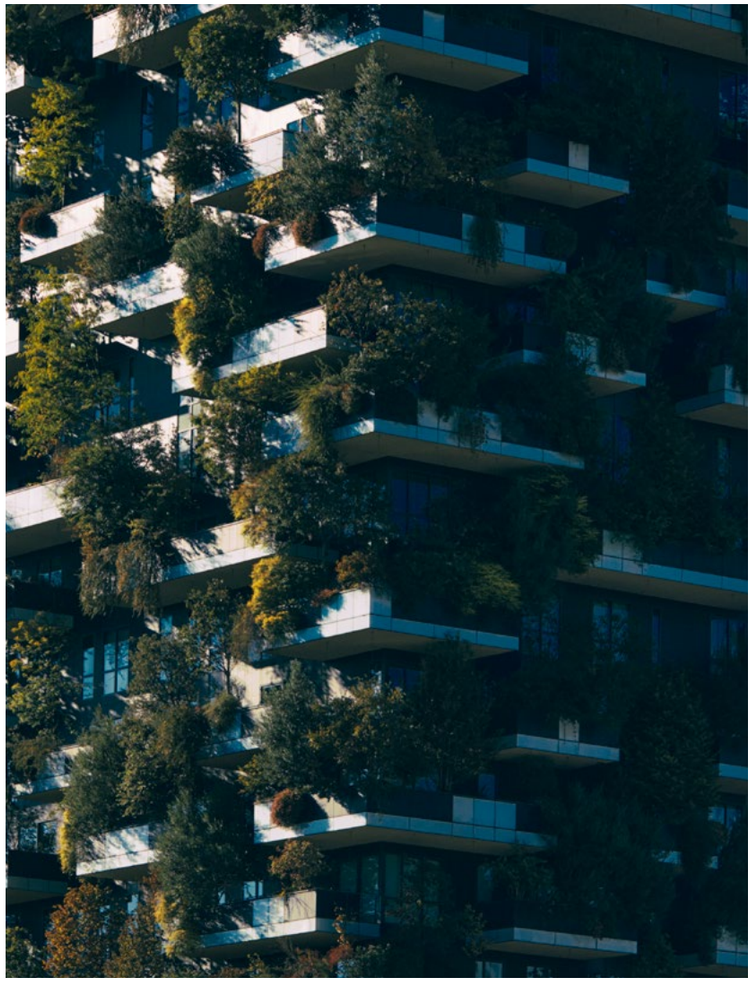
THE VERTICAL FOREST



Words by Tristan Kennedy

Art by Alecio Ferrari

THE BUILDING THAT STARTED A MOVEMENT

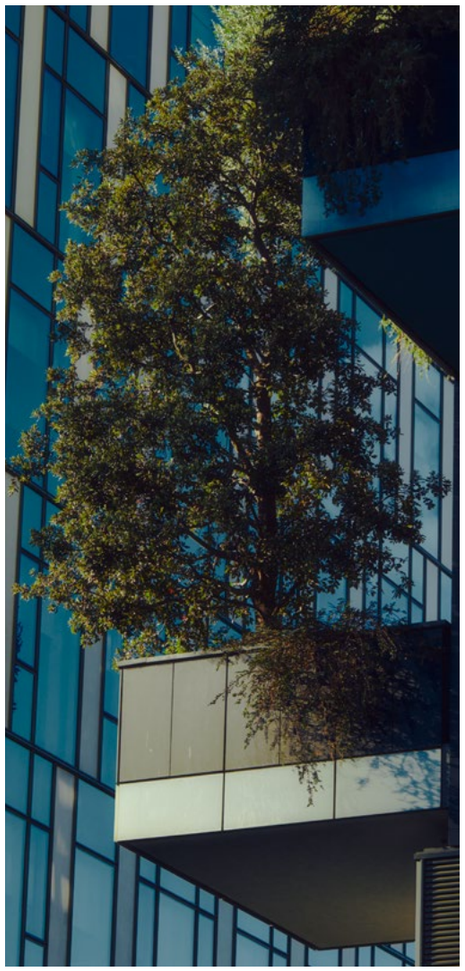
From the gothic grandeur of the Cattedrale di Santa Maria Nascente—whose intricate spires famously took six centuries to complete—to the neoclassical elegance of the La Scala theater, and the imposing fascist façade of its central station, Milan is not short of famous buildings. Which is why the sight of tourists stopping in the Porta Nuova district to point their camera-phones upwards at two modern tower blocks initially seems a little strange. As I round the corner of the Casa della Memoria museum, however, I see the Bosco Verticale in all its verdant glory—and find myself compelled to do exactly the same.

Meaning 'Vertical Forest' in Italian, the Bosco Verticale is a residential development like no other. Its two towers, standing 112m and 80m tall, are not just home to hundreds of human beings, but to thousands of plants—including 800 fully grown trees. Visually, the buildings are stunning, their angular man-made lines softened by the lush carpet of vegetation. But the greenery doesn't just look great in photos. As Stefano Boeri, the architect who designed the Vertical Forest explains, its real worth lies in its environmental impact.

"We have the equivalent of five or six hectares of park in a building which takes up half a hectare of space," says Boeri, when I speak to him over the phone. The plants absorb CO2 and convert it into oxygen, acting as a carbon sink. By filtering sunlight and creating shade, the trees reduce surface temperatures of the building significantly. Studies in the US have suggested that merely planting trees near detached houses can reduce air-conditioning costs by 20 to 30 percent. Wrap an entire high rise in them, as Boeri has done, "and the effect is very strong," he says. The filtering effect can reduce temperatures on the building's facade by up 30°C.

This, he explains, "seriously reduces the energy consumption and costs of the building. In Milan [where temperatures reach average highs of 30°C in August], we rent one of the apartments just to test, and we don't use air conditioning—we don't need it". Additionally, the trees promote biodiversity, providing new habitats for insects and birds. "We have more than 20 species [of bird] nesting here," says Boeri, including redstarts and kestrels. All of this makes these towers two of the greenest buildings in the city—both literally and metaphorically—if not the world.

The impact of the Bosco Verticale extends beyond its immediate environment, too. Since they were completed in 2014, the towers have earned gushing praise from critics, and won several major international architecture awards. Commissions for similar structures have come in thick and fast for Boeri and his practice.



They've completed vertical forest buildings in Eindhoven, Netherlands, and Huanggang, China, and are working on further projects in places as diverse as Lausanne, in Switzerland, and Cairo, in Egypt.

In 2019, the architect published the Urban Forestry Manifesto, which calls on "architects, urban planners, botanists, and agronomists [scientists who study soil management and crop development]" to work with government officials and NGOs, with the aim of massively multiplying the amount of greenery in urban spaces as a way to combat climate change. He presented his work at COP21, where the Paris agreement was signed, and now frequently works with multinational bodies like the FAO (Food & Agriculture Organization) and UN Habitat.

Meanwhile, the revolutionary ideas espoused in his manifesto have been taken up and amplified by like-minded architects around the world. Like a wildfire spreading in reverse, trees can be seen sprouting out of new buildings everywhere—from British architect Thomas Heatherwick's 1,000 Tree Shopping Center in Shanghai, which opened this year, to the new HQ for Chinese internet giant Tencent, being built by legendary French architect Jean Nouvel, to Australian architect Koichi Takada's planned development in Brisbane, called simply Urban Forest.

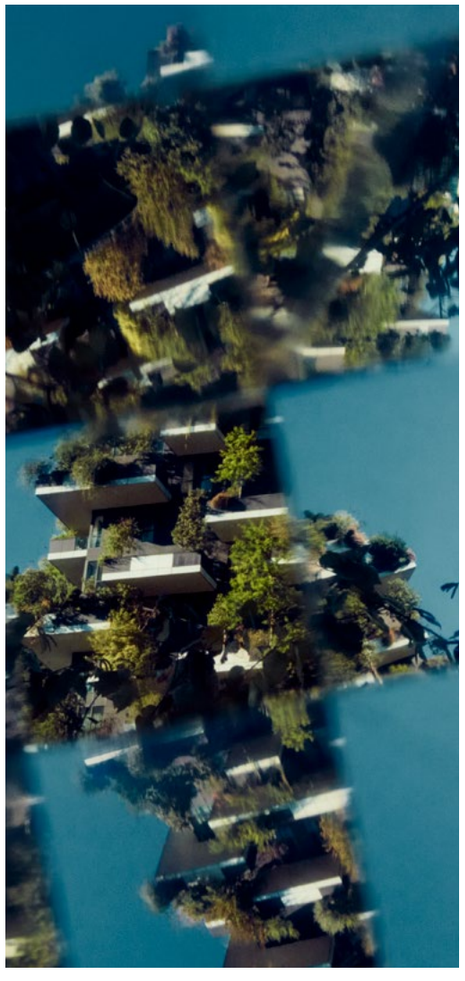
All of which is gratifying for Boeri. Because when he first started pitching his idea for a woodland in the sky, it looked like it would never get off the ground.

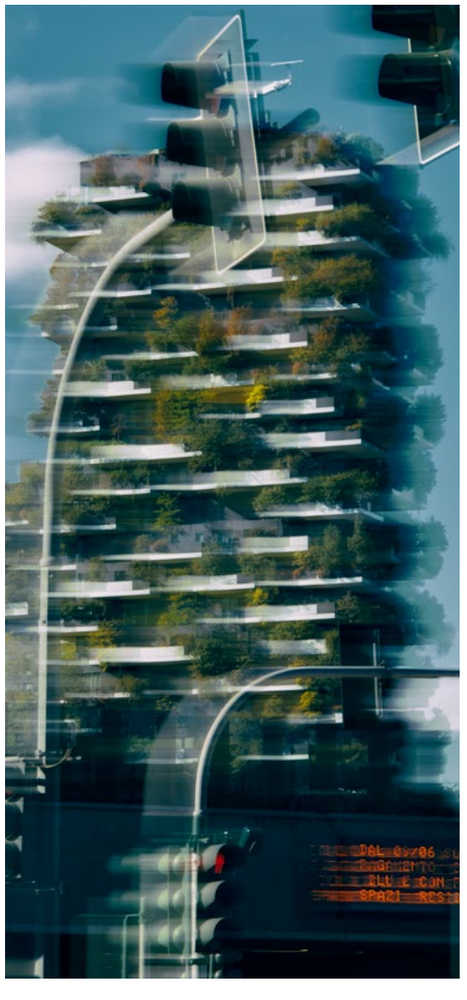
"I was basically always obsessed by trees, even when I was a child," Boeri explains. He was born in 1956 in Milan—"not a particularly green city at the time"—but spent large chunks of his childhood in Badalucco, the village where his father's family came from. "It's a very small village, where 80 percent of people share my last name, and it's in a valley that's covered by olive trees," he says.

If his experience of this rural idyll helped light a spark in the young Boeri, reading Italo Calvino's **Il Barone Rampante**, (translated into English as **The Baron in the Trees**) fanned the flames. Set in Liguria, the region around Badalucco, the novel tells the story of a young nobleman who decides to give up his life of privilege to live up in the forest canopy, where he learns to appreciate trees almost as individuals.

It's a concept that still informs Boeri's work to this day. Bosco Verticale, according to his website, is "a home for trees that also houses humans and birds," and throughout our conversation he refers to his trees as "tenants." But it's easy to see how this slightly whimsical set of ideas might initially have been given short shrift by hard-nosed property developers.

A home for trees that also houses humans and birds





"I entered so many competitions, and put in so many proposals that weren't successful," says Boeri. Funders, he found, weren't against covering buildings with plants per se. After all, the idea is as old as the Hanging Gardens of Babylon, and in the 20th century, the American landscape architect Stanley Hart White, and the French botanists Patrick Blanc and Gilles Clément (both of whom Boeri has worked with), all planted successful vertical gardens. But the idea of planting fully grown trees, with powerful, potentially destructive roots, on a skyscraper just seemed to pose too many practical problems. Even when, in 2006, Boeri eventually found a real estate firm willing to hear him out, they were sceptical. "They said, 'How do you manage a tree at 100m? How can you guarantee the right irrigation of the plants and so on? And what will happen if there's a typhoon?'"

The answers Boeri came up with—in consultation with a multidisciplinary team of experts including botanists and engineers—are where the real genius of the Bosco Verticale lies.

The towers are designed with a series of staggered balconies, which allow the trees the freedom to grow up to three storeys high. Metal supports are used to bolster trunks in some cases, while a digital monitoring system keeps constant tabs on the state of the trees. The innovative irrigation infrastructure mostly uses filtered effluent from the towers' human residents, while twice a year, a team of "flying gardeners"—tree surgeons trained in abseiling and mountaineering techniques—descend from the roof to check the health of all the plants, and prune them as necessary.

For all the obvious problems they encountered in construction, there were a myriad of unforeseen issues too, which often took Boeri months of work to resolve. "For example, from the beginning it was clear to us that the chemical composition of the soil was important," he says. "You cannot make it too heavy for structural reasons, but at the same time you cannot make it too light, because the roots have to be very well stabilized in the pots."

Choosing the species proved tricky, too. "You cannot plant an olive in northern Europe, for example. Or you cannot plant an oak in the desert," he says. These choices are not just about ensuring the trees' wellbeing or survival, but making sure they serve the needs of the building. "For example, in Utrecht, we're working with plants that lose their leaves over the winter period, to increase the available light. But in Cairo the idea is to create a barrier that can filter the sunlight year-round," he says. Boeri has deliberately not copyrighted any of the innovations, and has been gratified watching others learn from and improve on them.

"You can imagine as an architect, it feels good to be copied in the right way," he says. Yet for all that his buildings and ideas continue to be popular, there have been criticisms too.

Chief among these is that the Bosco Verticale is elitist—almost by definition—because of the pricey R&D and maintenance involved. Last year, a one-bedroom flat in the Milan development was listed for €2 million, while the penthouse at the top of the taller tower came on the market in October 2020 for €17.5 million. Looking after all those trees isn't cheap either—condominium fees, which cover the costs of the 'flying gardeners,' are €15,000 a year for even the smallest apartments. But much of the research and many of the innovations Boeri developed for the original Bosco Verticale have proved transferable. This means that subsequent Vertical Gardens can be built less expensively than the original. The Eindhoven project, paid for by a Dutch housing co-operative, contains exclusively social housing, with rental prices capped at around €1,000 a month.

The second frequently raised criticism is that the CO2 emitted in the construction process outweighs any savings these buildings might make. It's certainly true that as a material, concrete—or more specifically, the cement in it—is incredibly un-environmentally friendly. Cement production is estimated to account for seven percent of the world's CO2 emissions, more than three times that of the entire aviation sector. "But there are two ways to answer this question," Boeri counters. "The short way— the stupid way, if you like—is to point out that if a normal high rise was built in the same place, the production of CO2 in the construction process and the use of materials would be the same. But the real answer, and in fact the question we should be asking, is what we could do in order to reduce the production of CO2 in all construction processes?"

In search of answers, Boeri is turning once again to his beloved trees. "Timber and wood is the most sustainable material we have," he says, "which is why now, in Milano, we are experimenting with a high rise with all the slabs in wood." It seems a beautifully simple solution, but after I bid Boeri goodbye, I begin to think of the practical issues. And then I stop myself. Because while the idea of a wooden-framed skyscraper might sound far-fetched, so did the idea of a forest in the sky, once.