Council on Tall Buildings and Urban Habitat

CTBUH Research Paper

ctbuh.org/papers

Title: **Towards a Forest City**

Author: Stefano Boeri, Founder/Partner, Stefano Boeri Architetti

Subjects: Architectural/Design
Sustainability/Green/Energy
Urban Design

Keywords: Sustainability
Urban Design
Urban Sprawl

Publication Date: 2016

Original Publication: Cities to Megacities: Shaping Dense Vertical Urbanism

Paper Type:
1. Book chapter/Part chapter
2. Journal paper
3. **Conference proceeding**
4. Unpublished conference paper
5. Magazine article
6. Unpublished

© Council on Tall Buildings and Urban Habitat / Stefano Boeri

Towards a Forest City
通往森林之城

Stefano Boeri
Founder/Partner | 创始人

Stefano Boeri Architects
博埃里建筑设计事务所

Milan, Italy | 米兰，意大利

Stefano Boeri is an architect who lives and works in Milan, Italy. His professional firm, Stefano Boeri Architetti, has designed buildings across the globe, such as the award-winning Vertical Forest in Milan, Italy; Villa Mediterranee in Marseille, France; and a multi-purpose center in Changchun, China. Along with Richard Burdett, Jacques Herzog, and William MacDonough, Boeri was also a part of the architectural consult in charge of developing guidelines for Expo 2015 in Milan. He serves as a Full Professor of Urban Design at the Politecnico di Milano.

世界著名建筑师，策展人，评论家及教育家,以及博埃里建筑设计事务所创始人。他曾担任为米兰市文化副市长，并是米兰2015世博会概念阶段总规划师和命题人。 博埃里先生也是米兰理工大学城市学教授，曾执教于美国哈佛大学，哥伦比亚大学，麻省理工大学，荷兰贝拉罕建筑研究所，莫斯科斯特来卡等国际著名建筑院校。并曾是国际杂志《住》（ABITARE）以及《Domus》杂志主编以及国际联合研究机构“多样性”的创始人。 博埃里先生曾撰写了多部著作，也曾与库哈斯合著的《变异》。他曾多次参与世界大展，如威尼斯双年展，德国卡塞尔艺术大展，巴黎当代艺术博物馆，东京TNProbe等。

Abstract | 摘要

Shijiazhuang, the capital of the Hebei province in northeastern China, is a metropolis of three million people. It forms part of the immense developing megalopolis the Chinese call Jing-Jin-Ji, which is expected to accommodate more than 130 million inhabitants. Shijiazhuang itself already holds a nationwide record: it has the highest rate of air pollution in China. For this reason, the local government has asked Stefano Boeri Architetti (SBA) to design a new city for 100,000 inhabitants. The city of a new generation, it will become a model of sustainable growth – a small vertical town of public and private buildings, residences, offices, laboratories, museums, and schools, completely covered horizontally and vertically by the millions of leaves of plants, trees, and meadows. Due to the great extension of its surface area, the Forest City will be able to absorb and use renewable energy, and transport sustainable networks, contributing largely to the absorption of CO_2, reduction of energy consumption, and reversal of global warming.

Keywords: Biodiversity, Demineralisation, Forest City, Non-Anthropocentric, Urban Sustainability, Vertical Forest

石家庄，中国河北省省会，是中国北方的一座人口数目高达300万的大城市，是中国大型发展地区京津冀地区的一部分，该地区将在未来容纳1.3亿人口，但石家庄却背负着一个负面记录：中国污染速度最快的城市。 石家庄政府已经委托我们，设计一座可以容纳10万人口的新城。一座新时代城市，可以成为可持续发展的模型，一座垂直的小镇，所有的建筑，住宅，办公室，实验场所，博物馆，学校完全被垂直以及水平的灌木，乔木以及草甸覆盖。 由于其表面巨大的延伸，森林之城将能够吸收和利用再生能源和转换可持续网络，同时将吸收大量的二氧化碳，减少能量消耗和改变全球变暖。它产生了大量的实证。

关键词：生态多样性、脱矿化作用、森林之城、非人类中心主义、城市可持续性、垂直森林

Urban Injections of Biodiversity

When thinking about their work, it is increasingly common that those fields which deal with the planning and transformation of living spaces also have a strong ethical and philosophical edge in their outlook. We are pushed today towards thinking about the world in terms of the survival of humanity, due to an ongoing environmental crisis, unstoppable population expansion, widespread urbanization of green surfaces, and the destruction of our natural resources (in terms of flora and fauna) – in other words, a kind of species suicide. It is no longer enough to simply look after the principles, values, and needs of our species; we also need to locate ourselves within a wider vision of the future of our planet – a vision that, from an ethical perspective could be related to a non-anthropized approach to the urban phenomena.

A non-anthropized ethical approach is still interested in the survival of mankind, but places this desire within a wider scenario of

城市的生物多样性注入

当思考他们的工作时，在处理生活空间规划和更新的那些领域，他们的视野之中有很强的伦理和哲学边界，这变的越来越普遍。我们今天推行的方向是朝着人类的生存世界思考的，因为持续蔓延的环境危机，无法停止的人口增长，绿色表面的广泛城镇化以及我们对自然资源的破坏（在动植物方面）–换句话说，就是一种物种自杀。这些原则，价值以及我们物种的需求已经不能够被简单的满足，我们还需要在地球未来广阔的视野中定位自己。这是一种这样的视野——从伦理角度——可能关于非人类中心主义的城市现象。

非人类中心的伦理方式依然关注着人类的生存，但是，是将他们的需求放置在了限制与可能性中更为广泛的场景内。关键是只有在这样开阔的世界角度，才有可能去规划我们星球的未来。所以，非人类中心主义伦理不会抛弃人类去顺从他们的命运，但是会将其置于一种新对话方式的中心，在那里，人类不再孤独的成为生命的底座。

limits and possibilities. The point is that only within a wider worldview is it possible to plan the future of our planet. Non-anthropized ethics does not thus, abandon mankind to its fate, but simply places it at the center of a new kind of discourse, where humanity is no longer alone on the pedestal of life.

This kind of worldview, while keeping mankind and its needs at the center, begins with the desire to protect and help other species and plants. A vision of this type allows energies to be pushed towards actions of the reforestation and re-naturalization of anthropized territory (territory subjected to human impact), such as the urban re-colonization by animal species which have been expelled from these areas, and the regeneration of flora and fauna in oceans and in other great bodies of water present on our planet. The concept of biodiversity has a large a non-anthropocentric view on the living planet, and works in order to balance the proportions and the relations between the urban, natural, and agricultural spheres.

At the contrary of sustainability, which is interested only in the limitation of anthropic effects, biodiversity balances the relations between complexity and identity in every living species, recognizing the high degree of exchanges between the different identities needed to endure.

Both those who have lived for centuries in territories of rich countries, as well as those who have occupied in recent decades the edges of large developing metropolises can recognize that biodiversity is in fact a key resource for the exchange of cultures and businesses – an indispensable energy for the life of urban communities. Biodiversity is also an economic value, which generates wealth in the lands where the agricultural products that sustain us are grown, in the natural landscapes that are home to other animal species, and in the zoological variety of the world around us. It is also a cultural value, because the encounter, the intertwinement, even the conflict among species and life trajectories of individuals are, in fact, the lifeblood of human evolution.

Finally, it is an aesthetic value, because biodiversity enriches and multiplies, with colors, shapes, and sounds, the world which is enhanced by contrast. It makes the most spectacular discovery of every principle of repetition, variation, and the declination of a single identity. If it is true that there is no identity, except in relation to other identities, it is equally true that there is no community without the exchange of knowledge, traditions, and cultures that were born out of an archipelago of differences, of diversity.

Defending and increasing the biodiversity of our living environments today is a major challenge for the future of our planet. To do it within our cities, the mineral agglomerates of our buildings, streets, and squares, is one of the great challenges for our contemporary politics. Increasing biodiversity in today's metropolises means acting on the consolidated reality of the privately-owned buildings and public spaces formed over the centuries, collecting on one hand the pressures of individual families and civil society and, on the other, the collective decisions made by federal and local governments – a powerful and layered "palimpsest" which cannot be deleted or corrected if not for sensitive interventions from points to areas, places, or specific spaces.

Increasing biodiversity in a metropolis today therefore means working by injection, meaning to inject plant variety, wildlife, and culture, within a context that is affected by the planning policies and individual construction strategies of inhabited space. Those strategies and plans that have, for centuries, often been made to reduce the diversity of species and culture: to transform by repeating changes in mankind's behavior; to increase the stringency of the rules that make places homogeneous; and to dramatically decrease the diversity of species cohabiting in the urban sphere, where we have tamed those included in our habitat, enslaved those useful to the food cycle, and expelled as wild those that were not functional in our lifecycle or that were not willing to be subjugated.

Designing injections of biodiversity in our cities means reversing the processes of reduction of complexity, and increasing the variety of genus, species, and culture of living subjects. It means to activate injections of biodiversity locally that spread the effects of complexity and richness to their surroundings by multiplying the number of species of trees, plants, birds, and insects that live with us in the urban sphere. It means promoting a non-anthropocentric vision of territory, and recognizing the legitimate existence of living species which we foresee and plan their presence next to us.

Learning from the Vertical Forest (VF01)

The first prototype of an urban injection of biodiversity – the Vertical Forest (or VF01) – has been built in Milan, Italy and consists of two residential towers completely covered by

在这种世界视角中，保持人类和其需求处于中心的同时，开始了保护和帮助其他物种以及自然植物世界的愿望。这种角度允许了能量朝着植树造林行为和人类领土（受人类的影响的土地）重新自然化上的推动，例如动物物种的城市再植入，这已经从这些区域中除开了，以及地球上海洋和其他流动机体的一些动植物的再生。生物多样性概念就包含了一个在地球上的庞大的非人类中心主义的视角——同时也为了平衡城市，自然以及农业领域的比例和关系。

与可持续发展相反，可持续性是只关注人类影响的限制性，而生物多样性平衡每一个物种的复杂性和特征的关系，识别需要承受的不同特性的高等级交换。

生活在富有国家的领土百年的人们以及那些占据发展中大都市边缘数十年的人们，他们都能意识到生态多样性事实上是文化和贸易的重要资源；城市社区生活不可缺少的能量。生态多样性同样是一项经济价值，它在农业和食品生产上产生财富以供养我们。在自然景观层面，他又是其他物种的家园，世界的多种动物围绕我们。它也是一项文化价值，因为遭遇，缠结以及物种间的矛盾和个体的生活轨迹实际上都是人类进化的生命线。

最后，是它的美学价值，因为生态多样性丰富和倍增了颜色，形态，声音的世界，所以强化了对比的同时，在每一个单体特性在重复，变动和偏好的原则上制造了壮观的发现。如果它是真的没有特性，除了与其他单体的联系，那么所有社区都会真实存在多样的，差异组群的知识，传统以及文化的交换。

为我们生存的环境捍卫和提高生物多样性的今天，是对未来星球的一个主要挑战。在我们的这个被钢筋水泥所支撑的建筑，街道以及广场的城市内实现它，是对我们当代政策的严峻挑战。

在今天的大都市中增加生物多样性，意味着在综合的现实中努力：私人楼宇和公共场所，他们已经形成数百年了，所以一方面收集单个家庭和民间社会的压力，另一方面收集联邦和地方政府的决定。强大的和分层的“重写本”， 如果不是来自关键点到部分区域，地区以及特殊空间的敏感干预，在今天是不能被消除或纠正的。

在今天的大都市中增加生物多样性，因此意味着注射式的工作。它是指将多种植物，野生动物以及文化注射到居住空间的规划政策和个人建设战略的背景中去。这些策略和规划在几个世纪以来一直服务于减少文化和物种多样性的工作：通过人类行为的重复变化去转变，增加使地区均匀的条规的严谨度，戏剧化的减少城市中共生的多样性物种，在这里我们驯服那些处在我们生活环境中的东西，奴化那些有用

Figure 1. Rendering of the Vertical Forest (Source: Boeri Studio)
图1. 垂直植被效果图（来源：Boeri Studio）

Figure 2. Trees of the Vertical Forest (Source: Boeri Studio)
图2. 垂直森林树木（来源：Boeri Studio）

plants. It is useful to sum up the main features of this first prototype in a synthetic form (Figures 1 & 2):

VF01 is a project for the environmental survival of contemporary cities.
VF01 is a new generation of high-rise urban buildings completely covered by the leaves of trees and plants. It is an architectural device that promotes the coexistence of architecture and nature in urban areas, and the creation of complex urban ecosystems.

VF01 multiplies the number of trees in cities. VF01 grafts the equivalent of thousands of square meters of forest and undergrowth onto a few hundred square meters of urban space. The terraces, genuine outdoor extensions of the living spaces, are home to over a dozen trees (ranging from three to nine meters in height), numerous shrubs, and flowering plants. If about 350 trees make up a one-hectare forest, the over 700 trees of VF01 are equivalent to two hectares of woodland and ground level undergrowth (Figure 3).

VF01 is a tower for trees inhabited by humans.
VF01 sets the living standard between humans and trees within the built environment, establishing an amount of two trees, eight shrubs and 40 bushes for each human being. It houses about 1.7 kilometers of pots that are 1.10 meters high and up to 1.10 meters wide. The soil contained in the pots is a mix of agricultural soil, organic matter, and volcanic material that allows the reduction of the volume weighting on the perimeter of the balconies. Such diversity and typology of plant species within the urban center works as a point of reference and a tool for urban policies directed to the inclusion of plant and animal species inside the man-made urban context, promoting the development of different urban biodiversity dissemination sites.

的食品循环和排出，以此作为我们生命循环中没用的或者不愿被征服的东西。

在城市中设计生态多样性注射，意味着扭转减少复杂性的过程——以及增加物属，种类以及活体物种文化的类型。这意味着激活生物多样性的局部注射，通过倍增与我们一同生活在城市之下的树木，植物，鸟类，以及昆虫的物种，给他们的周围传播复杂性和丰富性的影响力。

这也意味着在境内推广一个非人类中心主义的视野， 去认识生物物种存在的合法性，并期待和规划他们与我们的相伴。

垂直森林经验

首个生态多样性的城市注射类型——垂直森林（VF01）——已经在米兰建成，它包含两栋塔楼，并完全被植物覆盖。它被用于总结第一个合成形态的主要特性(图1、2)。

VF01是一个当代城市环境生存项目。
VF01是城市高层建筑的新产物，完全被树木和绿植覆盖。他是促进建筑与自然在城市中共生的建筑设备，也是城市生态系统合成物的创新。

VF01倍增城市树木。
VF01嫁接了相当于上千平方米的森林于几百平方米的城市空间之中。露台，居住空间真正的户外延伸是这些树木（高达3–9m），无数的灌木和花草的家。如果350棵树组成1公顷的森林，那么垂直森林上的700棵树就相当于2公顷的林地和灌木丛（图3）。

VF01是供人类和树木栖息的高塔
VF01 在建成环境中设立了人与树木的生存标准，确立每个人有2棵树，8株灌木和40株草。它大约有1.7km的树池，树池约1.1m高，宽度可达1.1m。树池中的土壤是农用土，有机体，以及火山物质的混合体，这允许了在阳台的周边减少体积和重量。如此多样和多类型的植物物种在城市

Figure 3. The biodiversity of the Vertical Forest (Source: Boeri Studio)
图3. 垂直森林生态多样性（来源：Boeri Studio）

VF01 is an anti-sprawl device.
VF01 constitutes an alternative urban environment that allows inhabitants and community members to live close to trees, shrubs, and plants within the city; such a condition can be generally be found only in suburban houses with gardens, which is a development model that consumes agricultural soil and which is now being recognized as energy-consuming, expensive, and far from the communal services found in the compact city. Through densifying the urban fabric, VF01 creates new and innovative relationships of proximity between nature and the built environment with new landscapes and new skylines.

VF01 demineralizes urban surfaces.
VF01 is a high-density forestation project that increases green and permeable surfaces in the city and reduces the heat island caused also by sunlight reflected from glass façades. Together with green roofs, vegetable gardens, and vertical gardens, VF01 belongs to a new generation of environmental regeneration projects aimed at improving the quality and variety of everyday life in contemporary cities (Figure 4).

之中可以作为参照点和城市政策的工具，引导人造城市文脉内中植物和动物物种的包容性，促进不同城市生物多样性的传播场所的发展。

VF01是一台反城市扩张器。
VF01构成了一种替代的城市环境，它允许了在城市之中居住也和树木，灌木和草木近距离接触；这种情况是只可能在由花园的乡村住宅中找到，这是一个发展模式，消耗农业土壤以及被认为的能源消耗，价格昂贵而且远在紧凑型城市中的公共服务之外。

通过增密城市结构，VF01创造了自然和建筑环境之间的亲密的新型创新关系，创造了新型景观以及全新的天际线。

VF01净化了城市表面。
VF01是一个高密度造林项目，它增加树木并渗透到城市表面，同时和绿色屋顶，植被花园以及处置花园一同减少玻璃外墙反射阳光所引起的城市热岛效应。VF01属于环境再生项目的新产物，旨在当代城市中改变每日生活的质量和类型（图4）。

VF01减少城市环境污染
VF01中的植被被设计用做连续绿色过滤器，过滤居住空间的内与外，并能够吸收城市交通产生的细致颗粒，产生氧气，吸收二氧化碳，给阳台和室内屏蔽噪音污染。减少污染的益处不仅体现在大楼以及他它的住户层，同样也会改善整个城市的质量。

VF01减少能源消耗
VF01中的树木和乔木是由地下水通过位于顶楼的太阳能供能的水泵系统对大楼内的所有树池进行灌溉。植被渗透后的水以水蒸气的形式回到大气中。过程从周围的环境中提取热量。

VF01中阳台上的植被扮演过滤器的角色，以产生室内外将近3°的温差——在夏天——建筑外立面的热度会降至30°。

VF01是城市多样性倍增器
VF01承载了100种不同的植物物种，包括15种树木，45中灌木以及34种多年生植物。VF01中发现了超过20种鸟类在树上和灌木中筑巢，例如雨燕，红尾鸟和棕雨燕。

不同的昆虫也居住在VF01中，例如瓢虫，他们在植被中栖息，代替农药以抵抗害虫。

VF01是一个变幻的城市地标。
由于阳台上的多种生物以及多种落叶乔木（尤其在北面），根据季节的变幻和气候情况， VF01在其具有生命的外立面上改

Figure 4. Vertical Forest, Milan, Italy (Source: Boeri Studio)
图4. 垂直森林，米兰，意大利（来源：Boeri Studio）

VF01 reduces the pollution of the urban environment.
The vegetation within VF01 is designed in such a way so as to form a continuous green filter between the inside and the outside of the inhabited areas, capable of absorbing CO_2 and the fine particles produced by urban traffic, creating oxygen, and shielding balconies and interiors from noise pollution. The benefits resulting from a reduction in pollution are apparent not just for the building itself and its residents, but also in greatly contributing to improved air quality in the city.

VF01 reduces energy consumption.
Trees and shrubs in the VF01 are irrigated with groundwater pulled by a pump system – powered by solar panels located on the roof – to all the pots in the building. The water used by the trees and shrubs returns purified in the atmosphere in the form of water vapor in a process that also extracts heat from the surrounding environment. The vegetation acts as a filter on the tower balconies determining a reduction of nearly three degrees between the outside and inside temperatures. In summer, façade heat is reduced up to 30 degrees.

VF01 is a multiplier of urban biodiversity.
VF01 hosts about 100 different plant species, including 15 species of trees, 45 shrubs, and 34 types of perennials. More than 20 species of birds have nested on the trees and bushes found on the tower, such as the Martin, the Redstart, and the Pale Swift. Different insect populations also live in the vegetation, some of which, such as ladybugs, were released inside the vegetation in order to fight plant pests without the use of pesticides.

VF01 is an ever changing urban landmark.
Because of the variety of plant species hosted in the balconies and the presence (especially on the north walls) of many different deciduous trees, VF01 changes its skin and the color composition of its living façades according to the season variability and weather conditions. Like the trunk of a tree, its outer shell turns it into a living urban archive – a witness to the slow and gradual growth of a new and rich urban ecosystem in the heart of the city (Figure 5).

VF01 is a living ecosystem.
The contact between the leaves belonging to trees and the ones belonging to shrubs and groundcovers, each planted at different levels, transforms the façade of VF01 into potential vertical ecological corridors. As an ecosystem in a state of perennial transformation, the tower needs highly professional centralized tree care maintenance. Every two to three months, gardeners take care of plants from the balconies, and once a year, tree-climbing arborists intervene to prune the trees from the outside. The health of trees and shrubs hosted in the towers of VF01 is monitored in real time by a centralized network of sensors located in every pot (Figure 6).

Towards a "©Forest City"

Shijiazhuang, the capital of the Hebei province in northeastern China, is a metropolis of three million people. While occupying a vast territory, Shijiazhuang is only a small part of the immense developing megalopolis the Chinese call Jing-Jin-Ji which, in the next few years, will join Beijing, Tianjin, and precisely the rest of the Hebei region to accommodate

变其表皮和颜色。像乔木的树干，它的外壳把它变成一个活生生的城市档案馆，见证了城市中心丰富的生态系统的缓慢成长(图5)。

VF01是一个活的生态系统
不同层面的乔木，灌木以及草甸植被的对比将VF01转换成了潜在的垂直生态走廊。作为一个常年装换的生态系统，VF01需要专业化的集中树木维护。每2–3个月，VF01的园丁们在阳台内护理植被，每一年树木攀岩者的园艺师对VF01进行集中维护，从外部修剪树木。VF01中植被的健康状况都在被每一个树池中的网络探头实时监控着（图6）。

迈向森林之城

中国东北部地区的河北省省会石家庄，是一个拥有300万人口的大都市。在占据广

Figure 5. Vertical Forest, Milan, Italy (Source: Paolo Rosselli)
图5. 垂直森林，米兰，意大利（来源：Paolo Rosselli）

Figure 6. "The Flying Gardeners" of the Vertical Forest (Source: Laura Cionci)
图6. 垂直森林"飞翔的园丁"（来源：Laura Cionci）

Figure 7. Rendering of Forest City, Shijiazhuang, China (Source: Stefano Boeri Architetti)
图7. 中国石家庄森林之城效果图（来源：Stefano Boeri Architetti）

more than 130 million inhabitants. By extension, it will overcome other demographically immense megalopolises growing in southern China along the Pearl River Delta (PRD), which now encompasses cities like Hong Kong and Shenzhen, and reaches 60 million people.

Currently, Shijiazhuang holds a sad, nationwide record: it has the highest rate of air pollution in China – a pall of smog and soot that rises only a few days a year. Because of this record, the Shijiazhuang government, the Hebei province, and its municipalities have asked Stefano Boeri Architetti (SBA) to design, in the heart of an abandoned industrial area, a new city capable of accommodating 100,000 inhabitants. The city of a new generation, it will become a model of sustainable growth for a large country that sees 14 million farmers migrating to cities each year. The challenge was to design a prototype for this "©Forest City," which replicates and multiplies the "©Vertical Forest" typology.

A small vertical town of public and private buildings, residences, offices, laboratories, museums, schools, and more, completely wrapped, on the horizontal and vertical surfaces by millions of the leaves of plants, trees, and meadows – both agricultural/productive and spontaneously green grown. This is the city model that SBA has just presented in Chicago at the Illinois Institute of Technology's Crown Hall, during a Council for Tall Buildings and Urban Habitat (CTBUH) event. The CTBUH is known to promote the idea of green urban growth, in vertical and high density, to minimize the consumption of permeable soil.

Thanks to the great extension (vertical and horizontal only) of its surface and green living, the "©Forest City" will be totally wired for the capability of absorbing CO_2, creating and using renewable energy, transporting sustainable networks, reducing energy consumption, combating global warming, and increasing plant biodiversity and wildlife.

Results are quite evident in how the model of a "©Forest City" of 100,000 inhabitants could become a serious alternative to the unstoppable extension of the large suburbs welding together the edges of Chinese cities, creating endless conurbations – uninhabitable and ungovernable – like the one of Jing-Jin-Ji.

Instead of an infinite extension of the metropolis interspersed with settlements of low density housing (often without central places and community services), urban China could grow – thanks to a series of archipelagoes of bio-cities of medium dimension and the high density of biodiversity and green, surrounded by woods and farmland (Figure 7).

Imagining and helping to create a system of "©Forest Cities" in China would also be one of the most effective ways to follow up the protocol of COP21 in Paris (the forum promoted by the United Nations on climate change), which has asked US and Europe – burdened by historical responsibility for generating 70 percent of the emissions that have caused planetary climate change – to not only to continue their battle to reduce emissions (in progress thanks to the crisis), but, above all, to contribute funding, technologies, and projects to reduce emissions in the affected developing countries. This is a difficult and exciting challenge even for Italian excellence in the field of ecology and urban biodiversity.

The urban structure of the "©Forest City" is based on three superimposed layers:

1) "The earth" is a broad and permeable ground-floor area for productive, commercial, and cultural activities. It is a fluid and totally public space, open

袤土地的同时，石家庄只是一个中国京津冀地区大量发展中城市的一小部分，在未来的几年，京津冀将包含北京，天津以及河北省——同时将在未来几年容纳超过1.3亿的人口。通过扩张中国南方其他人口特大城市，沿着珠江三角洲，包括连接香港到深圳以及其他城市，达到6000万的人口。

中国东北部地区的河北省省会石家庄，是一个拥有300万人口的大都市。在占据广袤土地的同时，石家庄只是一个中国京津冀地区大量发展中城市的一小部分，在未来的几年，京津冀将包含北京，天津以及河北省——同时将在未来几年容纳超过1.3亿的人口。通过扩张中国南方其他人口特大城市，沿着珠江三角洲，包括连接香港到深圳以及其他城市，达到6000万的人口。

这是一座新时代的城市，能够成为大国中的可持续发展模型，每年可以发现有1400万的农民涌入城市。

这次的挑战是需要去设计一座真正的“森林城市”类型，重复以及倍增“垂直森林”类型。

一座拥有公共和私人建筑，住宅，办公，实验室，博物馆，学校等等的垂直小镇——在水平和垂直层面上完全被植物，树木，草甸覆盖。无论农业还是生产都自发的长出绿色。

SBA不久前在美国芝加哥伊利诺理工大学的皇冠大厅展示了一个城市模型，正迎上高层建筑与人居署理事会之际，以及推行绿色城市发展的理念，倡导在垂直高密度下最大限度地减少可渗透土壤的消耗。

得益于这个极大的表面延伸（只在水平和垂直层面）以及绿色生活方式，森林之城将会完全上线，它能够吸收和利用再生资源以及交通可持续网络，能在吸收二氧化碳，减少能源消耗以及全球变暖上给予极大贡献。同时增加植被的生物多样性和野生动物物种。

它产生了大量证据，关于容纳10万人的“森林城市”模型怎样可以成为一系列的势不可挡的大面积农业地区扩张的代替品，以连接城市边界，并创造无尽的大都市——无法居住以及肆意的——就像京津冀的一种。

不同于穿插低密度住宅点的大都市的无限延伸，这通常没有中心区域和社区服务，城市中国是可以成长的，在给予多年之后将会持续增长——受益于一系列的中等尺寸的生态城市组群以及高密度的生态多样性和绿色，他们都被围绕在林区和农田之中（图7）。

Figure 8. Rendering of Forest City, Shijiazhuang, China (Source: Stefano Boeri Architetti)
图8. 中国石家庄森林之城效果图（来源：Stefano Boeri Architetti）

to free transportation systems and the flow of people, goods, and carriers from everywhere.

2) "The gardens" are a horizontal pedestrian platform ranging from five to nine meters above the common space where the inhabitants of the forest and their visitors can meet each other, work, and enjoy sports and cultural activities. The gardens are a semi-public space that will house vegetable plots, sports facilities, and carrier systems for suspended transport.

3) "The forest" is an authentic forest of skyscrapers ranging from 40 to 200 meters in height. It is a private landscape where it will be possible to experience a new and unusual closeness between humans, trees, and other animal species. The forest is a vertical kaleidoscope of internal environments – for human beings who want to live with all the amenities and creature comforts within a genuine forest of trees, plants, bushes, and more.

The "©Forest City" is the prototype for a new lifestyle that develops directly from the extension, multiplication, and evolution of the "©Vertical Forest." It is a vertical city that brings together plant life, normally found spread over hundreds of hectares of forest, into a space of one or two square kilometers of urban surface. It is a settlement for humans, trees, plants, and other animal species based around a minimum standard of two trees per inhabitant. The "©Forest City" is a complex and integrated ecosystem combining environmental sustainability (anti-carbon strategy), biodiversity (the reproduction and cohabitation of living species), and social empathy (the development and promotion of the exchange of social capital – culture, traditions, emotions – among the resident populations). The "©Forest City" is a vibrant city, with a high proportion of creative relationships, inhabited by individuals, families, communities, and businesses, all of who/which experience a completely new sensation of equilibrium between the natural and the artificial, and which use this fertile balance to create innovation in every area of daily life. Within the "©Forest City," the urban, natural, and rural worlds (human care and attention to nature) can coexist, thanks to the creation of a unique and integrated architectural environment at every level of the settlement (Figure 8).

想象并帮助在中国创造一个“森林之城”系统，同样也是去履行COP21巴黎协议最有效的方式之一（联合国推动的气候变化论坛），该论坛已经要求美国以及欧洲一一承担历史责任所产生的70%排放量，这些排放导致了全球的气候变化一一他们不仅自己在努力减少排放（危机的发展），而且首先对发展中国家贡献了资助，技术以及减排项目。

这对意大利在生态和城市生物多样性上的优势着实也是一个困难和挑战。

“森林之城”的城市结构基于以下给出的3个叠加层面：

1）是一个广泛的具有渗透性的地面区域，提供生产，商业和文化活动。它是流动的并完全开放的空间，面向外部世界的自由交通系统和流动人群，商品以及货运

2）是一个水平的人行平台，距离公共空间约5至9米。在那里，森林之城的住户和访客，可以互动，交流，运动以及进行文化活动。花园将成为一个半公共空间，并将拥有植被花园，运动设施以及立体运输交通设施。

3）是一个真实的位于摩天大楼之上的垂直绿色森林，大约40–200米高，一个私人的景观区域。那里将有可能体验到人与树木，以及其他生物独特的亲密接触。森林是一个模拟自然环境的纵向万花筒，希望生活中多生物和居住设施并重的人们，在这里，将体会到真正森林中树木，植被，灌木等带来的舒适感。

“森林之城”是一种新生活方式形态，它直接拓展，倍增以及进化了垂直森林。它是一座垂直的城市，把自然生命普遍存在的上百公顷的森林带入了1–2 平方公里的城市空间中。它容纳人类，树木，植被，以及其他动物物种，基于2人一棵树这样简单的守则。“森林之城”是一个复杂且集合的生态系统，它汇集了可持续发展（反碳策略），生物多样性（不同物种的综合共居）以及共荣之心（社会资本交换的发展和推进——居住群体的文化，传统以及情感）。

“森林之城”是一个充满活力的城市，它伴随高比例的创新关系。个人，家庭，群体提及企业居住在此，都能体验一个全新的平衡自然与人工之间的感觉，并利用这片充盈的平衡在日常生活的各个领域创造革新。

在“森林之城”中，的城市，自然以及乡村（人类关注并有意识的联系自然）的共生均得益于在各个居住层面的独特综合建筑环境的创新（图8）。

References:

Boeri, S. (2015). **A Vertical Forest. Instructions Booklet For The Prototype Of A Forest City.** Corraini: Mantova.

Boeri, S. (2011). **“L’Aniticittà”**, Editori Laterza, Bari.

Boeri, S. (2011). **Biomilano.** Edited by Brunello M., and Pellegrini S., Corraini Edizioni: Mantova.

Boeri S. (2010). **“Arguments For A Planetary Garden”**, in Derive, vol. 40-41, p. 143-145.

Branzi, A. (2006). **Weak And Diffuse Modernity. The World Of Projects At The Beginning Of The 21St Century.** Skira: Milan.

Clément, G. (1991). **Le Jardin en Mouvement.** Paris: Pandora.

Clément, G. (2004). **“Manifest du Tiers Paysage”**, Editions Sujet/Objet, Quodlibet.