A F
FO

WRITTEN BY **ZACK VARRATO**

IRM OR THE FUTURE

Italian architecture firm Stefano Boeri Architetti redefines the modern city

OVERVIEW

Europe has long been a pioneer in environmental activism. It is home to the world's twelve greenest nations, yet European countries are consistently outranked when it comes to green architecture.[1] Since buildings contribute so greatly to energy consumption, focus is shifting to reducing the environmental impacts of European construction. Recently, the Italian architecture firm Stefano Boeri Architetti (SBA) has emerged on Europe's sustainability scene as an innovative leader. Based in Milan, SBA is a relatively young firm, whose groundbreaking Vertical Forest project made headlines in 2014. SBA has since lived up to the attention, delivering creative solutions that sufficiently address human needs, harmoniously work with nature, and consistently prove that sustainable architecture is more feasible than ever predicted.

Stefano Boeri's work lies at the intersection of aesthetic and function. Raised in Milan, amid a culture dually focused on grand historic aesthetic and ignorant of current deteriorating environmental conditions, Boeri was compelled to devise an architectural solution for the "pollution capital" of Europe. His firm, SBA, initially gained market share in the green niche among established, well-known Italian architecture firms. As SBA gained more and more recognition, the resulting demand for green architecture pressured its competitors to adapt their business models to include a keener consciousness of environmental impact.

Proposed plans for Immobile Villa
Stefano Boeri Architetti, 2009

IMMOBILE VILLA

When the owner of a Milano office building posed a design competition to convert its property to residential use, the applicant pool was flooded with prominent names in the industry. A plan that stood out, however, was the one conceived by the up-and-coming SBA.

The firm's proposition was radical. The focus of the *Immobile Villa* is green space: viewed from any angle, the residential building appears to house nearly as many trees as residents, harboring vegetation on its roof, in its courtyard, and tucked into numerous alcoves in the façade Its design relocated a large portion of the build ing's sun-facing side to the opposite corner of the central courtyard.[2] This adjustment allows more sunlight to reach the central courtyard with additional terraces of vegetation. SBA's design not only repurposed the building as the competition stipulated, but also significantly improves its aesthetic appeal and reduces energy consumption.[3] This innovative, sustainability-minded design expanded the existing definition of modern Milano architecture to include an element of environmental awareness, foreshadowing the firm's biggest project to date.

VERTICAL FOREST

In 2014, SBA was recognized on the world stage upon completing twin residential towers with enough integrated vegetation to constitute a working ecosystem. Officially the *Bosco Verticale*, the world's first forested skyscraper is home to 900 trees and over 2,000 plants, creating more foliage space than would be available in the buildings' footprint.[4] In fact, the Bosco Verticale has green space equivalent to over 7,000 square meters of forest. The carefully-designed ecosystem absorbs air pollutants, creates humidity, and provides habitats for displaced birds and insects.[5]

SBA envisions a network of vertical forest skyscrapers transforming the Milan skyline with continued praise from the architecture community. CNN journalist Matthew Knight believes these towers "offer up a refreshing vision of how urban skylines might look in the future."[6] The international architecture world agrees: *Bosco Verticale* is the recipient of the 2014 International Highrise Award and the 2015 Best Tall Building Worldwide distinction.[7]

Each component of the buildings was designed with environmental consideration. The interiors, for example, take a cue from the terraces with an emphasis on natural materials.[8] Beyond early concerns about windswept trees, a dissenting opinion of the *Bosco Verticale* is nearly impossible to find, though this bias might be attributed to the popularity or the age of the project; often, innovative projects gain a celebrity status in their infancy. SBA anticipated the initial concerns by installing only species resistant to uprooting based on wind tunnel lab testing.[9] As a result, no accidents have surfaced within *Bosco Verticale*'s first two years. The project that was once thought to be impractical is now a defining feature of the Milano skyline.

Bosco Verticale
Paolo Rosselli via Stefano Boeri Architetti, 2014

FOREST CITY

Following the world's positive reception of the Vertical Forest, SBA expanded its portfolio to include comprehensive urban planning. SBA envisioned a utopian masterplan intended to reduce the unparalleled air pollution of Shijiazhuang, China with a variety of vegetated skyscrapers that draw from the concepts of the *Bosco Verticale*. The need for such plans certainly exists. Not only are existing Chinese cities heavily polluted, but forecasts also estimate that 250 million rural residents will move to newly constructed cities in the next decade in a government effort toward modernization. Since China has been ranked first among nations with the greenest buildings and construction, there is an increased likelihood that the government will fund SBA's concepts of sustainable architecture. Anticipating this, SBA has prepared blueprints to transform Chinese cities Liuzhou and Chongqing into forested metropolises as well.

CRITICAL REVIEWS

When SBA proposed the *Bosco Verticale*, there was a general sense of skepticism that such a forested feat could be accomplished. Now that the project has been completed and accredited with a number of architectural distinctions, objections are few and far between. However, many experts still have their doubts while SBA continues to anticipate and answer many of the concerns.

A primary objection is that the projected forest cities would be too expensive to construct. SBA's master plans for Shijiazhuang and Liuzhou appear radical by today's standards, as the idea of building entire new cities seems out landish. However, SBA views China's need for additional

Bosco Verticale
Stefano Boeri Architetti, 2014

cities to alleviate rural poverty and support modernization as an opportunity to deliver product and improve long-term environmental impact. As for the price tag, some models predict that a forested skyscraper would cost only five percent more than a traditional skyscraper.[12] Nevertheless, a higher cost, no matter how slight, likely translates to higher rent, which would potentially demand wealthier tenants. SBA has successfully avoided an association with architectural elitism by benefiting the entire populations of cities with its master plans for forest cities and its renovations of public venues, such as the *Ospedale Maggiore Policlinico*, a Milan hospital.

Conceptual masterplan of Forest City
Stefano Boeri Architetti, 2015

Other experts question the sustainable merit of projects such as the Bosco Verticale. Science journalist Tim De Chant argues, "In reality, trees on skyscrapers will likely be anything but sustainable … A skyscraper that's built to support trees will require more concrete, more steel, more of anything structural."[13] This argument captures the complexity of measuring sustainability. While greater amounts of structural material are required to support the added weight of soil and vegetation, the use of additional concrete is not necessarily a death sentence for a building's sustainability if other factors can outweigh the material sourcing. For instance, SBA has sought to improve the efficiency of the *Bosco Verticale* by designing it to recycle its own grey water as irrigation. The meticulously-selected, deciduous trees on the buildings' exteriors provide shade during the summer and warmth during the winter, reducing energy consumption for climate control purposes. SBA will undoubtedly continue to seek ways to increase the efficiency of its designs. Perhaps next we will see green energy systems and vegetated facades that require less structural support.

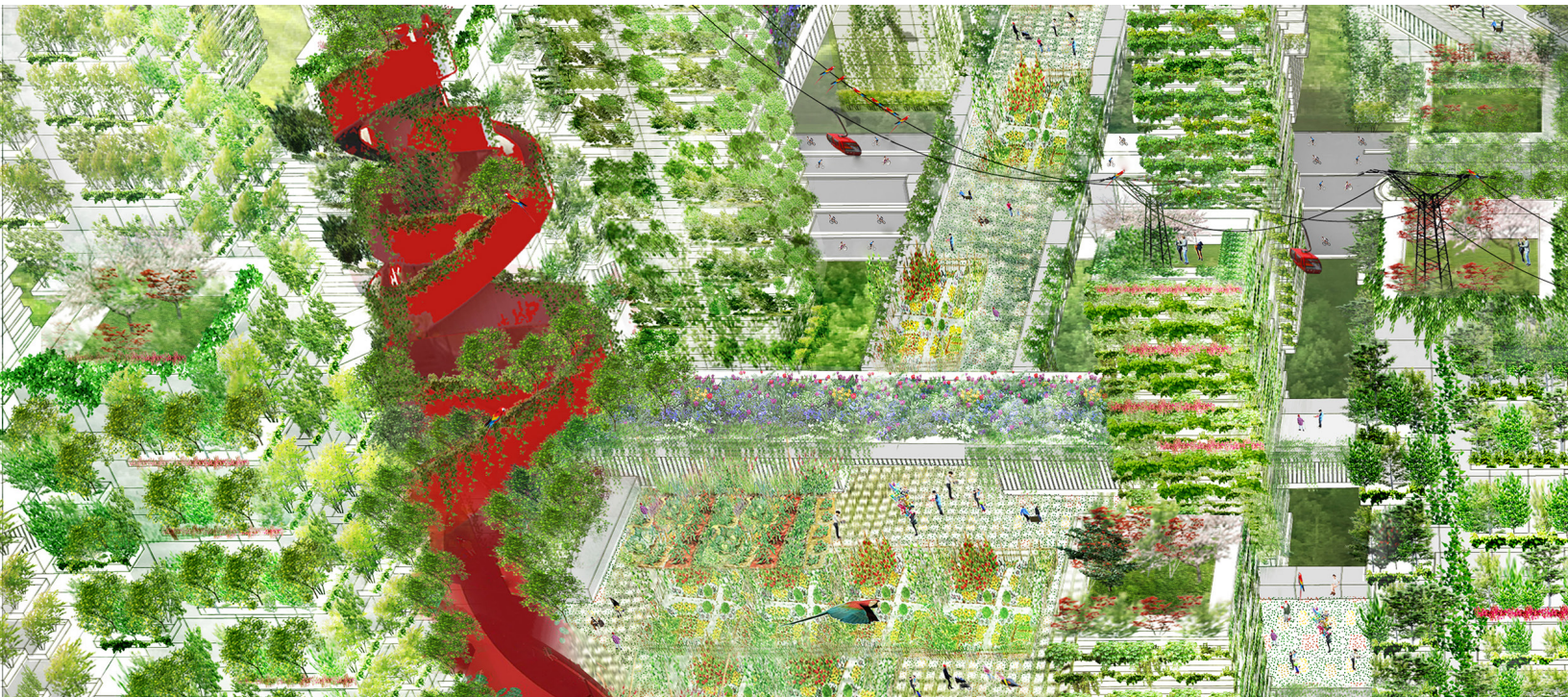
A dissenting opinion of SBA, however, is rare with demand for its vegetated towers ever increasing; SBA is scheduled to begin construction on an additional vertical forest in Nanjing, China in the coming months with several more in the planning stages.

LOOKING FORWARD

SBA earned the world's attention with its completion of the *Bosco Verticale.* The project has received tremendous praise from architectural critics, and deservedly so; it presents inspiring potential for the caliber of prospective sustainable architecture. Through its innovation, SBA has proven that clearing a lot for construction need not entail clearing vegetation. As SBA continues to deliver such revolutionary structures, the industry and its competitors will soon have to adopt a more sustainable lens in their business models. Stefano Boeri has published his visionary ideas in numerous articles and presented guest lectures at several graduate architecture schools such as Harvard and Columbia. Perhaps his next inspiring lecture could be given here at the University of Pennsylvania.

With visionaries like Stefano Boeri Architetti, there is no limit to how green a city can be.

Zack Varrato is a freshman in Wharton minoring in sustainability and environmental management. He is from the Rehoboth Beach, Delaware area and intends to make a positive impact through a career in business and politics.



CITATIONS

[1] Peter Watson, "Ranking the Greenest Countries in the World to Live," *Atlas & Boots*, last modified April 30, 2016, http://www.atlasandboots.com/greenest-country- in-the-world/.

[2] "Immobile Villa," *Stefano Boeri Architetti*, accessed December 3, 2016, http://www.stefanoboeriarchitetti.net/en/portfolios/immobile-villa/.

[3] "Immobile Villa," *Stefano Boeri Architetti.*

[4] "Vertical Forest," *Stefano Boeri Architetti*, accessed December 3, 2016, http://www.stefanoboeriarchitetti.net/en/portfolios/bosco-verticale/.

[5] "Vertical Forest," *Stefano Boeri Architetti.*

[6] Matthew Knight, "Gardens in the Sky: The Rise of Green Urban Architecture," *CNN*, last modified July 19, 2016, http://www.cnn.com/2016/07/18/architecture/green-skyscrapers-roofs-city-architecture/.

[7] "The Incredible Vertical Forest Residential Towers in Milan, Italy," *Twisted Sifter*, last modified June 13, 2013, http://twistedsifter.com/2016/06/vertical-forest-residential-towers-in-milan-by-boeri-studio/.

[8] "Bosco Verticale," *Residenze Porta Nuova*, accessed December 3, 2016, http://www.residenzeportanuova.com/en/residences-bosco-verticale/.

[9] "$2.6m Forest in the Sky Apartments, the Bosco Verticale," *News.com.au*, last modified October 31, 2011, http://www.news.com.au/travel/world-travel/bosco-verticale-tree-tower-apartments-build-a-forest-in-the-sky/story-e6frfqai-1226181208241.

[10] Ian Johnson, "China's Great Uprooting: Moving 250 Million Into Cities," *The New York Times*, last modified June 15, 2013, http://www.nytimes.com/2013/06/16/world/asia/chinas-great-uprooting-moving-250-million-into-cities.html?pagewanted=all&_r=0.

[11] Kristine Lofgren, "INFOGRAPHIC: The Greenest Countries in the World and How They Score on Energy Efficiency," *Inhabitat*, last modified January 05, 2016, http://inhabitat.com/infographic-the-greenest-countries-in-the-world-and-how-they-score/.

[12] "Bosco Verticale (Vertical Forest), Milan," *Design Build Network*, last modified 2016, http://www.designbuild-network.com/projects/bosco-verticale-vertical-forest- milan/.

[13] Kristine Wong, "Just How Green Is Milan's 'Vertical Forest'?" *TakePart*, last modified February 14, 2014, http://www.takepart.com/article/2014/02/14/just-how-green-milans-vertical-forest.

[14] "Nanjing Towers," Stefano Boeri Architetti, accessed December 3, 2016, http:// www.stefanoboeriarchitetti.net/en/portfolios/nanjing-towers/.