

16 May 2022

The Potential of Urban Reforestation for Climate Change Mitigation and Adaptation

Key Takeaways

- Urban reforestation could be a powerful nature-based climate solution for local carbon reduction.
- Of all city areas analysed worldwide, nearly one-fifth are potentially available for urban reforestation.
- Reforesting these areas could mitigate 1.1% of all cities' total annual carbon emissions.
- 1,189 cities are particularly promising for potentially being able to offset more than 25% of their carbon emissions through urban reforestation.
- Integrating regreening efforts in climate action plans and urban planning frameworks is key to realising this overlooked opportunity.

Recent years have seen rising global awareness of the importance of strategies aimed at working with nature to combat climate change. Ranging from protecting vulnerable habitats to restoring degraded ecosystems and sustainably managing croplands, these nature-

based climate solutions (NCS) have been shown to be capable of delivering over one third of the cost-effective climate mitigation needed by 2030 to keep global warming below 2°C while providing myriad co-benefits, including safeguarding biodiversity, generating livelihood opportunities, and shielding coasts from storms¹.

As cities grow denser and face more frequent and serious threats from climate change, creating climate-resilient cities is becoming increasingly pertinent. Reforestation ranks among those NCS that have garnered the most attention worldwide for tackling climate change while delivering adaptation benefits. But despite widespread enthusiasm for tree planting on barren land, few may realise that today's cities also offer copious space for forests to stage a comeback and co-exist with the packed concrete jungles urban dwellers call home. A cost-effective yet powerful tool, urban reforestation should be on the agenda of green-minded urban planners looking to tackle heat-trapping emissions while boosting climate resilience.

FROM GREY TO GREEN

Pinpointing the potential

Across 7,595 cities studied worldwide, our spatial analysis reveals that 17.6% of city areas could be potentially available for reforestation.

¹ Griscom, B. W. et al., Adams, J., Ellis, P. W., Houghton, R. A., Lomax, G., Miteva, D. A., Schlesinger, W. H., Shoch, D., Siikamäki, J. V., Smith, P., Woodbury, P., Zganjar, C., Blackman, A., Campari, J., Conant, R. T., Delgado, C., Elias, P.,

Gopalakrishna, T., Hamsik, M. R., ... Fargione, J. (2017). Natural climate solutions. *Proceedings of the National Academy of Sciences*, 114(44), 11645–11650.

This amounts to 10.9 million hectares, or roughly 150 times the size of Singapore. This would amount to a climate mitigation potential equivalent to 1.1 per cent of all cities' total annual carbon emissions, globally. Crucially, 1,189 cities stand out as particularly promising for potentially being able to offset more than 25 per cent of their emissions through tree planting. The majority of this potential lies in the Global South (Fig. 1).

Beyond climate benefits, there are numerous other reasons for urban reforestation to be front and centre of cities' climate action plans. Urban reforestation delivers a wealth of co-benefits through ecosystem services, such as cooling, flood regulation, health benefits, and cultural values, all of which have been recognised in ambitious urban tree planting programmes launched across the globe, including in Beijing, New York, Los Angeles, and Singapore.

Understanding constraints

Despite their vast potential, NCS projects continue to be held back by various obstacles ranging from a lack of enabling policies to gaps

in knowledge needed to inform investment decisions. Tree planting in cities is no exception.

In fact, urban reforestation has its own specific limitations. Besides biophysical constraints, such as poor soil conditions and light pollution, there are socioeconomic issues to consider. For example, in land-scarce cities with many conflicting priorities, tree planting initiatives may come up against tough competition from developers and other land users.

Take developing nations across Africa, South Asia and Latin America, for instance. Home to around two-thirds of global urban land, these countries boast the largest opportunities for urban tree planting, yet they also face a multitude of challenges related to governance capacity gaps and socioeconomic needs. As rapidly expanding populations in already dense cities pile more pressure on land, these challenges will only keep growing, underscoring the need for urban reforestation research and practices to be attuned to specific local circumstances. The Asia-Pacific region's current urban population of 2.3 billion, for example, is expected to increase to nearly 3.5

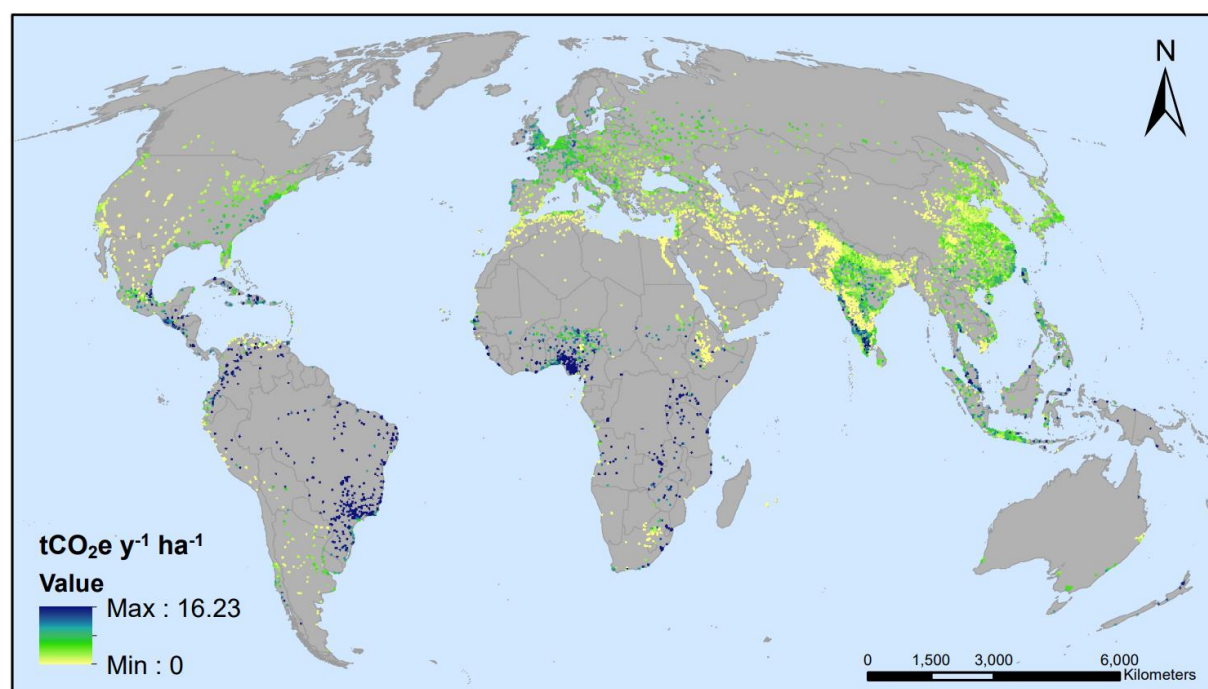


Fig. 1 Mean climate mitigation potential of global urban reforestation. The majority of this potential (shown in green), in the form of biophysically suitable areas, lies in the Global South.

billion in 2050², exacerbating existing clashes in land use priorities.

WHAT SHOULD CITIES DO?

Do more with less

To make the most of available space, urban tree planting initiatives could employ more intensive and efficient planting techniques. One popular example is the Miyawaki method³, which involves soil restoration and the use of indigenous plant species to create dense, multi-layered forests. The Miyawaki method has been applied in various urban reforestation projects. While research on its long-term effects remains sparse, early evidence suggests it may boost carbon sequestration by up to five to eight times. By contrast, reforestation through monoculture plantations can also deliver rapid tree growth, but comes with risks to the longevity of the carbon stored, such as greater susceptibility to pests and other disturbances.

Leverage cities' strengths

Tree planting ambitions should take advantage of the high concentrations of human, financial and political capacities that characterise cities. This immense resource density could not only enable urban planners to pursue resource-intensive projects that require buy-in from numerous stakeholders, but also grant cities an opportunity to support nature conservation and restoration in rural areas. Indeed, much of the rising interest in working with nature to solve the climate and biodiversity crises has come from urban centres, suggesting vast potential to integrate reforestation into urban planning approaches and local climate mitigation strategies.

² United Nations ESCAP (2019). *The Future of Asian & Pacific Cities*. United Nations.

³ Read more about the Miyawaki method here: <https://india.mongabay.com/2019/09/role-of-miyawaki-forests-in-mitigating-urban-heat-island-effects/>

THE BOTTOM LINE

With our spatial analysis showing the climate-saving potential of urban reforestation, urban tree planting clearly deserves a prominent place on local and global political agendas. As more frequent climate change-induced disasters hit cities in Asia and elsewhere⁴, the importance of reforestation and similar solutions for creating more climate-resilient and sustainable urban spaces will only keep growing. Yet the decision of whether theoretically available land should be reforested must ultimately be made locally with full consideration of the benefits, opportunity costs, and other repercussions for people and livelihoods.

LINK TO PAPER

<https://doi.org/10.1088/1748-9326/abe783>

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⁴ Rahman, A., Parvin, G. A., Shaw, R., Surjan, A. (2016). Cities, Vulnerability, and Climate Change. Urban Disasters and Resilience in Asia, 2016, 35-47. Butterworth-Heinemann.