Living streets:

How cities are trading car culture for climate resilience

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Index

Executive Summary

Urban forests play a crucial role in enhancing climate resilience and sustainability in cities. These green spaces serve as effective climate shields, offering multifaceted benefits that address various environmental challenges.

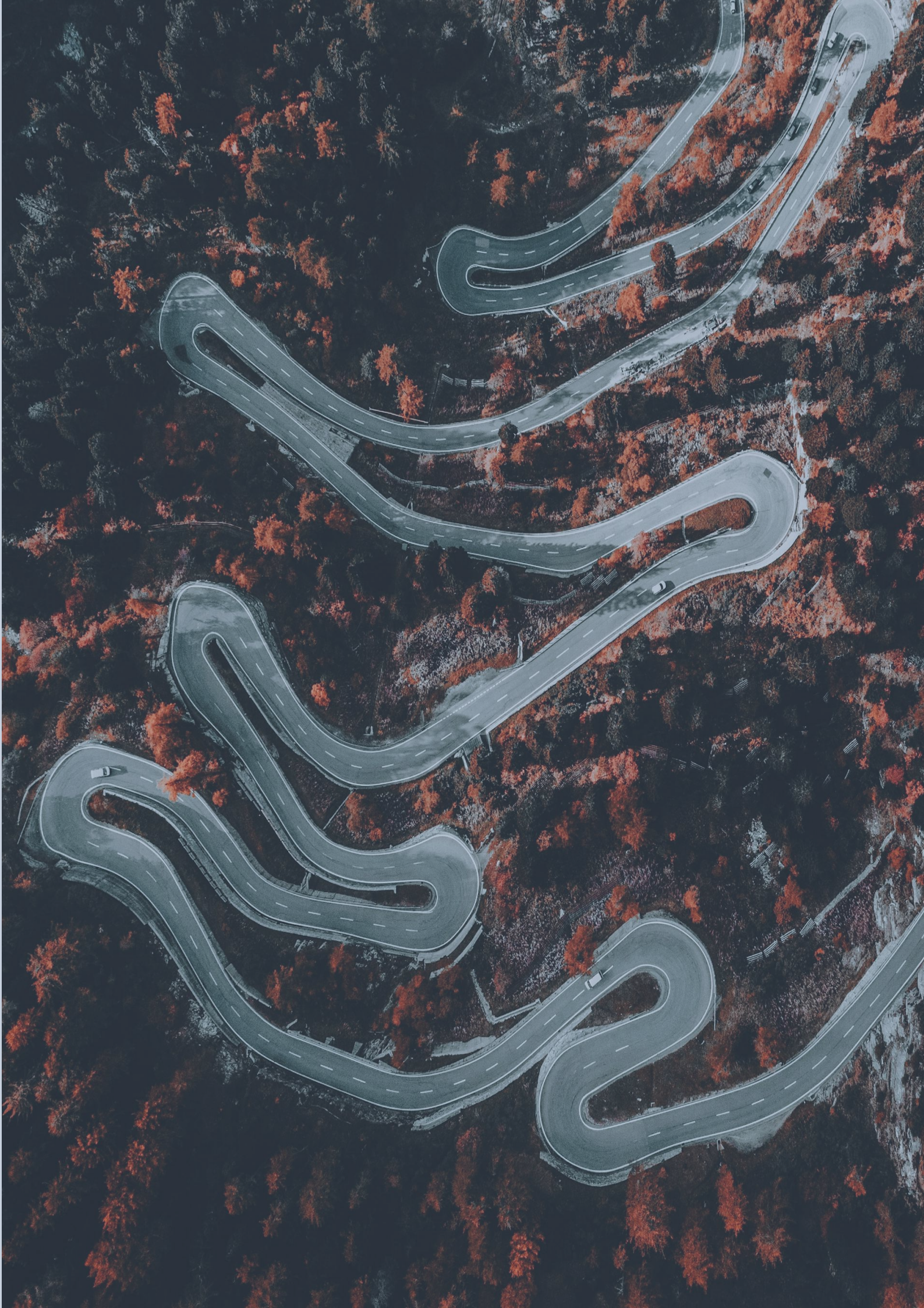
One of the primary advantages of urban forests is their ability to mitigate the Urban Heat Island (UHI) effect. Trees reduce temperatures through shade provision and evapotranspiration, with diverse tree structures offering stronger cooling effects compared to monoculture plantations. Notably, trees continue to provide cooling even during nighttime, making them a constant source of temperature regulation in urban environments.

Integrating trees into urban agriculture through agroforestry practices significantly improves water retention and soil quality. This approach enhances food security and acts as a buffer against climate extremes, supporting both environmental and social resilience in urban areas.

Urban forests also play a vital role in natural disaster resilience. Coastal and riparian forests serve as bio-shields against storms and flooding, while urban forests help manage stormwater and prevent soil erosion. In areas prone to wildfires, strategic urban forest management can reduce risks in urban-wildland interfaces, with proper tree spacing and species selection creating natural firebreaks.

Several innovative solutions complement the benefits of urban forests. These include satellite analytics for monitoring urban heat (WEO), advanced fire prevention systems (FortyGuard), extreme heat risk analysis and forecasting (ClimaSens), AI-driven analytics for optimal tree placement (Taro AI), wave-attenuating structures to protect coastal forests (Reef Arches), and AI-powered weather prediction for protecting urban forests (FlashWeather AI).

These strategies and technologies demonstrate the immense potential of urban forests to serve as effective climate shields. By enhancing city resilience against various environmental challenges, urban forests are proving to be an indispensable component of sustainable urban planning and climate adaptation strategies.



Living Streets: How Cities Are Trading Car Culture for Climate Resilience

Urban populations are growing, resulting in cities facing increasing challenges related to congestion, pollution, and climate change. The world has become completely car-dependent which has raised issues of pedestrian safety, inadequate bike lanes, reduced green space, and accessibility issues. Research completed from EAFIT University found that across 794 cities in 61 countries with a combined population of almost 850 million people, 51.4% of people depend on cars (Prieto-Curiel and Juan Ospina, 2023). The increased use of cars has resulted in negative consequences, including air pollution, traffic congestion, and heat island effects. Automobility also causes indirect impacts such as social/community isolation, discrimination based on the ability to drive cars, expenses on community stakeholders, a decline of small businesses, and effects on the public health like increases vehicle crashes, obesity, and asthma (Price, 2015).

However, urban planners and policymakers are increasingly recognizing the need to rethink how streets function. Rather than being only conduits for vehicles, streets are being transformed into multifunctional spaces that prioritize pedestrians, cycling, and green infrastructure. Planners and policymakers are reimagining these streets to provide social, environmental, and economic benefits – fostering more vibrant, healthy, and climate-resilient communities.

Cities worldwide are experimenting with innovative street designs to reclaim space for people and nature. For example, Rotterdam has integrated water plazas and green streets to manage stormwater while improving walkability. Barcelona's Superblocks model limits car traffic within neighborhoods which creates pedestrian-friendly areas with enhanced green space. Melbourne has successfully prioritized green streets through its Urban Forest strategy, significantly increasing tree canopy cover. These cities demonstrate the ability to convert streets into multifunctional spaces are not only feasible but also transformative for urban resilience and quality of life.

This article explores the critical role of converting streets into multifunctional spaces that prioritize pedestrians, cycling, and green areas. It examines the limitations of car-centric infrastructure, the benefits of prioritizing pedestrians and cyclists, and the role of green infrastructure in the mitigation of climate change impacts. Furthermore, it highlights the innovative ways cities are rethinking urban streets as public spaces

rather than traffic corridors – making cities more livable, equitable, and environmentally sustainable urban landscapes.

Urban Streets & The Challenge of Car-Centric Infrastructure

Around 40 million miles of roadways encircle the earth resulting in 3,000 tons of infrastructure for every human (Goldfarb, 2023). Cars and paved roads have given humans freedom to travel and connect with each other. However, the current world's car dependency has led to numerous environmental, economic, and social challenges. Paved roads (impervious surfaces) significantly impact our natural environment by fragmenting natural habitats, contributing to air and water pollution, increasing greenhouse gas emissions due to vehicle traffic, and altering land use patterns which often leads to deforestation and ecosystem degradation. These surfaces also lead to an increase of flooding, one paper showing a 3.3% increase for every one percentage point increase in impervious surfaces (Gies, 2020). Furthermore, paved surfaces impact stormwater runoff due to pollution and containments from the road and slow groundwater discharge.

Research indicates that roadways generally influence air quality within a few hundred meters, about 500-600 feet downwind. It should be noted that more than 45 million people in the United States lives, works, or attends school within 300 feet of a major road, airport, or railroad (EPA). Furthermore, automobility (considering for car crashes and fatalities linked directly to car-related air pollution and lead exposure) has killed at least 1.67 million people around the world every year – a total of 60 to 80 million since emergence of the automobile (Ionescu, 2024). That is roughly the equivalent of the entire populations of Canada, Australia and the Netherlands. However, this is not the only issue of our reliance on cars, this reliance also affects how we plan our cities.

The world's reliance on cars has changed the way we plan and shape our cities. It is estimated that more than one half of modern American city's land area is dedicated to streets and roads, parking lots, service stations, driveways, signals and traffic signs, automobile-oriented businesses, car dealerships, and more (Melosi 2004). Car infrastructure has become the monster that is slowly taking over entire cities and towns. Cities and towns were once places for human interaction, but automobiles changed these areas to parking lots and highways.

These highways exacerbated urban sprawl, decimating urban centers and economies and allowing more of the natural environment to be converted to development. An example of how sprawl increased city sizes is Los Angeles. From 1970 to 1990, the metropolitan population grew by 45%, but the land size sprawled by 300% beyond its former size (Schloemer, 72). To decrease and change the impact of our car-centric world, we need to change the way we interact and plan streets.

Urban Streets & Active Mobility Resilience

To deal with the issues created by centering our cities towards cars, we need to start shifting our planning ideals towards active mobility resilience. Active mobility resilience is changing our cities infrastructure towards the support of walking and cycling in the face of environmental, social, and economic challenges. Walking and cycling are not only more sustainable modes of transportation but also key factors in creating healthier and more resilient urban environments. Cities would be able to reduce their transport-related fuel consumption by around 25% through the combinations of more compact land use and utilizing less car-dependent transport infrastructure, supporting the Paris Agreements goals of a 43% reduction of global greenhouse gas emissions by 2030 (IPCC, 2022 & United Nations).

Beyond environmental benefits, active mobility contributes to public health and community well-being. Studies have found great health benefits for people who walk and cycle. According to a large long-term study completed by BMJ Public Health, people who cycle or walk to work or school are at a lower risk of mental and physical illness. Cyclists are seen to have a 47% lower risk of death from any cause, a 24% lower risk of hospital admission for cardiovascular disease, and a 20% lower risk of being prescribed drugs for mental health problems (SMC, 2024). Furthermore, pedestrian- and cyclist-designed infrastructure leads to the reduction of road fatalities and injuries. The addition of bike lanes reduces collisions and injuries by 30% to 50% as it improves road organization and safety for all users which includes drivers, pedestrians, and cyclists. An example of these protected bike lanes benefiting cities is New York City. New York implemented a protected bike lane on 9th Avenue which led to a 57% reduction in injuries to people on bikes, 29% reduction in injuries to people walking, and an 84% reduction in sidewalk riding (Kanner).

Investing in active mobility infrastructure also strengthens urban resilience by ensuring equitable access to transportation. Walking and cycling are among the most cost-effective and accessible transportation options, especially for lower-income communities who may not have access to private vehicles. With extreme weather events and fuel price fluctuations posing increasing threats to traditional transportation systems, cities that prioritize active mobility will be better prepared to provide reliable, low-cost transportation alternatives. By shifting focus toward active mobility resilience, urban areas can create safer, healthier, and more adaptable environments for all residents.

Urban Streets & Climate Resilience

Cities and towns are facing rising temperatures, increased flooding, and deteriorating air quality, emphasizing the need to develop more climate resilient streets. We can redesign our streets from being only transportation corridors, to streets that mitigate climate change impacts and enhance environmental sustainability. Research indicates that integrating green infrastructure (permeable pavements, rain gardens, and tree canopies) can reduce surface temperatures and absorb stormwater runoff. Green roofs has been seen to reduce citywide ambient temperatures by 5°F through shading and evapotranspiration, shading from trees and vegetation have the ability to lower surface temperatures on building walls and rooftops by as much as 45°F, and green infrastructure has the ability to capture more than 90 percent of the runoff generated annually by storm events (EPA, 2025; Urban Climate Lab, 2016; New Jersey Future).

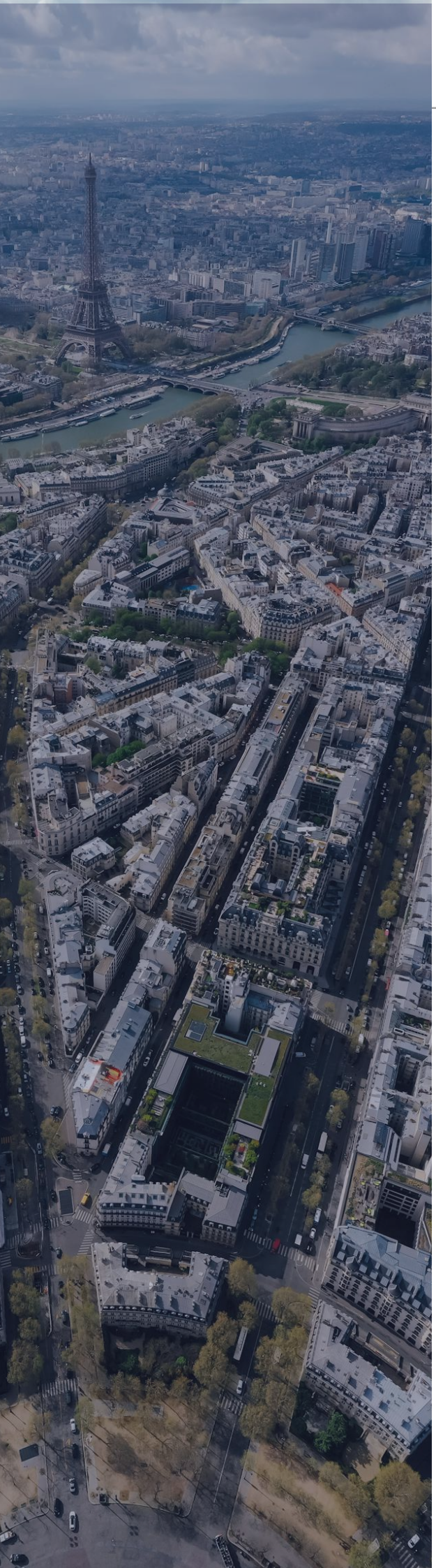
One of the most pressing climate issues for cities and towns is the urban heat island effect. Paved roads and the dense infrastructure traps heat, making urban areas significantly warmer than their surroundings. Studies show that streets covered in traditional asphalt can be 50-90°F hotter than air, while shaded or moist surfaces remain close to air temperature (EPA, 2017). Implementing reflective or porous pavement materials and increasing urban tree cover can dramatically reduce this effect, improving thermal comfort and reducing cooling costs.

Beyond temperature regulation, urban streets play a crucial role in stormwater management. With extreme rainfall events becoming more frequent, many cities struggle with flooding due to the dominance of impermeable surfaces that prevent water from naturally filtering into the ground. Cities implementing green streets with bioswales and rain gardens have shown to reduce runoff volumes to up to 88% (EPA, 2025).

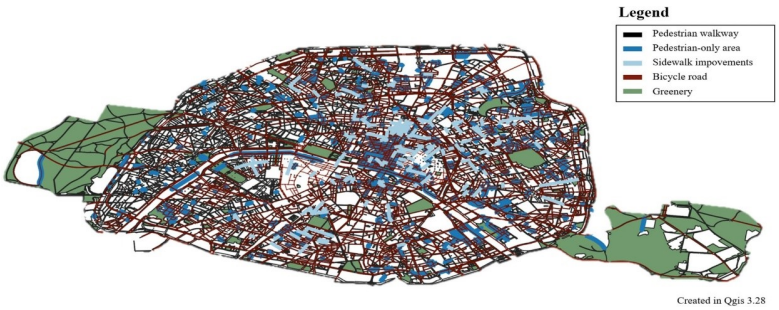
Designing streets with climate resilience in mind is not just an environmental necessity —it is also a public health and economic imperative. Cities that invest in climate-adaptive street infrastructure not only reduce disaster risks but also create healthier, more livable urban environments for their residents. As climate challenges intensify, rethinking street design will be a key strategy in ensuring cities remain sustainable and resilient for future generations.

Innovative Solutions Addressing These Challenges

Cities around the world are grappling with the challenges of climate change, pollution, and urban congestion. However, some cities have emerged as leaders in redefining streets as a multifunctional space that prioritizes pedestrians, cycling, and green infrastructure. These cities have demonstrated that human-centered urban design can



improve air quality, reduce carbon emissions, enhance public health, and create more livable communities.



(Jeong, Choi, Kwak, Ku, & Lee, 2023

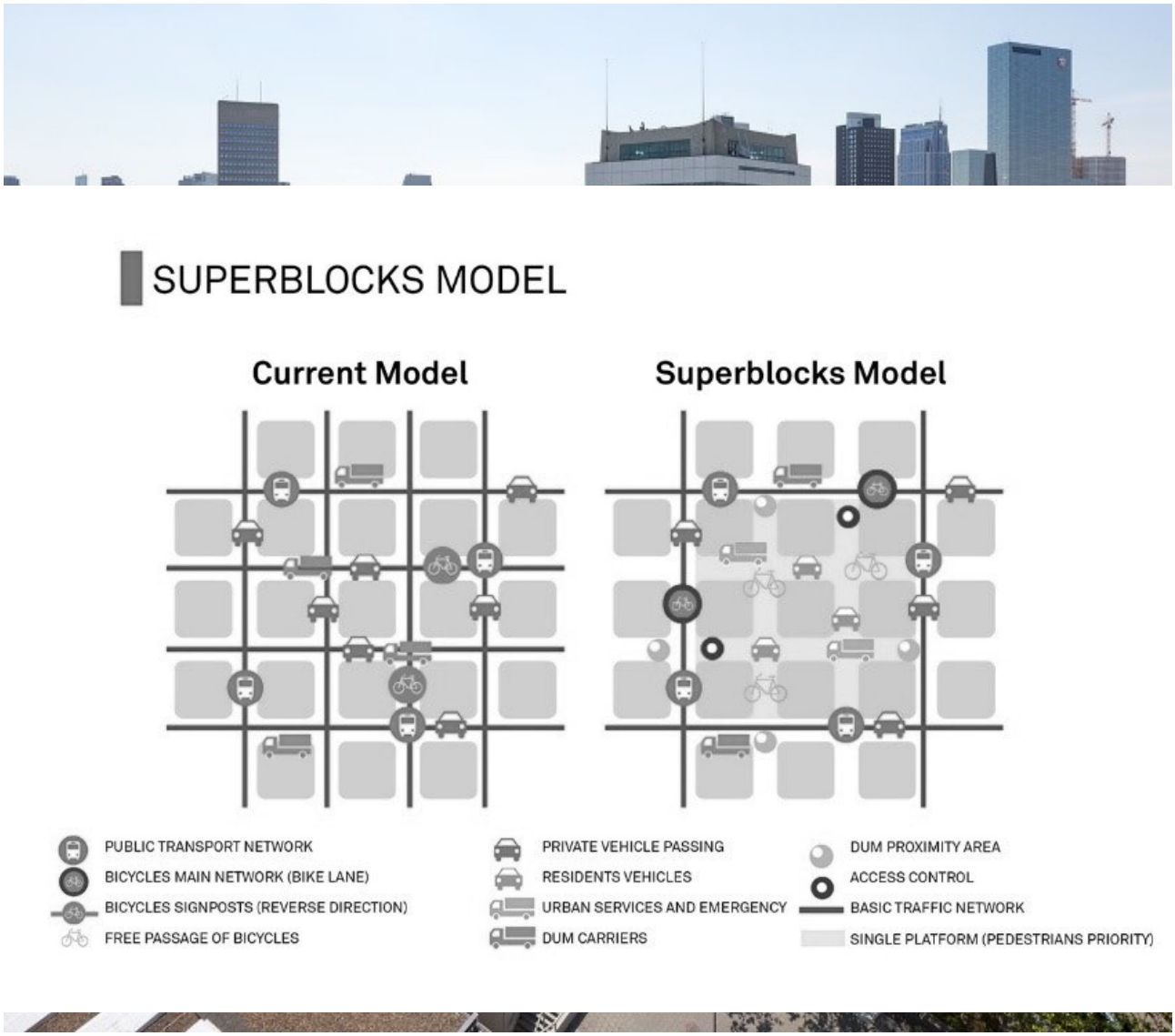
Paris, France – 15-Minute City

Paris has been at the forefront of urban transformation with its use of the 15-minute city, which aims to create neighborhoods where residents can access work, education, shopping, and leisure within a short walk or bike ride. The city has aggressively expanded pedestrian zones, developed over 746 miles of bike lanes, and converted major roadways into green spaces. Empty offices have been redeveloped with housing, coworking spaces, gyms, shops, and other uses under one roof. The city has also focused on making streets for kids, with streets in front of schools banning cars and the implementation of 200 mini parks (Peters, 2024).

Angie Ruíz Rojas

Bogotá, Colombia – Prioritizing Cycling and Public Transport

Bogotá is a global leader in cycling infrastructure and car-free initiatives. The city pioneered Ciclovía created in 1974, a weekly event where over 75 miles of streets are closed to cars and opened to pedestrians and cyclists. The idea has spread across 450 cities around the world (UCLA, 2024). The city has also expanded its protected bike lane network to over 368 miles of protected lanes. Research shows that these investments have reduced carbon emissions by around 22,000 metric tons or roughly as much carbon as planting between 300,000 and 400,000 ~~tons~~new trees (Peters, 2022).



Barcelona, Spain – The Superblocks Model

Ajuntament de Barcelona

Barcelona's Superblocks initiative is a groundbreaking model that transforms clusters of city blocks into pedestrian-first spaces, restricting through-traffic and prioritizing walking, cycling, and green infrastructure. Since implementing the model, in certain areas vehicle usage has dropped by 92% and was met with no increase in traffic in neighboring streets, while noise pollution has been reduced by 4 decibels on average (Castrezzati, 2023). Air pollution levels in Superblock areas have also seen a 25% decrease, leading to significant public health benefits (Cities4Health). This innovative approach has inspired other cities to rethink their street design in favor of people-centric urban planning.

De Urbanisten

Rotterdam, Netherlands – Climate-Resilient Streets

As a low-lying city prone to flooding, Rotterdam has integrated climate adaptation into street design by transforming roadways into green and blue infrastructure to manage stormwater and extreme weather. The city's Water Squares serve as both public plazas and rainwater storage areas, helping reduce flood risk while adding community spaces. These squares, such as Benthemplein, are designed to store up to 2 million liters of stormwater during heavy rainfall (Stormwater Report, 2014).

Nature Conservancy

Melbourne, Australia – Urban Forest Strategy

Melbourne has prioritized green streets through its Urban Forest Strategy, aiming to increase tree canopy cover to 40% by 2040. The city has focused on planting climate-resilient tree species along streets to reduce the urban heat island effect and improve air quality (Diamondhead). The goal of the strategy is to guide the transition of the landscape to one that is resilient, healthy and diverse, and that meets the needs of the community.

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