global North and South (Anguelovski et al., 2022; de Souza and Torres, 2021; Torres et al., 2022). Recent work further highlights this paradox, showing that dense urban development can exacerbate inequalities in access to green infrastructure if distributional aspects are not explicitly addressed (Ceballos and Jato-Espino, 2026).

The idea of the metabolic city offers a promising alternative. In such systems, urban infrastructure is designed to generate ecological value rather than simply reduce harm. Density, in this context, becomes a catalyst for ecosystem services rather than a source of environmental pressure (Raut and Deshpande, 2026). However, such urban ecosystems must be accompanied by policies that guarantee equitable access to environmental benefits. Without deliberate attention to environmental justice, the green city risks becoming a privilege rather than a universal right. This builds upon foundational work on urban metabolism by Wolman (1965) and more recent analyses by Kennedy et al. (2007) and Ulgiati and Zucaro (2019), who highlight the importance

FIGURE 1
Colored glass façade of Te Whare Nui o Tuteata, designed to reflect the surrounding redwood forest canopy and create a dappled light effect.

of understanding cities as dynamic systems of material and energy flows.

3 Discussion: reconciling density and greenness

The tension between urban greening and social inequality often stems from how the concept of "green" is framed. Too frequently, it is interpreted as a lifestyle amenity—a desirable feature of neighborhoods where residents enjoy both proximity to nature and the full advantages of modern urban infrastructure. Those environments are understandably attractive, but their desirability often makes them economically exclusive. As property values rise, access to greenery becomes concentrated among wealthier populations, while lower-income communities are pushed to the urban periphery.

A different perspective emerges if sustainability is considered from a universal rather than egocentric standpoint. In this view, "green" is not primarily a private amenity but a collective good. Environmental responsibility may therefore require accepting certain lifestyle trade-offs in order to reduce humanity's overall ecological footprint. From this perspective, compact urban development offers a powerful opportunity. By concentrating populations and infrastructure, dense cities can reduce land consumption, lower per-capita energy use, and support efficient public transportation systems. These efficiencies can significantly reduce environmental impacts while preserving natural landscapes.

Multifamily housing—particularly when constructed from renewable materials such as timber—illustrates this potential. Prefabricated and recyclable building systems can centralize water, energy, and waste management while using substantially less land (Newman and Kenworthy, 2013). The resulting spatial efficiency creates opportunities to expand shared green spaces and ecological corridors throughout the city. Properly designed compact neighborhoods also increases opportunities for social interaction, particularly in standardized high-rise environments. Furthermore, recent studies have shown that mass timber construction has the potential to significantly reduce carbon emissions compared to conventional materials (Churkina et al., 2020; Himes and Busby, 2020).

Of course, integrating green infrastructure into increasingly dense urban environments presents significant planning and governance challenges (Haaland and Konijnendijk van den Bosch, 2015). Critics argue that the "compact city" model can oversimplify complex urban dynamics and may fail to deliver expected sustainability outcomes if not carefully implemented (Neuman, 2005).

In a previous discussion letter (Elustondo et al., 2023), we argued that social interaction should form the center of gravity of circular cities. Conventional interpretations of urban circularity focus primarily on minimizing resources inputs and waste outputs from cities. While technically coherent, this perspective risks overlooking a defining feature of cities: they are engines of exchange. Urban prosperity has historically emerged from the circulation of people, ideas, goods, and services. Trade, mobility, and exchange are therefore not signs of inefficiency but expressions of urban vitality. A circular city should not aspire to local autarky, but rather to global circularity—minimizing environmentally harmful flows regardless of where they occur in global supply chains.

A similar logic applies to the green city. If greenness is understood as a synthesis of ecological integrity, human wellbeing, and social justice, urban design should resist the privatization of nature. Access to greenery should not depend on individual property or exclusive neighborhoods but should instead function as a shared civic asset. In practice, this vision is compatible with dense residential environments that meet high standards of comfort, health, and sustainability, supported by efficient transportation systems and integrated energy, water, waste infrastructure, as well as accessible communal green spaces—parks, urban forests, and ecological corridors—that reconnect residents with nature while providing venues for social interaction.

4 Conclusions

The question posed in this opinion letter—whether a city can be both dense and green—reveals a deeper tension in how sustainability is commonly perceived. Public imagination often associates environmental quality with visible proximity to nature, such as private gardens and low-density neighborhoods. Yet this perspective can conflate personal environmental comfort with genuine ecological sustainability. From a systemic perspective, density and greenness are not antagonistic but mutually reinforcing. Compact urban development can reduce land consumption, enable efficient infrastructure, and lower per-capita environmental impacts while preserving natural ecosystems within and beyond city boundaries.

At the same time, the concept of the green city is inherently multidimensional. It encompasses not only urban vegetation but also environmental performance, resource efficiency, social equity, and resilience. Approaches such as metabolic urbanism, which align with the Building with Nature paradigm (Van Slobbe et al., 2013) and broader nature-based solutions frameworks, emphasize that nature can function as active infrastructure within cities, regulating flows of energy, water, carbon, and biodiversity (Kumar et al., 2025). However, the pursuit of greener cities also exposes social contradictions, and it is shaped by political and institutional contexts (van der Jagt et al., 2020). Urban greening often raises property values and contributes to green gentrification, concentrating environmental benefits among wealthier populations. These outcomes highlight the limitations of viewing sustainability primarily through the lens of individual lifestyle amenities.

A more universal understanding of greenness treats environmental quality as a shared civic and planetary good. Within this framework, dense urban living—supported by sustainable materials, efficient infrastructure, and accessible public green spaces—can distribute environmental benefits more equitably while reducing overall resource consumption. Ultimately, the compatibility between density and greenness depends less on urban form than on governance and design. Cities that combine compact housing with high-quality public green infrastructure, efficient metabolic systems, and inclusive access to environmental amenities can simultaneously advance ecological sustainability, social equity, and urban vitality.

In this sense, dense and green cities are not merely compatible—they may be essential for reconciling urban prosperity with the long-term stability of the planet's ecosystems.

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