

Stefano Boeri Architetti

**GREEN**  
**Obsession**  
**: TREES**  
**towards**  
**Cities**  
**Humans**  
**towards**  
**Forests**



# GREEN Obsession

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Stefano Boeri Architetti

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■ TREES  
towards  
Cities  
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Projects by Stefano Boeri Architetti

Texts by Stefano Boeri

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# Questions, an introduction

Stefano Boeri

How can one create the best habitat for trees growing into the sky of a city?

How can one direct the roots of an oak or linden tree to extend horizontally, instead of vertically?

What is the best chemical composition and correct weight of soil that should be put into the pot of a balcony situated one hundred meters high?

How many ladybirds need to be spread into the pots in order to combat the pests that infest plants when these are on the facade of a tower?

How do trees react to the wind?

How can we anchor the trunk of a maple tree to the facade of a tower in order to prevent it from cracking?

For how many years should the growth of a small tree in a field be followed?

How many specimens per hectare are needed in order to create a fir forest? Similarly, how many different species of trees are required to create a forest of biodiversity?

Moreover, how many tons of fine dust particles can a 10-meter-high tree absorb in a year?

How many degrees of heat reduction can be achieved by a tree and its leaves on horizontal or vertical surfaces?

How can one aid the growth of deciduous trees on north-facing facades that are less exposed to the sun, while at the same time avoiding the leaves from filtering out the dim light from the interiors in winter months?

What is the advantage in terms of strengthening the immune response that comes from living in a neighbourhood with a widespread presence of trees and plants?

How much CO<sub>2</sub> can a mature tree transform into oxygen over the course of its ten years of life?

What is the advantage of connecting the poles of biodiversity (gardens, parks, green roofs, tree-lined avenues, green facades etc...) through the use of green corridors, and how can this be achieved in an urban environment?

What is an urban forest, really?

And above all, how does a pine tree that grows along a cliff live, and what does it perceive of its environment?

Is it different from what a fellow pine tree growing along the concrete facade of a building perceives?

Why is it that the leaves of two trees of the same family, if placed side by side, come to almost touch each other?

What do plants feel when they live in daily contact with insects, birds and small rodents?

What do plants feel when they live in daily contact with humans?

What intelligence flows within the monopodial or sympodial ramifications of a juniper?

What is the measure of time for an oak tree?

At via Donizetti 4 in Milan, Headquarter of Stefano Boeri Architetti, we have been dealing with botany for at least twenty years.

We are an architectural firm that deals with botany.

Most of all, we are interested in the environmental performance of plants; we study their attitudes and preferences and we have come to learn about their climatic compatibility.

We have an obsession: that of creating buildings for trees, which can also be inhabited by humans and even birds.

We are also obsessed with designing Forest Cities; cities where plants and nature have no less of a presence than humans, and where both create a habitat in which mineral surfaces are reduced to the minimum amount needed for life.

We have the obsession of creating large planetary corridors for biodiversity, which would be able to connect parks, natural oases and forests within large territorial systems.

Finally, we are obsessed with creating Forest Cities, or green cities, that are transformed into points of connection by generating corridors of biodiversity.

It is said that obsessions arise by chance. This, however, is not the case. Obsessions arise from other obsessions. James Lovelock had the intuition of Gaia while trying, as an astrophysicist, to figure out how to reach Mars. While projecting all of his intellectual strength in identifying the most suitable ways to reach the red planet, Lovelock tells of how he suddenly turned his gaze towards planet Earth, which was, conceptually, millions of kilometres away from him. All at once he was able to conceive its completeness, the living and pulsating nature of its biodiversity, conversely so absent in the part of universe that we know.

The same thing happened to us when, while thinking about the future of cities and the need to create tall buildings rich in quality and functions, we began to imagine what would happen if we planted a large tree on the roof or a balcony of a residential tower, or perhaps even an office building or a museum.

From then on, everything changed.

Trees and plants went from being decorative objects that embellish our architecture to thinking, autonomous and noble subjects, endowed with their unmistakable individuality as well as their own peculiar life trajectory.

Our obsession with greenery is not just a stubborn desire to create greener architectures. It is, rather, the stubborn search for a different point of view in architecture.

It is the idea of an architecture of biodiversity which supports a variety of living species, not just the human one. It is the firm belief that biodiversity is not simply a matrix for measuring the density of living species in a place, nor is it just an important resource for strengthening our immune defences.

The biodiversity that we practice in via Donizetti, as well as in our offices in Shanghai and Tirana, is an exercise and at the same time a game. It is the game of putting ourselves in the perspective of trees, maples, beech trees - but also of foxes, crows and hedgehogs - while thinking about the urban world from their point of view.

This book, with its several voices, wants to give an account of this slightly crazy but hopefully, overall, fertile obsession.

# A preface

Maria Chiara Pastore

This is a book about a green obsession with the ambitious goal of telling the story of the evolution of the professional and research work of the Stefano Boeri Architetti (SBA) studio.

It is a reconstruction that traces the history of the firm's projects, their inspirations and the personal, cultural and economic networks that underlie these projects.

But that's not all: the history of SBA's green obsession is borne witness to here by the authoritative voices of several of the many professionals, researchers, thinkers and institutional representatives who in recent years have discussed, designed, created events, organized and curated conferences and research while working with or together with this professional firm. Among these is Mario Piazza was responsible for the graphic concept of this book and who was a constant presence in many of Stefano Boeri's projects.

The book is laid out in five chapters, each of which presents a collection of themes and projects and which offers different areas for reading. There is that of the projects, that of the interviews with the leading personalities involved in the relationships that the studio has had over the years, that of the texts that Stefano Boeri has written over the years regarding the complex relationship between Nature and Architecture. Then there is that of the images and the data, which alternate and are presented throughout the pages by the narrator of the Stefano Boeri Architetti research group, which brings the materials and occasions handled by the Architecture Studio back to the central theme of biodiversity, looking at different working scales and considering for example the different geographical contexts, policies and future challenges, to name but a few.

Biodiversity has been defined as a concept which covers "all types of variability among living organisms, including among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of

which they are part; between species and ecosystems” (Treccani, 2021), onto which the concepts of coexistence, balance and evolution have been grafted.

Following the development of a series of projects and concepts relating to the theme of Biodiversity, the book highlights the obstinate and undeniably obsessive quest for new goals and new applicative opportunities for the studio.

This is the case with the evolution of the Vertical Forest project (which today sees the Studio active in many different parts of the world), where the choice of thinking about the Milan prototype not as a point of arrival, but rather the starting point for a series of subsequent experiments has opened up the possibility of making this type of building accessible to a wider user base (with social housing Vertical Forests built in Eindhoven in the Netherlands and in Huanggang in China) as well as the use of wood as a structural material in order to minimize production of CO<sub>2</sub> in the construction process, as in the case of the Botanica tower designed for the Porta Nuova area in Milan, or as the central point of a series of modular buildings designed for post-Earthquake reconstruction in Amatrice.

But the same obsession emerges in the recurring attention dedicated to the issue of cohabitation between living species within the urban environment. This started from a text by Stefano Boeri from 2008 entitled *Down from the Stand: Arguments in favour of Non-Anthropocentric Urban Ethics* (in “Abitare”, 480, 2008) which came out of the vision shared with Andrea Branzi of a Paris transformed into a great metropolis of coexisting species and which then re-emerged during the courses at the Politecnico di Milano dedicated to cohabitation (*Animal City*, 2015) forcefully re-appearing in the recent project for a Grand Genève which has at its core not a square or a monument but a mountain with all its multiform biodiversity.

Then again, in interweaving these threads of intellectual inspiration and personal relationships, the book offers a dialogue between Pier Mannuccio Mannucci, professor of internal medicine, and Laura Gatti, agronomist and landscape designer, on the relationship between health and the environment, as well as linking these texts to the continuous work carried out over the years, first by the Boeri Studio and then by SBA on urban Urban Forestry and in particular on green connections in greater Milan, starting from the Metrobosco project which in 2005 launched the idea of an orbital forest in the metropolitan city of Milan. This thread continued with the project for a planetary garden for EXPO 2015, the Fiume Verde project in 2014 which proposed the re-using of disused railway stations

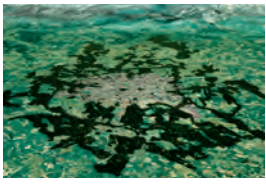
as new areas to host nature within the dense Milan built sector, up to the great challenge of Forestami, the project currently underway in the metropolitan city of Milan for the improvement of environmental quality, health, and greenery.

The book also explains the studio's attitude to transdisciplinary working, constantly seeking partnerships and dialogue with researchers, thinkers and philosophers, politicians, activists, scientists, academics and artists such as Enrico Alleva, Emanuele Coccia, Fredi Devas, Laura Gatti, Jane Goodall, Paul Hawken, Cecil Konijnendijk, Davi Kopenawa Yanomami, Pier Mannuccio Mannucci, David Miller, Harini Nagendra, Thomas B. Randrup, Giuseppe Sala, Mitchell Silver, Giorgio Vacchiano, and Li Xiangning.

These places, people, projects and visions which are all connected by a healthy obsession for biodiversity and the connectivity of natural landscapes came together in 2018 in the collaboration between the FAO, SIS-EEF, Politecnico di Milano and Stefano Boeri Architetti for the setting-up of the first World Forum on Urban Forests, considered to be of highly significant. The Forum was in fact a crossroads of relationships and an exchange of experiences from different backgrounds and design experiences, such as that of Richard Weller of *World Park*, who imagines the connection of the Americas with a Biodiversity Corridor, but also of new suggestions for the work of the SBA.

Many of these inspirations have produced genuine Manifestos, as in the case of the first example of the Vertical Forest (2008) or that of Botanica, a new prototype of Vertical Forest as a catalyst of urban intensity and biodiversity in Milan; or the Manifesto for a Forest City, presented in 2021 at the Power Station of Art in Shanghai as part of an exhibition (*Trees*) promoted by the *Fondation Cartier pour l'art contemporaine*.

It is the very form of the Manifesto, recurrent and at the same time ambitious that perhaps best reflects the fertile green obsession that has distinguished SBA's thinking, research and work over the last 20 years.



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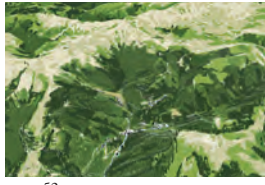
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# The fragility of a species

Stefano Boeri

From the speech as President of Triennale Milano at the symposium “The Earth seen from the Moon” (Triennale, 11th July 2020)

I would like to begin with a brief reflection on the concept of Fragility.

I believe that the real great legacy of the Covid-19 Pandemic lies precisely in everyone - everywhere in the world - finally having acquired an undeniable awareness of the fragility of our species. We have found ourselves to be fragile in our technocratic presumptions of domination - which have suddenly turned out to be harmful to ourselves. We have recognized ourselves as fragile in our intellectual capabilities for prediction and proved unable to foresee an infection that is simply the latest in a chain of episodes of contagion caused by a virus. We are fragile in our desperate desire to be present in the world in the face of a pandemic that (in the words of the beautiful metaphor coined by Pope Francis) like a storm yet without being a war, has wiped hundreds of thousands of living beings from the face of the Earth.

I believe we must both accept and work with this unveiled and in many ways unexpected Fragility. It may be that the only way to use this Fragility as something positive and productive rather than just a terrible weakness, is to critically rethink our centrality on the planet, our place at the centre of the stage on the pedestal of life. Thinking about a new anthropocentrism does not necessarily mean choosing a decentralized position and lulling oneself into a sort of ontological relativism, but rather aiming towards a sort of simultaneous double movement.

On the one hand, we need to learn to reinterpret human life as that of a living species immersed like all other forms in the great miscellany of Life (as the philosopher Emanuele Coccia constantly reminds us). This means measuring and weighing up every gesture, every policy and every decision that has an effect on the here and now in this world of cities and spaces, and taking into account the perspectives, expectations and needs of other living species.

It means decentralizing; starting over from an empathetic position which takes the point of view of every other living species as a necessary resource for every action on a global scale and therefore as a measure and potential

correction of our actions, in the senses of both downsizing and extension.

On the other hand, it is undeniable that this decentralization both creates and encourages the conditions for cognitive enhancement. This is not only because as James Lovelock showed us, our vision of the Earth as a unitary ecosystem originated from a visual, optical decentralization, namely that of seeing ourselves from the Moon or Mars; a decentralization that needs all our wisdom, technology and, I add, desire to dominate the world. It is also because this movement towards adopting a position of viewing other species requires a giant cultural and cognitive leap, which poses questions about our cultural and scientific abilities. It requires us to transform a conquered fragility into the conscious force of a new type of intelligence that must first of all deal with not only economic and social, but also cultural imbalances that still condemn our species to unacceptable forms of racism and contempt for the rights of minorities, as unfortunately confirmed by the murder of George Floyd and the tragic events that took place in May 2020 in the United States, and of which Europe, in various forms, is not exempt. Thus in that enormous part of the world that we do not yet know, we will then - indeed, from now on - introduce the point of view of other living species. In other words: what we do not yet know is not only that huge range of phenomena that our intelligence does not rationally dominate, but it is also that perspective on the world that other types of intelligences (other minds, paraphrasing Peter Godfrey-Smith) have developed. This opens up the field to a formidable expansion of our intelligence towards the phenomena that our disciplines continue to consider unknown (a theme dear to Steven Pinker and his studies on a new Enlightenment) and at the same time, towards the knowledge and study of intelligences of other living species and of that part of the world unknown to them. With these thoughts we would like to introduce those infinite explorations that still await us on different scales, to describe the future of human intelligence and cities plus that of the plant world and together present the most advanced strategies and projects that I have followed with my practice and my team, in the course of twenty years of activity.

Here I am referring of the big issues: climate crisis, which has the potential to turn into an unprecedented social crisis, as well as having a strong environmental impact; the concept of Nature, of which we too are a part, however much we try to think the opposite; and the changing relationship that binds Cities and Forests. Only a radical and necessary mutual interaction between different disciplines such as Art, Architecture, Urban Planning, Philosophy and Science, can help us to get closer to that evolutionary leap that our species, today more than ever, must make.

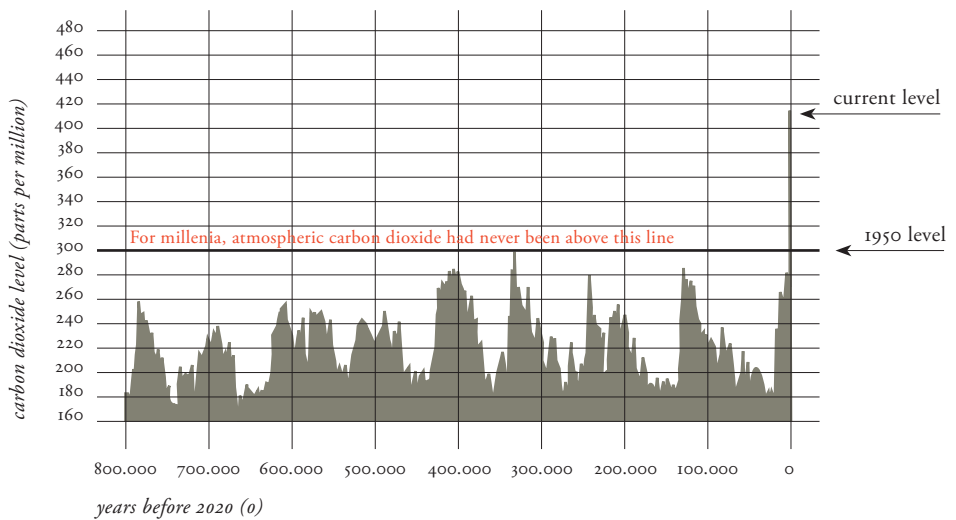


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# The Environmental and Climate Crisis

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## Carbon Dioxide have reached unprecedented levels in a short amount of time



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Source: - Luthi, D., et al., 2008; Etheridge, D.M., et al. 2010; Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO<sub>2</sub> record. Some description adapted from the Scripps CO<sub>2</sub> Program website, "Keeling Curve Lessons."

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## An overview

Simone Marchetti and Maria Chiara Pastore

### *Great Acceleration*

Unlike previous climatic “crises” or earlier climate changes that occurred during different geological eras, the climate crisis we are currently experiencing has been largely caused by human beings; it is the product of the hand of man and has extremely heavy repercussions for the entire terrestrial ecosystem. According to a study conducted by the Potsdam Institute for Climate Impact Research, the concentration of carbon in the atmosphere has increased exponentially, reaching in a few decades values that had not been detected for at least 3-4 million years, about 412 parts per million of carbon dioxide in the atmosphere (Gütschow, 2016)

These traces of carbon are clear evidence of the Anthropocene<sup>1</sup>, of our passage here on Earth. The debate on when the Anthropocene began is open, but it seems useful to report two possible dates, presented in an article published by Lewis and Maslin in *Nature* (Lewis, S.L., Maslin M.A., 2015) and the criteria with which these dates were indicated. The dates are 1610 and 1964. The 1610 marks the wide-scale swapping of species between continents as the first element of analysis which began in 1492 but was felt in 1610.

*“One biological result of the exchange was the globalization of human food-stuffs. The New World crops maize/corn, potatoes and the tropical staple manioc/cassava were subsequently grown across Europe, Asia and Africa. Meanwhile, Old World crops such as sugarcane and wheat were planted in the New World. The cross-continental movement of dozens of other food species (...) domesticated animals (...) and human commensals (the black rat, to the Americas), plus accidental transfers (many species of Earth worms, to North America; American mink to Europe) contributed to a swift, ongoing, radical reorganization of life on Earth without geological precedent”* (Lewis, S.L., Maslin M.A., 2015, page 174).

The second element instead concerns the decline in absolute terms of the human race, caused by the spread of diseases, particularly smallpox, wars and famine.

1 For the definition of Anthropocene see Jenkyn, T. W. Lessons in Geology XLVI. Chapter IV. On the effects of organic agents on the Earth's crust. *Popular Educator* 4, 139–141 (1854); Crutzen, P. J. & Stoermer, E. F. The “Anthropocene”. *IGBP Newsletter* 41, 12 (2000); Lewis, S. L. & Maslin, M. A. Defining the Anthropocene. *Nature* 519, 171–180 (2015); Waters, C. N. et al. The Anthropocene is functionally and stratigraphically distinct from the Holocene. *Science* 351, 137 (2016); Van der Pluijm, B. Hello Anthropocene, goodbye Holocene. *Earth's Future* 2, 566–568 (2014); Waters, C. N. et al. Global Boundary Stratotype Section and Point (GSSP) for the Anthropocene Series: Where and how to look for potential candidates. *Earth-Science Reviews*, 2017

*“(...) The accompanying near-cessation of farming and reduction in fire use resulted in the regeneration of over 50 million hectares of forest, woody savanna and grassland (...) within around 100 years. The approximate magnitude and timing of carbon sequestration suggest that this event significantly contributed to the observed decline in atmospheric CO<sub>2</sub> (...) between 1570 and 1620 documented in two high-resolution Antarctic ice core records. This dip in atmospheric CO<sub>2</sub> is the most prominent feature, in terms of both rate of change and magnitude, in pre-industrial atmospheric CO<sub>2</sub> records over the past 2,000 years.”* (Lewis, S.L., Maslin M.A., 2015, page 174)

The other historic date suggested is 1964. *“Since the 1950s the influence of human activity on the Earth system has increased markedly. This ‘Great Acceleration’ is marked by a major expansion in human population, large changes in natural processes, and the development of novel materials from minerals to plastics to persistent organic pollutants and inorganic compounds. Among these many changes the global fallout from nuclear bomb tests has been proposed as a global event horizon marker. The clearest signal is from atmospheric <sup>14</sup>C, seen in direct air measurements and captured by tree-rings and glacier ice.”* (Lewis, S.L., Maslin M.A., 2015, page 174)

Both dates, extremely specific, highlight moments that have marked a change on a global level and it is nature in both cases that has recorded this sudden change. From 1964 to today, this “giant acceleration” has changed and is changing our planet in a sudden and fast-moving way. In his book “Thank you for being late” (Friedman L.T., 2017), Thomas L. Friedman describes how in just over a couple of generations humanity has managed to become a real “geological force on a planetary scale ... where the trends of the Giant Acceleration offer a dynamic view of the emerging coupling through globalization on a planetary scale between the socio-economic system and the biophysical Earth system ... they have pushed all the Earth’s key systems up to and perhaps beyond the limits of safe functioning that defined the Holocene”, the geological era prior to the current one (which began about 11,700 years ago) and which has seen these biophysical factors undergo a serious change since the early 1900s.

### *Tipping Points*

In order to better define the changes to which the planet is subjected, we refer to the work published in Nature on climate “tipping points” (Lenton et al., 2019) or rather the points of discontinuity or sudden change in the Earth’s climate system. The term tipping points or “points of no return”, was first coined by the IPCC - The Intergovernmental Panel on Climate

Change, the intergovernmental body created in 1998 by UNEP – the United Nations Environment Program and WMO – the World Meteorological Organization, whose main role is to provide governments with information and scientific data for the development of climate policies. The concept of tipping points was used by researchers to demonstrate that some of them have already been exceeded, as a further demonstration that climate change is real and that we are facing an emergency that requires solid action.

The point to be made here is that in the history of the Earth these critical points of no return have already occurred on a cyclical basis. In actual fact, it is not the first time that the biosphere has experienced a drastic chain of events that have been significant for both the climate and species living in that given era (with relative mass extinctions). Just think, for example of the glaciations, or ice ages, in which the lowering of global temperatures led the polar ice caps to cover much of Europe and North America and as a result, the glaciers of the mountainous areas were much larger than today, to name but one of the most recent climatic events in our era. There are numerous hypotheses relating to the occurrence of these cycles (the lowering or raising of temperatures): one refers to the ocean currents and the concentration of carbon dioxide in the atmosphere, another the inclination of the Earth's axis. We are now facing the reaching (and exceeding) of threshold values - the tipping points - that can generate chains of events of such power as to endanger the lives of many animal species on Earth, including humans.

Below we highlight some examples of tipping points, which illustrate the importance of markers and the consequent need to understand the changes.

One of the threshold values already reached, for example, concerns the melting of glaciers at both poles (Lenton et al., 2019). Both the Arctic and Antarctic polar systems are fundamental for the initiation of biological, oceanic and atmospheric processes involving the entire terrestrial ecosystem and there are numerous impacts that climate change could entail. It is now established that the polar ice caps, as well as almost all glaciers throughout the world, are rapidly shrinking. This happens because a fusion process has been triggered, a chain reaction process that amplifies itself. The Arctic, for example, is heating up and melting twice as fast.

A point of no return, again according to the study published in *Nature*, is the slowdown of the oceanic circulation system known as AMOC or “Atlantic Meridional Overturning Circulation” (compared to the values

of 1,600 years ago), which gives rise to a cycle of hot/cold currents and exchanges of heat and energy which is highly significant for the planet's climate balance. Here are just two reasons why it is so important: firstly it regulates the European climate, influencing the distribution of air pressures and favouring the movement of hot air to Europe (a slowdown in the AMOC could in fact cause an increase in temperatures and an increase in thunderstorm events in central Europe) and secondly a number of studies suggest that a slowing of the AMOC could lead to a rise in sea levels along the coasts of the United States (Yin et al., 2009).

Another tipping point is potential droughts, caused by climate change, fires, and deforestation, which is jeopardizing the health of the Amazon rainforest. According to another study published in *Nature*, (Amigo, I., 2020) in some areas of the Amazon rainforest the dry season has lengthened from 4 to at least 5 months in the last 50 years with an average increase in temperatures of 1 to 1.5 ° C in the last century, and that an increase in the dry season and a warmer climate could double the area of forests affected by fires in the next 30 years, thus further diminishing one of the world's main lungs.

The researchers also added the state of boreal forests to the list of tipping points, which due to the increase in temperatures are more at risk of “disturbances”, in other words, all those phenomena whose impact is sometimes not necessarily negative, but natural and regenerative, such as fires. However, the impact that increasing heat waves have on boreal forests can lead to catastrophic consequences for this type of ecosystem, as it increases the risk of fires. An area particularly affected by heat waves is Siberia which reached peaks of +38°C at a latitude well beyond the Arctic Circle and well beyond the temperatures recorded in the same period in previous years (ACF, 2020). The preliminary analysis of temperatures recorded in the month of May 2020 alone in North-Western Siberia is exceptionally important because such high temperatures would normally only be recorded once every 100,000 years if there were no interference from the actions of humans regarding rising global temperatures.

Then again, there is the rapid melting of the Greenland ice sheet, which has led to an increase in the melting of ice from about 25 billion tons per year in the 1990s to an average of about 234 billion tons per year today (7 times faster) (Shepherd, et al., 2020).

In the summer of 2020 came news that according to estimates by experts at the Byrd Polar and the Ohio State University Climate Research Center drawn up using satellite monitoring of more than 200 glaciers,

in Greenland the point of no return had already been reached. This indicates an irreversible process of melting whose advancement cannot be halted even if we stop global emissions of greenhouse gases (Sasgen et al., 2020).

The melting of permafrost is also considered one of the tipping points, whose “limit” point could be dangerously close, and whose most serious consequence would be the release of enormous quantities of carbon dioxide and methane into the atmosphere, thus further aggravating the current situation. (Plaza, C., 2019)

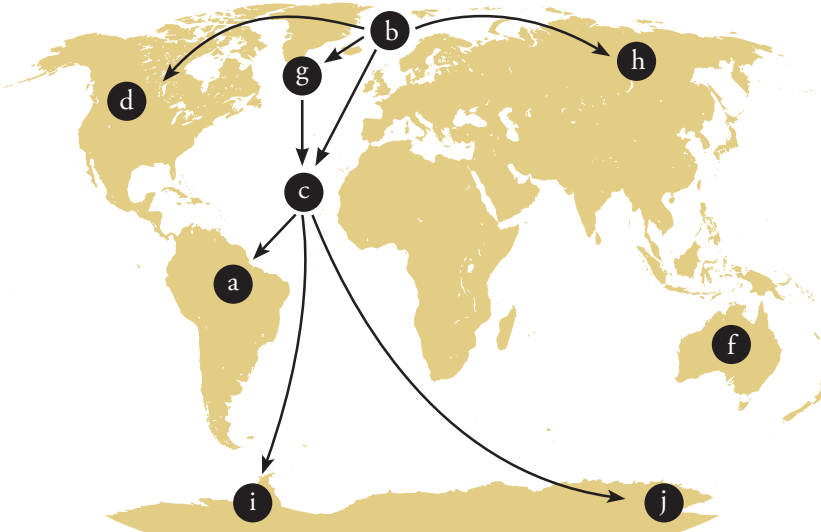
To sum up then, the points of no return already exceeded are:

- the shifting of monsoons in India and West Africa
- the melting of the Greenland ice sheet
- the reduction of boreal forests
- the extensive thawing of permafrost
- the slowing down of the Atlantic Meridional Overturning Circulation (AMOC), which makes it possible to warm the European coasts
- Drought and deforestation in the Amazon forest
- Large-scale coral reef deaths
- The collapse of pack ice in Western and Eastern Antarctica

Source: T.M. Lenton et al., 2019

## Raising the alarm

Evidence that tipping points under way has mounted in the past decade. Domino effects have also been proposed.



- a. Amazon rainforest / Frequent droughts
- b. Arctic sea ice / Reduction in area
- c. Atlantic circulation / In slowdown since 1950s
- d. Boreal forest / Fires and pets changing
- f. Coral reefs / Large-scale die-offs
- g. Greenland ice sheet / Ice loss accelerating
- h. Permafrost / Thawing
- i. West Antarctic ice sheet / Ice loss accelerating
- j. Wilkes Basin / East Antarctica / Ice loss accelerating

- Tipping points
- ➔ Connectivity

Source: Lenton T.M. et al., 2019

Of all the critical points (about thirty) which scientists and climatologists have identified for some time now, it seems that nine have already exceeded the criticality threshold, due to the +1°C increase in temperature compared to the pre-industrial era (due to causes directly related to human activities).

Not all of these events are easily monitored. According to a study conducted by IPCC scientists about 20 years ago, the exceeding of these thresholds would have occurred only following global warming of more than 5°C, while now observations are increasing that show that some events are already in place, such as those listed above. This is why it is right to say that we are in a state of emergency: a dangerous situation with very little time left to prevent it. This is an unprecedented point in human history, where in one way or another we can make a difference.

The reason for the increase in the frequency of “exceptional” phenomena, i.e. anomalous because they are more intense than the average such as prolonged drought or heavy rains, is explained precisely by the increase in temperatures. The presence of greater water vapour in the atmosphere due to high temperatures determines the development of increasingly powerful climatic events: for example, the greater the heat in the atmosphere, the higher the surface temperature of the oceans, the greater the violence of storms in tropical climates. The increase in sea level will then increase the exposure of coastal areas to potentially harmful events because they will be those areas most subject to the “corrosive” forces of the oceans.

### *Species at risk*

The climate and environmental crisis also affects living species such as animals and plants and with an even greater effect on those species which are not given time to adapt to new changes (whether caused by anthropogenic or natural actions).

According to the United Nations (IPBES, 2019), the extinction rate of animal species is accelerating, due to the health of the ecosystems in which these species live. An average of about 25% of animal and plant species are threatened and this is equivalent to about 1 million species at risk of extinction. According to the report, an analysis of the number of species for which sufficient habitat remains suggests that to date already half a million terrestrial species of animals and plants are doomed to extinction due to the loss or deterioration of their habitat.

According to the IUCN (International Union for Conservation of Nature) red list, at present about 32,000 animal species are at risk of extinction (this is made up of Amphibians: 41%, Mammals 26%, Birds 14%, Sharks and Rays 30%, some species of Crustaceans 28%) (IUCN, 2020)








This global endangered species trend has undergone an acceleration which to date is tens to hundreds of times greater than the average of the past 10 million years. The reasons that lead us to reflect on a necessary stance towards biodiversity in terms of the protection of ecosystems and endangered species are many, but they can be traced back to a single concept: the survival of our species depends on the survival of other species. In fact, nature plays a fundamental role in providing food, energy, medicine, and primary resources for our own sustenance. Just think of the air we breathe, the water we drink, or the food we eat: more than 75% of food crops such as fruit and vegetables for example, depend on pollinating animals. According to the IPBES study, about 75% of the land has been significantly altered, 66% of ocean areas are suffering significant impacts, and over 85% of so-called “wetlands” have been lost.

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### More than 32,000 species are threatened with extinction

That is still 27% of all assessed species

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Amphibians	<b>41 %</b>	
Mammals	<b>26 %</b>	
Conifers	<b>34 %</b>	
Birds	<b>14 %</b>	
Sharks & Rays	<b>30 %</b>	
Reef Corals	<b>33 %</b>	
Selected Crustaceans	<b>28 %</b>	

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Source: The IUCN Red List of threatened species, IUCN 2021

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Many countries have long reported the increasingly dramatic disappearance of birds and insects which previously made it possible to naturally regulate the presence of parasites and diseases (FAO, 2019). Vanishing

bee colonies are the clearest example of this dramatically uncontrolled loss. In fact, it seems that about 17% of pollinator species are at risk of extinction on a global scale and that in places where the climate crisis is making itself felt more in terms of temperature increases, the percentage of pollinating insects is drastically reduced. It is therefore the climate crisis and the increase in temperatures that represent the greatest risk for these species (Soroye et al., 2020). In actual fact this catastrophe even undermines our own ecosystem: it is sufficient to think of how much agricultural production (crop pollination) depends on the presence of these types of insects (Valido et al., 2019).

On the other hand, since 2000 the loss of forests worldwide on a planetary level has been slowing down even if not at a standard rate. In the tropics, about 32 million hectares of primary forests or “recovering forests” were lost between 2010 and 2015 (IPBES, 2019). The main driver of deforestation appears to be the change in land use, mainly to make room for large-scale agriculture (33%), reasons connected to urban extension (10%), infrastructures (10%) and mines (7%) while forest degradation is mainly due to cutting of wood (58%), use of wood as firewood (27%), uncontrollable fires (10%), and urban expansion (5%).

The areas most affected by biodiversity loss would be dry and humid tropical and subtropical forests, which hold the primacy in terms of global biological diversity, and counting about 10 of the hotspots with the largest number of endemic species of terrestrial vertebrates with at the same time the highest number of endangered species (IPBES, 2019).

The report is accompanied by a series of important facts regarding the state of global biodiversity, analyzing all types of climatic zones and the state of the related plant and animal species. It is evident that the state of biomes can be significantly altered by complex interactions with the anthropic sphere, with agricultural land surfaces as well as all other urbanized land areas.

Almost all aspects of both physical and psychological human health depend on natural ecosystems. It is impossible to think that our survival is possible without the essential contribution of other animal and plant species.

With the above numbers regarding endangered species, it is important to make assessments to understand sustainable management strategies able to direct changes in this alarming trajectory in order to reduce the impacts on already damaged and degraded ecosystems.

It is therefore important to emphasize the interdependence between

species (including ours), since a decrease and degradation of ecosystems in which species on which we are not strictly dependent could lead to disastrous consequences for other ecosystems as well.

In Europe, in order to react to the challenges due to biodiversity loss, the European Commission is setting up an ambitious biodiversity strategy for 2030 with the objective of bringing nature back into our lives (EC, 2020). This strategy takes into account the fact that biodiversity and the climate crisis are strictly related, and that together, loss of biodiversity and ecosystem collapse are one of the biggest threats facing humanity. To face these threats the plan proposes to address all the possible areas related to biodiversity and climate in the next decade, including fisheries, agriculture, protected areas, pollution, organic farming, planting trees, and the greening of urban and peri-urban areas.

In the following chapters, we will outline our ideas concerning the evolution of urban areas, villages, and large cities.

# Towards the ethics of responsibility

Stefano Boeri

The pandemic that exploded in early 2020 has forced us to think about a different relationship with Nature, in particular, that nature that we have long thought of imitating and controlling, which we have objectified through technology and finally tried to regard as a manageable material to be dominated. Through its effect of creating incongruous proximity between the human sphere and that of untamed nature, this pandemic somehow calls into question an ancient paradigm of domination and control. It has forced us to directly confront the concept of unpredictability and the sudden and undeniable emergence of an already precarious loss of equilibrium, thereby opening up perspectives that offer a series of alternatives for action. The first of these is a total reliance on technology, genuinely thinking that simply through applying scientific tools and exact mathematics, it will be possible to return to greater management of nature which seems to have rebelled against us. The second direction is one of denying the strength that this pandemic possesses in questioning our perspectives, our visions of the future.

It is as though we are already comfortably resigned to accepting the potential risk of the extinction of our species which climate change has already indicated as an actual possibility and which the Covid-19 epidemic is urgently reiterating.

The opportunity that we are presented with, also raised by Pope Francis' "Laudato Si" Encyclical, is to focus on a form of anthropocentrism which is neither indifferent nor in denial, nor with an unquestioning trust in technology

This text is a transcription of a lecture by Stefano Boeri filmed during the first lockdown between March and April 2020 as part of the "Tempo Ritrovato" series of readings. Published in Italian in S. Boeri, Urbania, op.cit



NASA, *Earthrise*, Jun 25, 2013

but which instead appears as a strong assuming of responsibility towards our Planet which mankind can care for in two fundamental ways: firstly through the act of safeguarding, in the sense of an act of protection and care of shared space, and secondly one of cultivating, in the sense of seeing the Earth as a fundamental and essential necessity for the life-giving biome or human sphere to be kept fertile.

A further reflection from the Encyclical concerns time and space, in the sense that the first is superior to the second: today the ability to generate processes with a broad temporal vision is more important than having control over a range of places or the definition and manipulation of spatial realities. This calls attention to a way of thinking about the future that not only questions any sense of coherence between what we think or want and our actions, but also the effects of our actions. From this point of view, criticism of a policy based solely on immediate results and which supports the dynamics of a narrow temporal and spatial vision by referring exclusively to “instant time” is pivotal, if we want to find an approach and a series of practical proposals capable of creating positive effects in the medium and long term.

When we start thinking in depth about a substantial ecological conversion, we realise that in fact, we are the Earth, we are part of this common home. From this point of view, in a holistic view of the relationship between our own and other living species but also an integral ecology that unites us with the great natural processes and phenomena, there is a great deal of the most advanced results from Enlightenment and scientific rationality, part of a Darwinian thought process that we often forget and which frequently reminds us how our species is just one among the many other living species, that we are simply animals among other animals.

This ecological conversion comes from the ground up, from our existence as individuals and involves our way of being, thinking, living, and moving through spaces and places as we do today.

Once again this too becomes a question that concerns an inner conversion, an individual conviction along with the participation of all of us in a collective effort.

A great question to mention in this regard is that of forestation and deforestation: the first, now unavoidably necessary, is diametrically opposed to the second, which represents a tremendous reduction in the biodiversity of species and is one of the main contributing causes of those zoonosis processes by which certain diseases pass from the animal kingdom to that of humans. The risk of lowering biodiversity leads us to look to a future in which a different presence of greenery, plants, and trees both around and within our cities really becomes an unavoidable challenge.

## Behind our ethical choices

Simone Marchetti

Politics and economics, architecture and urbanism have ethical choices at their roots. Ethics is also the basis of our political and civil life; yet the simplistic restriction and association of our actions and behaviour to the usual mechanisms of reward and punishment must be overcome.

Our choices, both those as individuals but above all the choices made at the national and international level, substantially determine the impact of the current climate crisis. With regard to the ecological disasters we are witnessing, we should necessarily make weighted ethical environmental choices that go beyond morality, or what we at a given time consider right or wrong. The climate crisis is an issue that can only be addressed if we forget about the reward or punishment mechanisms, and it will only be resolved when we have instead reached a responsible ethical attitude that moves us all in the same direction, as with a flock of birds, in this case, a flock with a clear ethical line in mind along which to move and which will do so without the unreasonable attitudes of a few, coming sooner or later to choose the final direction in which it will head. Thus one should not focus on the sense of guilt (which often produces a sense of rejection), but rather the collective will that allows a greater will to act (Tielbeke, 2020).

Environmental ethics is part of progress or in other words the idea according to which, thanks to new tools and thoughts, one's own suffering and that of others is reduced. This form of ethics is already topical, and it is what the younger generations are declaring from streets and cities around the world, led by activists such as Greta Thunberg.

The demand now is for us to adopt transformative actions that will safeguard the conditions of life for everyone now as well as for future generations by interrupting the emission of greenhouse gases. This is essential in order to prevent that series of irreversible chain reactions that we talked about previously from taking place and yet which could very

well happen if the global average temperature rise of 1.5°C is exceeded (IPCC, 2018). The climate crisis will bring about a series of events whose devastating effects can already be seen. For some time now scientists have advanced alarming projections, the responses to which will require a common commitment shared by several generations. In fact, thinking that the consequences are solvable within one generation is unrealistic. For this reason, the climate crisis can be quite clearly defined as a trans-generational problem.

### *Towards a Global Shift*

The European Union's commitment to the implementation of the New European Green Deal is an initiative that envisages not only a drastic reduction in emissions, thus leaving behind the old growth model based on fossil fuels, but also a strengthening of new sustainable technologies through innovation, which can generate new jobs to replace old ones (EC, 2019 COM). The New European Green Deal has in fact been presented as the new growth model for Europe which promises to transform the old continent into the first true continent with zero emissions, a new driving force for economic growth, and the achievement of a more sustainable direction by 2050. This plan is claiming to be able to lead Europe on a truly sustainable and inclusive growth path. Given the extent of such a change, it is well known that the same plan would be both possible and desirable for other nations as well. Countries such as the United States, which appears to be among the leading fossil fuel extractor countries in the world, together with Saudi Arabia, Russia, Canada, and China, and followed by Australia, South Africa, and Brazil would have a fundamental role in reducing carbon emissions into the atmosphere.

The plan for the New Green Deal proposed by the American Democrats foresees the achievement of “net-zero greenhouse emissions” through a transition that at the same time will fight social inequalities and socio-economic injustice with the aim of creating new prosperity and economic security for all citizens. The US Democrats' plan, therefore, sees the fight against the climate crisis as being closely linked to that of social injustice and economic problems. In fact, this transition must be able to provide an advantage to all, based on the principles of equity, inclusiveness, and reducing dependence on non-renewable sources and resources. (EC, 2019)

On a more general discussion, it is important to consider the overall impact of these policies, evaluating the possible contributions. Recently,

a study conducted by Stanford University (Jacobson et al., 2019), evaluated the energy plans of green deals in about 143 countries around the world. Although the approach focuses only on the energy sector, The study reveals that with an energy transition plan completed by 2050, or rather with a complete transition to renewable WWS (Water-Wind-Solar technology) energy, it will be possible to globally achieve energy savings of 57.1%, in terms of consumption with cost savings of “private” energy from \$17.7 to \$6.8 trillion/year (61%).

Energy is not the only element to be considered in the fight against the climate crisis, but rather one of the leading factors of an effective reduction of CO<sub>2</sub> emissions and atmospheric pollution if converted into non-fossil sources. Obviously, the clean energy sector also represents a driving force for the economy and therefore an important growth opportunity for employment. In Europe for example, between 2008 and 2014 the number of jobs in the renewable technology sector increased by 70% and according to a report by the European Commission (EC, Renewable energy in Europe, 2020), there is the potential to create around 900,000 jobs by 2030, provided that both public and private investments are made. The energy efficiency sector could also bring an additional 400,000 jobs (EC, 2019). Europe could do a lot towards aspiring to climate neutrality by 2050, with ambitious reform plans for individual member countries and investments in sectors such as energy, transport, circular economies, water management, and biodiversity as well as the decarbonisation of the entire industrial sector.

However, it is not just a question of changing the energy model, reducing consumption, and improving the efficiency of buildings (which are still responsible for about 40% of total energy consumption). Sectors such as mobility and infrastructure need to be radically rethought because they generate atmospheric and noise pollution and congestion in today’s conurbations.

The social factor should not be overlooked, either. The ethical choices that governments are making in moving towards this ecological transition cannot fail to take the social factor into consideration. The twofold social-ecological condition that will bring changes in natural systems and impinge into the dynamic of social systems is one of the essential points requiring emphasis here, considering that the citizens of our planet, facing the environmental crisis, are equal neither in terms of their responsibility nor in terms of their vulnerability (Laurent, Pochet, 2015), and actions concerning the ecological transitions will have a structural impact on the societal system.

We can only react to a global climate, environmental, and health (as well as economic) crisis, such as the one we are currently experiencing, in a coordinated way on a global scale. We, therefore, need a global action plan and we need it immediately. Humanity must therefore make a choice, whether to continue on the path of division or take that of solidarity. Becoming aware that the climate crisis affects everyone on a global level will be a victory over all future crises that could occur during this century because it will finally change the approach that we systematically persist in pursuing, this tendency to divide rather than unite. At this point, we must not only ask ourselves what governance models we want to aspire to in order to lead a revolution of this type, but we must also try to question the forms of urbanity in which we live in order to respond to contemporary challenges in a conscious way.





# Regeneration vs Extraction. On the Nature of Man

A Dialogue between Stefano Boeri and Paul Hawken

Paul Hawken is an environmentalist, entrepreneur, author and activist who has dedicated his life to environmental sustainability and changing the relationship between business and the environment. He is one of the environmental movement's leading voices, and a pioneering architect of corporate reform with respect to ecological practices. His work includes founding successful, ecologically conscious businesses, writing about the impacts of commerce on living systems, and consulting with heads of state and CEOs on economic development, industrial ecology, and environmental policy.

*The dialogue was moderated by Simone Marchetti in September 2020*

*Simone Marchetti* Paul, your approach to the climate crisis is an attempt to see the world we are living in in a holistic way. Most of the time we are used to making a distinction between priorities, we are used to considering biodiversity detached from poverty, forestry-related issues detached from hunger, and soil exploitation detached from pandemics. The truth is that the natural world is perfectly intertwined, and so we are.

*Paul Hawken* The climate movement is very narrow. It came out of science, it came out of men who are apt to see climate as a problem we need to “fix”. It is a very specific focus on fossil fuels, naturally, the biggest source of GHG. But the scientific climate movement ignored social justice, biodiversity, and desertification and with all these silent issues, it didn't see that climate is systemic and that the combustion of fossil fuels is part of an overall system including so-called “health industry” or agriculture. The climate movement has excluded so many people. If we just focus just on climate we cannot solve the climate crisis. If you don't get to cause, you don't get to cure. The cause and cure are people. Nature never makes a mistake. Humans do. The climate movement is exclusive. Only a small number of people are engaged. Today, almost 99% of the world's population is disengaged from climate change. How could that be? They might be sympathetic or understand the basic science, but they are disengaged and if you don't believe it, just go on the street and ask people: “What are you doing about the climate crisis? Do you know what you can do?” They don't know. Or maybe they would answer “Yes, I acknowledge the problem but I don't know what to do”. How could that be? That's because the way global warming has been communicated is through fear, as a threat. That is an incomplete

and psychological damaging way of communicating. People just shut down because the climate conversation doesn't relate to their personal needs. Most people want the best for their family, the best for their children, the best for where they live. Climate action and solutions are something that is detached from them. There is a great disconnection. So, I think it is about changing communication. If we don't communicate in a way that is inclusive, if we don't offer solutions that directly impact people's current needs, which are not future existential threats, which science constantly talks about, they will ignore, and if we keep talking and communicating to people in this way, we will have to wait until people experience the current existential threat (which is what we are currently experiencing in California: referring to the fires that occurred during August/September 2020 [ed.]) and then wait for people to change their opinion. To solve the crisis, we have to focus on food security, how our clothing industry contributes hugely to global warming, and how our political industry makes climate politics dysfunctional. The food and farming industry together are the number one cause of global warming; it's not just about cars and coal, it is about agriculture. The food system and electricity generation are neck and neck in terms of their overall climate impact.

Getting more people engaged is about communication, it is about understanding a world that is beautifully connected rather than a world made of compartments and pieces. The climate movement has not been about possibilities, it has been about the probability of threats. We are human beings, and we move towards possibility, it is natural. Where are the possibilities here? People don't see it.

Our economy is a system of extraction. We are basically stealing the future and selling it in the present, and calling it gross domestic product (GDP). That is degeneration. You are degenerating all forms of life, whether it is the ocean, lands, forests or people. Regeneration is the opposite. You are basically investing in the future, you are restoring life and increasing resources, and that can be GDP too, that is better economics. Today, our choice is to either heal or steal the future. A world where water is cleaner, where there is more nutritious food, more forests, more fish in the oceans, a world where people are healthier and cities are vibrant places because they are not fortresses. They are actually places where nature and people are interactive and relate to each other. All these things are possible. Again, it's a matter of regeneration

Edward Burtynsky, *Greenhouses #2*, El Ejido, Southern Spain, 2010





or degeneration. Most of the time we think of nature as a circle but it is not. Nature is a spiral. Either you spiral down or spiral up. If you are spiraling down that means the feedback loops are making things worse (so called “vicious” loops), or you are spiraling up which means what you do improves the next thing and so on (that is restoration and regeneration). So, it is either regeneration or degeneration but everything we do today, every industry, is degenerative. Reversing this is how you address global warming and climate. If we continue to address global warming by itself, it won’t work out.

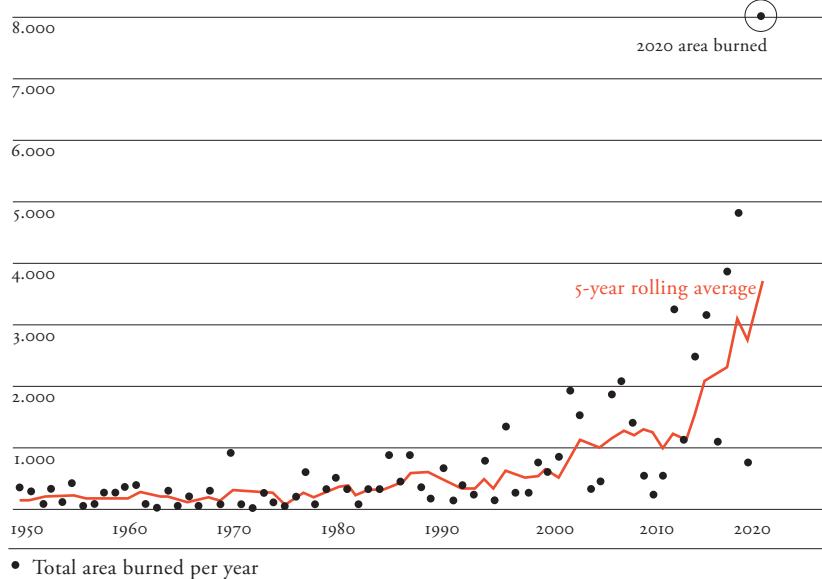
*sm* What if we start approaching economics and GDP considering nature and its value (economical/energetical)?

*ph* We should change the idea that the value is something out there for the “taking”. The incentives are monetary, or short-term and that is how the economic system is sending wrong signals to everybody. We should definitely change our approach and try to move from an extractive economy to a regenerative economy.

*sm* During the 2020 summer California was hit by violent wildfires, making 2020 the worst year for fires, with an unprecedented amount of land burned on the West Coast that has ballooned over the last two decades and which is part of a long-term trend toward more frequent, more devastating fires in the US West Coast that shows no sign of slowing down. You were close to San Francisco when it happened, the pictures of a red sky really shocked me, the same reaction I had when I saw the pictures of the wildfires in Australia, in January 2020.

*ph* Yes, I was in northern San Francisco, near the coast. We didn’t have the fire there, but fires were everywhere, in all three directions: South, North, East. We felt it. Almost a million hectares of forests were burnt in California and it wasn’t even the peak fire season (which is usually September/October). There has been more than a hundred years of fire suppression. That builds up fuel loads of dry brush and trees. As dryness increases, trees die and it is a perfect setup for a conflagration. When native Americans were the only residents in California, they used fire every winter to clear the forests and didn’t allow forests to get dense. They would have 20 oak trees per acre, while now you see in some places 200. When branches would fall off or die from the oaks, they would use

## Amount of land burned on the West Coast each year has ballooned over the last two decades



Source: New York Times, web article, <https://www.nytimes.com/interactive/2020/09/24/climate/fires-worst-year-california-oregon-washington.html>

them to smoke the trees to get rid of the insects, which would give more acorns. When fires came the grass would burn while trees wouldn't. When the Spanish and the Europeans arrived, they would describe California as a Park, with trees and grass, with lilies everywhere (native Americans would plant lilies). It was a completely different environment and ecosystem than it is today. What we did is that we made fire a bad thing. Fire is not necessarily bad. Indigenous people living in dry lands used fire to protect themselves and the lands. They called it "goodfire". Look at what happened to Australia: the same thing, The native aboriginal cultures stayed there for 40,000 years and never had fires like today. We appreciate the forest, but we don't really live in the forest, that is why most of the time we don't understand how it works. In the new book I am writing (Hawken P., 2021) together with other relevant contributors there is an essay written by Lyla June Johnston where she talks about the forest as a farm. And she describes how 3,000 years ago in the East Coast the native American people completely changed the forest of the Coast. The change in the forests can be seen in soil core samples of pollen. They transformed the wild forest into a wild farm. There were 4 billion chestnut trees in North America before the 19th century. They provided

2/400 pounds of food per tree. If we had these trees today, it would provide food that could feed half of the world. Chestnut alone is not the perfect diet of course but it is not a bad diet either, because it provides fat, proteins, carbohydrates. They had other things too: pecan, hickory, acorns, animals, fish, perennial vegetables, and everything was wild, and it provided more food per hectare than we produce today.

*sm* Paul, you mentioned the cities. They represent the most grandiose product - places of exchange and freedom - and on the other hand, they represent the greatest expression of detachment from the natural environment. Shouldn't we stop demonizing the Anthropocene and propose something different?

*ph* I am not a fan of the word Anthropocene. So much of what we face today is caused by human beings thinking that they are separate from nature. And we are not. We act that way, we believe that way, but it is not true. The Anthropocene, in a sense, gives the impression that this is a human age. Instead, it is an age where one species, which is the human species, has caused great damage - there is no question about that - but it is not an age on Earth that is meaningful to me. What is meaningful to me is to understand the integration, the inseparability between us and everything around us. It is not enough to say that we share DNA with trees and plants - that's true - but in a much more profound way. I was thinking about the urban environment with trees: Italian scientists have led the research on plant intelligence, such as Stefano Mancuso and Monica Gagliano, these people led the way of understanding plants and their intelligence. I remember Stefano Mancuso stating that plants and trees can "see" the surroundings, not with eyes as we see, but they do have a perception of the environment they are living in. After reading that book I remember walking out of my home where there are redwood trees, some 100 ft tall, and for the first time I had the impression I was being looked at, feeling being seen while walking. And it was such a beautiful experience. That's the understanding we need to inculcate because if people really feel and know that, they will act differently, absolutely. They cannot act the way they are acting when you sense the aliveness of the Earth. So, I think the Anthropocene, although I don't argue the points, is the further separation and division between us and this beautiful planet.

sm What do you think about it, Stefano?

*Stefano Boeri* I totally agree with Paul. The paradox is that all we can do in order to move our presence on the pedestal of life, in order to become more sensitive in relation to the other living species and to try to acquire the perspective of the other living species on the planet, is a confirmation that we can act and intervene on the planet as protagonists. I think the more we decentralize our position and the more we make it weaker, the stronger we are because we demonstrate that we are capable of accepting, understanding other points of view. During the lockdown, I was recording a series of online lectures. In one lecture I tried to compare your book *Drawdown* with the *Encyclical* by Pope Francis. Both of the books try to give a holistic perspective on climate change. Pope Francis, with a religious perspective, was saying in the *Encyclical* that the human being cannot abandon or quit its responsibility: human beings are the “gardeners of the planet”, to recall also a definition by Gilles Clément. This is how this paradox works: on one hand, I try to legitimize those who define the Anthropocene as an era where human beings are deeply affecting the health of the planet and thus must also change the course of things. On the other hand, I totally agree with you. I am really curious to understand what you think about the theories around Gaia, elaborated by James Lovelock when he was studying Mars. He started to observe the Earth more than Mars itself, and then he came out basically saying that there is no need to think about the Anthropocene because we are in a unique ecosystem and there is no separation between us and the Earth itself, between us and Gaia. Our planet is an organism and we are part of it, in other words, “life is a miscellany of trajectories and different forms of life”. I think I am in between these two positions.

*ph* Yes, James Lovelock was hired by NASA in order to figure out how to create an atmosphere on Mars, and he realized that we don't understand how the atmosphere on Earth has been created. The Gaia hypothesis arose from the fact that we cannot explain the self-regulation of the atmosphere. We don't have an explanation for it unless we look at the whole planet as a living organism. There is a beautiful book on water where the author explains that we cannot understand the properties of water unless we describe it as alive. But of course it says it's not alive, yet it is the only way we can explain its properties, and nothing else explains it. And this is true for much of the Earth: we don't really know where

we live, we don't know what is . Prior to the Anthropocene, there were 5,000 cultures on the planet. We call them indigenous cultures, and indigenous means the original inhabitants, the people who first lived in that place. They were here for 15,000 up to 30,000 years. They learned where they lived, how to live there. A keystone species is an animal or an insect that produces more life for other species in the natural course of its way of living. It can be a predator, it can be a bee, a hummingbird, etc., These are all keystone species. Human beings were once keystone species, and they learned, generation after generation, how to live in a specific place. To know how to thrive in a given place with almost no tools or possessions developed into what we might call observational science, the science of place. I am going to tell you a story: I was going to Alaska on a plane and sat next to a Yup'ik woman. The Yup'iks live on the Bering strait in northern Alaska. They have been there for thousands of years and the woman was going home because her sister died and now she was the elder. We started talking about what it is like to be a Yup'ik and she described that in her culture you had to be able to tell what the weather was going to be two years in advance. I was surprised and asked her "how?", She explained that every detail gathered from nature was a source of information (observing the caribou, when they migrated, the velvet on their antlers, the color of the sea ice, and much more.). And I asked her: "Why did you do that?", and she answered "if we didn't do that, we might not have survived. If we did not know what the weather was going to be, we would not have been properly prepared." At one time there was a way of living on Earth that created the conditions for more life. Relatively recently, we learned how to extract life instead of regenerating it. There is an opportunity to start changing the way we live on the planet. It is about regeneration. This is the reason the work you are doing on cities is so crucial. Working on a regenerative approach means that the city can become regenerative on many levels. The possibilities are extraordinary in terms of humankind, how we educate, how we design, what we imagine, where we are, and what we do in this place.

*sm* Regarding this Stefano, I think it is the right moment to finally rethink the urban environment looking at it from a different perspective. We are part of nature, but still, we are keeping the plant world away from us, instead of considering it as an ally. This is a paradigm that we must overcome if we want to make cities resilient, more adaptive to changes and increase the quality of life for the citizens. Yet using only one approach

won't solve the problem of the climate crisis nor the environmental crisis. So, which is the right approach to develop the city of the future? Do you see any trend in the development of the urban /peri-urban or non-urban scenario?

*sb* We really need a holistic view, this is a fact. What Paul was saying was crucial and his book *Drawdown* together with his research is absolutely pivotal. Another peculiar topic in Paul's thought is the consideration regarding poverty, social inequality, and the condition of refugees all over the world. It is estimated that in 2020 30 million people are refugees from climate change-related issues. This exacerbates the condition of poverty of millions of people that are already living in an unstable condition, with a huge impact on the urban and metropolitan environment. If we could sum up all that is urban, all the cities and all the human settlements together we would cover basically 3% of the total land surface of the Earth, but this 3% alone is responsible for 70% of the global CO<sub>2</sub> emissions. In this 3%, one-third is made of informal settlements, favelas, slums...

That is why, if we want to solve some of the problems related to the climate crisis we are living in - and it is something you have already been doing with your book *Drawdown* and with your new book *Regeneration, Ending the climate crisis in one generation*, is to consider inequality, poverty and sustainability as a part of a whole common challenge.

I appreciate the methodology of your research and approach, because you create networks. It is not simply the result of personal capacity, but it is always the value of a network of studies, researches, perspectives that are really covering the geopolitics of the planet. This is what makes your work so deep, strong, and relevant. I believe that for the future of cities we should do the same: it is absolutely useless to think about solving the problem of our era just with a single intervention. Even the greenery - I have been obsessed with trees for a long time - cannot be treated alone. It cannot become an aesthetic, nor a systematic approach to solving the climate crisis. Trees are, we must admit, keystone species that are, as Stefano Mancuso also is explaining well in his books, the connectors between different species, and they use other species for their own purposes as well. I still believe that what we are doing, what we have done so far, is important as an attempt to multiply the biodiversity, bringing the dimension of the forest and the trees inside cities.

I used to say: "more trees towards cities and more humans towards for-

ests”, because I believe that we must try to merge these two entities. The word *Forest* comes from the Latin “Foris” which means outside. We should start reconsidering, redefining the relationship with the plant world and the environment we are living in. If we care about the future of cities, we have first to consider all the layers, the complexity of the world we are living in in a holistic way.

Second, we must be pragmatic as Paul is stating with his book *Draw-down*. For instance, in Europe, there is a progressive trend of abandonment of cities. This trend might have even been exacerbated by the pandemic, but it is still something serious we have to look at, without being judgmental. Many people are starting to imagine a different lifestyle, a different daily life, for instance spending at least part of their time not in a super congested urban environment but in another context, less polluted and less dense. Everybody has discovered that it is possible to work from home - you can move your work with you - and recent advancements in the digitalization of the territory in Italy will have a boosting effect on the spreading of this trend. This is a delicate issue; on the one hand, you might think this could be possible: just imagine the thousands and thousands of historical and rural settlements, hamlets and villages (places that were cities in the past, spread in the Alps, in France, in Germany..), where it could be possible to plan a decentralization of urban vitality, and regenerate a new life there.

On the other hand, there is the risk of “dilution”, of dispersion. We definitely must avoid the urban sprawl that we have seen everywhere, the proliferation of the anti-city, one made of single-family houses, malls and a general fragmentation of the built environment over the territory, with its relative degradation and damage. In this scenario we could lose the intensity of cities, it is such a big risk and in which the dimension of poverty has more chance to creep in. That is why it should be crucial to keep a strong relationship among villages and cities, through “reciprocity contracts” between the two.

*ph* So many interesting thoughts I agree with, and that you are putting on the table here. The main question here is “How do you heal a system?”. We are talking about systems here. The way to heal a system is to connect more of it to itself. That’s how our immune system, an ecosystem, a social system or any system works. The problem is that we are profoundly disconnected, disconnected from each other, we are disconnected from nature and we disconnected nature from itself by

habitat fragmentation, exploitation etc. The question here is: “Can we go back the other way?” All the systems we were talking about before, the economic system, the political system, the industrial system, are all systems of disconnection. Facebook, Twitter, and social media in general are a system of disconnection. We are thinking that it is a system of connection but it is actually a profound system of extraction, extracting data on who you are, which are your habits, which are your tastes and then putting you in bubbles where everything you see is basically tailored to what you think and read in a loop that reinforces it. That is the reason why we have in the US this condition. We have idiots everywhere running things and that’s because of disconnection: when we are connected we can be different. We can argue and have discussions for sure but we aren’t disconnected the way we are now. So, when you think about cities, cities were created as a form of protection, they had barriers, they kept animals away, they had walls, they were guarded, people felt safe there because being in cities meant protection. With so many different people gathering in urban areas, we had the encounter of minds, of opinions, of different perspectives, we had art, music, new inventions. When you have that proximity to other people, you see an extraordinary explosion of innovation and creativity.

I gave a talk in Vancouver last year, it was called the “eco-city” conference and I don’t remember exactly the question, but I remember my answer. There’s so much talk about “renewable energy” and cities are committed to it and that’s a wonderful thing but I told them that if we don’t start to think about renewable food what does it matter if we have renewable energy.

People who are disconnected from nature - which is something that we have done to ourselves - see the world in a way that is inaccurate, it is an error and an illusion. We make mistakes, we say things and act in a certain way that causes damage and harm to self and others. The evolution of urbanism is about reconnecting the broken streams between each other and between nature and when you think about renewable food you think about the peri-urban area of a city, which is something you have proposed in some of your projects too. There are 31,000 edible plants in the world, and we eat 15, for basically 99% of our diet. Again, understanding that, trying to restore, and the refinement that is missing in the world right now is a profound disconnection. To answer the first question, for me regeneration is again putting together these broken streams that the Anthropocene has shattered and cut.

*sm* When we talk about the climate crisis, we often give an interpretation to a collection of scientific data. Timothy Morton has defined the current state in which we are living like a “trauma”, where we lose a lot of time worrying and discussing data without thinking about solutions, actions, goals because we are, most of the time, completely overwhelmed by them. One of the problems is the language. If we are not able to communicate or to find the correct words to define a problem it means that we must rethink our vocabulary in this matter and find a new language to describe the world around us.

*sb* Yes, I remember when I met Paul the first time I was in London, taking part in the Commonwealth Initiative.

I was really impressed how you were changing the vocabulary, moving towards a different kind of language that is not communicating a sense of fear or pessimism that won't stimulate people to react or to act.

*ph* We can start with the use of the term “climate change”, as if that was a bad thing. Change is a beautiful word, and change is something that we don't want to stop. We try but we cannot. Climate changes every nano-second and always will. It is a universal law that everything is changing, always, constantly. It might be scary sometimes, but it is part of our daily life. Regeneration is completely different. It means action. There are three things we can do conceptually: The first one is to stop emitting greenhouse gases. Number two is to bring carbon back home, the sequestration of carbon dioxide. Number three is often overlooked, which is to protect. In the terrestrial systems that are wetlands, mangrove, forests, grasslands, farmlands etc. there are 3,200 billion tons of carbon. That is nearly four times more than in the atmosphere, and we are losing these terrestrial systems, 1%, 2% per year. These are ecosystems that we are losing. If we lose 10% of the terrestrial carbon that would increase the CO<sub>2</sub> in the atmosphere by 100 ppm (parts per million).

We have a complex living system called the planet that we are trying to decode. It is literally home-schooling us, showing us what to do and what not to do. There is the UN Convention on Biodiversity (CBD) in Kunming, China in October and we have the UN Framework on Climate Change Conference of the Parties meeting in Glasgow, Scotland, in November. They should be sitting in the same room on each other's lap. They are inseparable issues in my mind. If we think about ecosystems, we have to think about who or what lives there: it is extraordinary

which life forms that occupy these different biomes, species that we don't even fully understand or even know yet. If we are not protecting these life forms, these systems will fail, whether it is fish, mammals, insects, reptiles and even people in the case of Indigenous cultures that protect the vast majority of biodiversity hotspots. Unprotected, these systems will start to degrade and we will lose them. The idea that biodiversity loss and being responsible for global warming are two different things is part of the problem again. We still hear people saying "we are going to fix the problem." How could you possibly fix nature? Be in alignment with nature, yes! You can't fix nature, but nature can fix us!

*sb* That's what is happening already with the Corona-19 pandemic! Nature heals itself.

*ph* There is wonder, celebration, and creativity in thinking about the world in this way. Our purpose and opportunity here is to honor life, to create the conditions for life, to bring back life. There is in Illinois a watershed group comprised of volunteers and citizens. They bought a farm made tranches with clay pipes in it, that continuously drains the fields so they can farm. Every day 9 million gallons of water were going into the Illinois river. The non-profit that bought the land dug up and removed all the 45 miles of clay pipe. In three months, two huge lakes came back which had been there before. After 15 years they did what is called a "BioBlitz" (n.d.: this is a survey carried out by scientists, volunteers, citizens etc. in order to record all the living species within a designated area) where docents, scientists, and volunteers surveyed the life on this wetland reserve. They identified: 918 species. The only species that were introduced were the fish. Everything else showed up by itself. It was extraordinary what happened there and how life came back. One of the bird species that came back is the white pelican with its nine-foot wingspan. The interesting fact about these birds is that even though they are huge in size we don't know where they breed (how could a bird keep it a secret like this from us?). When I was in the Tetons in Wyoming where I used to climb the Grand Teton which is 14,000 feet (approx. 4200 mt). Before I climbed it the second time, a friend of mine who is a naturalist gave me a tip: "Once you reach the top, lie down and look straight up and stare. You will see white pelicans flying in circles a mile above the mountain". They can fly to 25,000, some say 30,000 feet, almost 1 and 2 miles above you. They use the thermals, ascendent winds. There is no food there, they are

not trying to mate and show off, they seem to be just having fun, they will glide down and then ride the thermal back up again. There is so much about this world that we have to discover. The good thing about the project I was talking about is that nature is telling us that if we go back to ourselves, if we can come back to nature, accept to be part of it, it is extraordinary. If we want to imagine solving global warming we must think about all that is beneficial on all levels of being, how to care for our species too, for those who live in crowded informal settlements. If we can restore wetlands, we can restore “people lands.” Increasing the dignity and quality of life for all living beings bring us alive, and it is what actually will reverse global warming, as it’s supposed to. And then yes of course, we should stop using cars and so on, of course. I am not denying technological solutions. The development we’ve reached on the technology side is amazing, we only have to increase our wind turbine capacity by 8 times in the next 10 years, 4 times more in the 10 years after that and 50% more in the final 10 years (in 2050). And that would cover 50% of all electricity in the world, as projected by the International energy agency. We can do that, and we are going to do it sooner than that. The same is true with solar power. It is not difficult for us to get to 100 percent clean energy, given what we know. What we need to understand is that - and this is why I love your work Stefano - we must change the way we do things and the way we think about our life on Earth. And it is clear from your work that you are trying to do the exact same thing, and it is what I want “regeneration” to be.

*sm* Stefano, I remember one talk you had with Richard Sennett, once when he came to Milan in 2019, and you were discussing his book “Building and Dwelling”. On that occasion, Richard and you started a discussion on the reasons for an “open” and “closed” city and what defines an open city compared to the closed one. On that occasion, the discussion was turning around the necessity of leaving a certain degree of freedom to public spaces so that they could adapt to the needs of its citizens. Determinism vs Unpredictability.

One neighborhood, one part of the city, a whole city is open when it is able to welcome, accept a strong degree of unpredictability, indeterminacy. The way we design urban settlements is also affecting social and environmental justice. How could we possibly create more just urban settlements while also considering environmental justice?

*sb* I believe things are changing in a way. The topic of migration is a huge one for instance. In the future the problems related to the climate crisis will exacerbate social tensions and environmental conditions if we don't act differently, as Paul was saying.

We should be prepared to host millions of migrants in cities due to climate related issues. We know very well that slums and barrios and favelas are normally the first places where people, coming from a condition of poverty, can find a basic network and resources for surviving. We have to work on slums considering them as an expression of nature itself. What I also appreciate about Paul's thought is that it is not about trying to reconnect ourselves with nature, not about disconnecting nor removing from our perspective the fact that informal settlements are part of our cities, places that resemble organic shapes. They are, from many points of view, extremely dynamic places. They have a relation with organic life, with wildlife, that is even more developed compared to the one you can find in a normal bourgeois district in other capitals such as Paris or Los Angeles. We have worked a lot in São Paulo studying slums and we have learned so much about what slums really are and which is the social fabric that keeps these kinds of settlements together. This is not an excuse to forget the negative effects of it, since these kinds of settlements could worsen the condition of people living there. We should definitely work on that, we should work on cities, to prepare them for fostering and receiving the incoming flows of people, in light of the worsening climate conditions in areas where humans and other species live will be eradicated.

If we try to observe what is actually happening right now, I am also interested in understanding which part of the city will be more affected in the near future: the city centres, where we - as architects and urban planners- have gathered offices and commercial areas. What is happening now - after the Covid-19 lockdown - is extremely dangerous and I think those might be the first areas to be abandoned in the near future. Just take into consideration the life of city centres: especially in certain areas of them, life starts at 8 am and at 8 pm nobody is there, no one sleeps there, most of the people cannot afford it really. Compared to these areas, some peripheries and suburbs of our cities have so many more resources to put on the table right now, to thrive and be resilient, especially in terms of social support. I think this is also going to be a serious issue we must face in the near future.

Edward Burtynsky, *Makoko #1*, Lagos, Nigeria, 2016







II

# Taxonomies of the Earth

# A new agreement

Stefano Boeri

Ethical and philosophical considerations are currently having an increasing effect on the thought processes behind those disciplines that deal with designing the transformations of anthropized spaces. Serious environmental emergencies, the unstoppable rise in the Earth's population, excessive land consumption or soil sealing and unsuitable land use, the extensive urbanization of the planet and the destruction of immense natural vegetable and animal resources are forcing us to consider the need for a world view that focuses on the survival of humanity not simply by continuing to consider just the principles, values and needs of our species, but rather by placing this latter within a broader vision of the future of our planet.

It is impossible today to avoid the fact that human beings pose the problem of a different balance, a renewed form of cohabitation and a new relationship with other living species, especially non-domestic ones. This is not limited to looking just at vast areas of forestation in South America, complex peasant farming systems in China or *favelas* in the countries of Southeast Asia, it is a matter that closely concerns our cities. The focus is now on asking what correct and immediate actions are needed.

Stefano Boeri,  
*Down from the Stand: Arguments in Favor of a Non-Anthropocentric Urban Ethics*, in «Abitare», 480, 2008.



As an architect and urban planner, I think that first of all we should examine and try to understand the causes and risks that derive from the close co-habitation and cross-pollination between different biodiversities and between man-made and natural ecosystems. We need to do this in the awareness that the answer doesn't lie in abandoning what is simplistically defined as anthropocentrism. We also need to learn to stop considering ourselves as being at the centre of the world with the role of the planet's dominant species and thus able to control and determine the habitat and living spaces of other living species.

Rather than abandoning "traditional" anthropocentrism and leaving the Anthropocene, our great task in the coming decades will be to build a new version of anthropocentrism. By now it is no longer possible and much less acceptable at this present time to shrug off responsibility for not having had the tremendous foresight to restore balance where we have brought imbalance, to restore co-habitation and awareness where we have brought conflict and destruction and to restore coexistence between species where mankind has brought about violent domination and at times the total destruction of habitats as well as of species in favour of industrialization or extreme exploitation, as in the case of large intensive livestock farms of entire species transformed into consumer products.

This new anthropocentrism should emerge primarily from awareness. The overriding need that emerges in this day and age is that of learning to study what the ecosystems and needs of other living species are with greater attention, just as is being done with plant species. Above all we must study all animal species in order to rediscover their intelligence, and especially those that live with us in cities. There is an extraordinary intelligence in the lives of ants, just as there is an extraordinary intelligence in the habitat



and relationships and interactions of dolphins, for example, featuring a level of autonomy and inquiry that should be understood and appreciated, before being judged or placed in a hierarchy.

Finally, the last major element to take into consideration is linked to the awareness of the existence of balanced cohabitation. As with forests, in a landscape where we are clearly responsible for reconstructing and re-balancing, we can find space for this renewed form of cohabitation. Human beings have no choice but to take charge of this new stability, taking the needs of other living species into account, and moving in the direction of a non-anthropocentric form of ethics that – at least from the human point of view - is able to consider the demands and evolutionary trajectories of other living species, along with the possibility of imagining that there are regions or entire more or less urbanized areas where non-human and non-domestic species can find space for autonomous existence in the awareness that we are the ones responsible and the promoters of whatever actions that attempt to repair everything that is broken in our relationship and our agreement with nature.



Mario Piazza,  
*Conference of the  
animals*, 2008

## Drivers of Change

Simone Marchetti and Luis Pimentel

### *A foreword*

Moments of crisis always lead to changes, and as such should not necessarily have to be greeted with anxiety or a negative approach. Indeed, crises such as the ones we are experiencing could well be the catalysts for a range of social, political, and economic transformations. In delicate moments like these, history teaches us that it is easy to make mistakes that may lead to the establishment of repressive models that impinge upon personal liberties and seriously damage civil rights and there are numerous indications that the climate crisis will not be exempt from these issues. It is plausible, and perhaps even desirable, for example, that a “wildly unfair” economic model such as the current one will not be able to withstand the consequences of a climate crisis (Naomi Klein, 2014). We will not be able to deal with the answers (economic, political, social, environmental) using the same methods with which past global crises were faced.

In actual fact, the climate crisis is not only an environmental crisis but is also closely connected to anthropogenic elements such as socio-economic factors (with the subsequent increase or reduction in inequalities), which may well lead to a further widening of social gaps within individual nations and, on a wider scale, further increase the displacement created by migratory flows where there are social situations that are already highly at risk.

Unfortunately, if for example we are talking about economic crises, methods for recovery have always been contrary to a global scale rethinking of production, manufacturing or construction methods, which are currently extremely polluting. Indeed, precisely by virtue of an economic crisis, a moment of slowdown in carbon emissions into the atmosphere was followed by a substantial increase in emissions, not a decrease (both following the 2008 crisis and previous ones) (Peters P. Glen et al, 2011). The reason for such a state of affairs is that in times of crisis, governments are more

interested in restarting the economy without implementing any form of virtuous behaviour related to innovative strategies - and risky investments - in alternative new ways of reactivating the economy. Rather, the choice is to start once again with an even more forceful “Business as usual”, preferring the resumption of traditional production and manufacturing activities and exceeding limits using “restarting” as the justification, rather than the excuse it is. The same is evident with regard to policies implemented to reduce carbon dioxide emissions: there has never been a real stop in emissions as a result of treaties, rather there has been a substantial increase. (Harari Y.N., 2015)

Instead, it is highly desirable that in the light of a global climate crisis (which is simply the tip of the iceberg, since it includes potential economic, social, health and environmental crises), more forceful decisions should firstly aim at reducing the anthropogenic causes and then acting on the strategies of adaptation. In terms of planning, we are still used to thinking in very short time frames. Nations and institutions have begun to develop plans and visions for 10/20 years later to keep emissions under control, but it is necessary to have much more forward-looking plans since the irreversible processes already in place will have an impact that will not be limited by this timeframe. Today we need to consider the problem of the climate crisis as transgenerational, and launch far more forward-looking visions if the goal is to make our cities and communities resilient and adaptive. Visions for 10 or 20 years ahead are a good place to start, but maybe not enough.

Resilience is precisely this ability to initiate a transformative process that responds to a need for adaptation to a given condition, regardless of the cause. The strength of the human species lies precisely in this ability to adapt and apply preventative measures when responding to a future problem. As architects and planners, it is our duty to understand that our sector is not exempt from all this and that understanding the complexity of the systems that surround us also means responding more adequately to future challenges.

## *Drivers of Change*

Within the context of natural sciences, taxonomy refers to the theoretical study of classification through the exact definition of the principles, procedures, and rules that regulate it, while the terminology is often associated with a branch of science that studies the methods of ordering within the system of elements, knowledge, data, and theories that belong to a specific scientific field (Treccani, Web).

The taxonomies looked at here, on the other hand, tend to give structure and investigate the invisible links that determine urban conditions, even if they do not claim to fully describe the complexity of the logics that govern this system.

Taxonomies are a selection of various themes that will be touched upon and developed more or less indirectly, each with different intensities, in the selection of the projects presented in this book. As architects and urban planners, we believe that it is important to be able to start identifying a number of factors, mostly anthropogenic, which we believe can lead to a change of course in the ways in which we conceive both urban space and architectural artifacts. We are interested in going beyond the threshold of visible forms to explore the hidden and deeper structures or super-structures that generate urban space, in order to investigate new forms of urban planning in which a greater sensitivity towards the environment in which we live and all the living forms that inhabit it. To achieve progress in all human fields, we must admit that human ethics should eventually recognize its relationship with Animal ethics and Environmental ethics. Progress is meant to be an alleviation of our own sufferings along with those of others.

In order to do this, on the one hand, we need to think about the complexity of the global ecosystem in which we live, and that complex system of natural interactions mentioned in *The Environmental and Climate Crisis* paragraph in Chapter 1, while on the other, we need to try and give shape to a vision that takes possible futures into consideration: not utopias, but plans and strategies that together can describe a unitary project envisaging a paradigm shift in the way of conceiving the culture/nature systems. These two entities can finally dialogue and interact, on a battlefield that will be transformed into a space that generates new sensitivities, a place for dialogue and comparison, and the mutual recognition of their own value.

Taxonomies, therefore, represent the fields of action in which we, as human species, still have space to make the necessary changes to reverse

## World Greenhouse Gas Emissions in 2016 according to sector



From a Diagram by WRI – World Resources Institute, based on Climate Watch, raw data from IEA (2018), CO<sub>2</sub> Emissions from Fuel Combustion. [www.iea.org/statistics](http://www.iea.org/statistics)

the current climatic trend. The fields of action we identify as architects and urban planners, seminal to be investigated to understand the pathway of change are Economy, Forestry, Mobility, and the Built Environment. Working on these fields could help us understand the logic that governs anthropogenic landscapes. They are actually macro themes, connected to each other, within which the sub-themes interweave and overlap. The quality of the Built Environment, for example, is first of all the result of a deep bond with collective memory. The economy, the relationship with the environment, the speed of movement of our bodies in space and time as well as the ways in which urban space or buildings are designed, are all factors that change over time and cannot be considered as relevant criteria for the definition of a scientific methodology in the strict sense of the word. Despite this, we still believe they are all factors that predominantly determine the development not only of the urban settlement but also of its (and our) relationship with everything that is not anthropized, and which also tell us a lot about our relationship with the space we call home, and it's the identification as an intimate space. No city or urban settlement is exempt from these considerations. All these factors are influenced by a social system, a socio-cultural construct that determines unexpected variations within urban development and its surroundings.

However, it is also necessary for this scenario to introduce the possibility that not everything we are talking about is the fruit of our labours or the efforts of human beings. There are dynamics whose developments, which we think we can tame, are however beyond our control and as such are worthy of being considered as neither the result of our handiwork nor the result of our memories. At most, they are the result of a shared history between species.

But where is the sense in identifying issues on which it is necessary to intervene if the complexity involved includes many more? The reason is that to understand a complex world it is easier to firstly categorize and put it in order, then start with one or two elements, and finally go and investigate others, thereby broadening the field of action. Starting to modify each of these taxonomies little by little makes sense if accompanied by a cultural revolution, of which we are perhaps already reaping the first benefits, and which may result in cities or small settlements becoming places of progress, where the economic system is not based on extractive models but focused instead on regeneration.

### *Economy*

It is possible to resolve this imbalance that we are imposing on the Earth. We can innovate, change and find a new form of equilibrium, but this must also be done by rethinking all the other models with which our society works, including the one that deals with economics.

While not suggesting a radical change in our economic system, Jeremy Rifkin has made his position quite clear regarding the need to start a process of real change, a genuine industrial revolution. Rifkin is known for his bold new perspectives on how to handle the climate crisis and make sure the ecological transition is happening globally, he is in fact the author of “The Green New Deal: Why the Fossil Fuel Civilization Will Collapse by 2028, and the Bold Economic Plan to Save Life on Earth” (Rifkin, J., 2019), in which he describes in detail the plan to make the change happen. According to Rifkin, the creation of the intelligent infrastructure for the Green New Deal will necessarily have to involve a great number of sectors including ICT - Information and Communication Technology and all those companies connected to it, along with electricity and energy companies, the transport and logistics sector, construction and real estate, and the food, agriculture and life sciences sectors (Rifkin, J., 2019).

The latest document on the European Green New Deal released by the European Union for example, has been presented as an essential tool

Current likely temperature-rise trajectories, supported by implementation of mitigation pledges, would entail 2.0–2.6°C global warming by mid-century. If we use this as the baseline to simulate the impact of rising temperatures over time, while also modelling for the uncertainties around most severe possible physical outcomes, the result is that global GDP would be 11–14% less than in a world without climate change (ie, 0°C change)” (Swiss Re Institute, *The economics of climate change: no action not an option*. 2021). That amounts to as much as \$23 trillion in reduced annual global economic output worldwide as a result of climate change (New York Times, April 2021).

for investing both in the economy and in nature and its ecosystems. To do so, the EU is aiming to create a shared strategy that directs the efforts of public and private capital towards environmental and climate actions while avoiding unsustainable practices that are contrary to this line, which is focused on sustainability and inclusive growth (COM2019 640 final, European Commission). The European Green Deal aims to implement a series of profoundly transformative policies affecting the European regulatory and economic system. One of the main objectives is to achieve climate neutrality by 2050 by transforming the economic system while at the same time maintaining its growth. Alongside this is the development of a European Climate Law and a European Climate Pact, for the active involvement of all European citizens and all sections of society (COM (2020) 80 final, 2020). In order for all member countries to meet this objective, an ambitious European climate change adaptation plan (the 2030 Climate Target Plan), which aims to reduce net GHG emissions (a reduction of at least 55% compared to 1990 levels by 2030) and involving all sectors, must be adopted. A considerable effort will therefore be required both in the energy sector and in the tertiary sector with the enormous challenge of making industries “cleaner” along with a series of incentives to be applied for the redevelopment of existing buildings in terms of polluting emissions and improving energy efficiency, thus making them “energy and resource-efficient” (COM (2020) 562 final, 2020).

The transition to neutrality will necessarily require the development and dissemination of low-carbon solutions that will affect all sectors and have a positive impact at an economic level. To make this happen, a great effort will be necessary in terms of innovation and new technologies. It will also be essential to move towards a circular economy that will impact the entire industrial chain and work on every aspect.

In light of the investments made with the Recovery Fund, (the new economic instrument of the European Union for the recovery and re-launch caused by the covid 19 pandemic, released in 2021), even more importance will be given to operational plans that put future-proof clean technologies and acceleration of the development and use of renewable resources into play, as well as improving and increasing the digitalization of administrative, healthcare and education systems with the efforts of local administrations as well as strong governance. As a solution for the mobility sector, while awaiting the arrival of technologies that will make it possible to have “zero-emission vehicles”, the European Union is proposing a substantial intensification of public transport and “multi-mod-

al” solutions with a varied choice of options including the use of electricity and hydrogen. As for the energy sector, there is a proposal to encourage improving the energy efficiency of buildings and the demolition of those whose refurbishment would not be economically advantageous (Next Generation EU Press release, 2020).

With particular regard to the construction sector, which is heavily involved in generating carbon emissions, the European Union has presented a new approach, which is that of managing the transition of complex sectors to be modified in the short term with the aim of total decarbonisation. One tool that may well represent a starting point in the fight against the climate crisis will be the adoption of a different type of taxation. This has been under discussion for some time and is often called the “Carbon Tax” since it establishes a price for CO<sub>2</sub> emissions (at least in Europe) and will force this increase to be compensated for with a reduction in taxes on income from work while at the same time encouraging the transition to renewable energy sources.

### *The environment and forestation*

Trees and forests themselves are a driver of change. It is scientifically proven that forests help stabilize the climate even though their role in climate change is two-fold. They act as a cause and a solution for greenhouse gas emissions. The scientific explanation for this is that forest degradation and deforestation represent one of the biggest drivers of carbon emission, after the land sector and the energy sector. (IUCN, 2021) On the other hand, forests regulate ecosystems, protect biodiversity, play an integral part in the carbon cycle, support livelihoods, and supply goods and services that can drive sustainable growth. Moreover, around 2.6 billion tonnes of carbon dioxide, one-third of the CO<sub>2</sub> released from burning fossil fuels, is absorbed by forests every year (IUCN, 2021). That doesn't mean that we can entirely rely on their help, or that we can underestimate their role in producing carbon emission in case of deforestation and forest degradation, but this couldn't be an excuse not to develop strategies and actions towards better management of the forest ecosystems of the planet nor to avoid considering their potential in reducing the carbon footprint.

According to FAO, the area of naturally regenerating forests has decreased since 1990 (at a declining rate of loss) - around 10 million ha lost per year - while planted forests have increased by an average of 4 million ha per year since 1990. The meanings of these changes will be the focus of

a more detailed study in the fourth chapter, but analyzing these data help us to understand the reason why forestation might be one of the answers to change the status quo.

From a policy perspective, institutions such as the United Nations and the IPCC itself, along with their reports, provide a solid scientific basis that should allow us to deal with the climate crisis in an informed and conscious way. On a global scale, this issue is being addressed by significant intergovernmental agencies such as the FAO and the United Nations with working groups and committees designed to analyze, study and hypothesize strategies and actions aimed at safeguarding the environment. Environmental and forestry policy frameworks are also changing and evolving, not only in Europe and America but also in the rest of the world. The problem related to their implementation lies in the bureaucratic slowness of administrative systems on one side and in the fragility of government systems on the other, whose policies are too often used as propaganda weapons to the detriment of environmental protection and associated policies.

Environmental policy has become particularly important by virtue of a historical moment in which globalization is on the rise: environmental problems extend beyond national borders and solutions can only be found through international cooperation. This could have a huge impact on forestry too as the climate crisis and deforestation is making the carbon sinks of the world even more vulnerable. According to scientists, losing Amazon's power to capture CO<sub>2</sub> is an obvious sign that slashing emissions from fossil fuels is more urgent than ever. That is why the role of political action in the battle for the environment becomes increasingly important since only political and therefore collective action can make a difference, acting on multiple fronts. However, despite the efforts made so far on an environmental policy level, the decline of the global environmental and climatic situation has not yet even been managed to date, much less reversed. To a legislative framework of this type are often added ferocious social disparities, in which environmental problems determine unacceptable aggravating factors to the detriment of specific targets, usually communities that are further marginalized or more exposed to environmental risks. It is no coincidence that social injustice goes hand in hand with environmental injustice. These are too often considered as belonging to two different spheres.

Despite this, a solution could be found in forestry as it supports the development of several human activities considered essential for local

communities in rural areas (thus reducing poverty and food insecurity, for instance), as well as supporting cities in their resilience plan, cleaning the air from dangerous pollutants and absorbing CO<sub>2</sub>. Especially in big cities, there is an urgent need on one hand to provide access to green areas for all and on the other to find an ally to reduce the effects of the climate crisis. Often less affluent communities have more difficulty in accessing spaces of this type while scientific studies show how proximity to green spaces and trees decreases the number of cases of violence and crime (Shepley M., Sachs N., et al, 2019). This makes Urban Forestry even more relevant.

Furthermore, Forests provide around US\$ 75–100 billion per year in goods and services such as clean water and healthy soils, and forests are home to 80% of the world's terrestrial biodiversity (IUCN, 2021). Cities are in urgent need of solutions to fight air pollution and the effects of the climate crisis that are more and more affecting the health of millions of people every year. Adding forestry and urban forestry policies to the urban agenda could ameliorate the quality of living of its citizens but it needs to be done merging different issues such as environmental justice into our urban policies, as well as through a better management of the existing trees and woods. According to the climatic area, urban forestry might assume different shapes and meanings thus implementing and balancing ecological aspects with economical and social benefits for the citizens and communities.

### *The construction sector and the energy sector*

A number of studies clearly show that the materials and buildings in the global building sector are responsible for 38% of the planet's total carbon dioxide emissions (IEA 2020). In terms of a necessary ecological transition, this extremely high percentage puts into perspective the role of architects and urban planners together with all those professionals who gravitate around the construction sector.

The construction sector is responsible for 36% of global electricity consumption (Global Alliance for Buildings and Construction, 2019), and can contribute significantly, at least in Europe, to reducing consumption and having an influence on 42% of final energy consumption, reducing the extraction of raw materials by 50% with carefully made choices linked to the circular economy, as well as helping reduce water consumption by 30% in some areas (Ecorys, Resource Efficiency in The Building Sector Final Report, 2014).

To avoid oversimplification, the route to change will have to see profound alterations in the process of building material design and produc-

tion, including the machinery used and finishing with the entire life cycle and maintenance of buildings up to their complete demolition and disposal. In the book “Cradle to cradle. Remaking the way we make things” (Braungart M., McDonough W., 2002), the authors were pioneers in considering challenging the whole industry by producing materials and products whose use is not following the logic of single-use but rather whose life provides nourishment for other purposes. It is no longer conceivable to continue to build and design as before; instead, it is essential to give appropriate significance to how buildings are constructed, what kind of materials are used and what kind of companies are involved in the process, as well as how building materials are produced, maintained and disposed of in order to assess their impact on the environment in each of these phases.

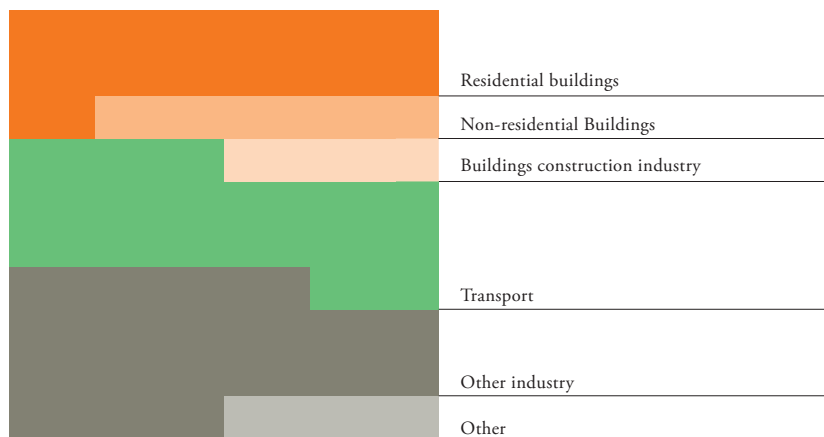
Extremely high pollution levels are reached if we then include electricity consumption from lighting or domestic appliances, energy dispersion or from air conditioning and heating.

According to the report “2019 Global Status Report for Buildings and Construction” (Global Alliance for Buildings and construction, 2019), the world’s building stock is destined to double by 2060 - a truly alarming fact considering the previously stated data on the increase of carbon emissions.

It is therefore certain that the building sector, in all areas, has contributed greatly to levels of pollution that are now unsustainable. The World

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Global share of buildings and construction final energy, 2019




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Graphic from the UN Environment Programme, 2020  
 Source: Graphic from the UN Environment Programme, 2020, based on IEA2020d; IEA2020b – adapted from “IEA World Energy Statistics and Balances” and “Energy Technology Perspectives”.

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Green Building Council, however, a voluntary international agency specializing in bio-building, has come out in favour of the construction sector. According to certain data and analysis (World Green Building Council, Advancing Net Zero Status Report 2020), it appears clear that the construction sector can make a considerable contribution to the decarbonisation process. This sector offers the possibility of developing alternative ecological solutions, with the aim of reaching 2050 with zero emissions. The agency aims to develop a methodology for measuring and tracing carbon emissions from buildings, reducing energy demand by giving priority to efficiency and avoiding waste, creating a balance of consumption through renewable resources (preferably on- rather than off-site) and suggests ensuring that this process is strictly adhered to overtime through the achieving of goals such as zero-water and zero-waste, with the involvement of other sectors in addition to that of energy.

The objective of eliminating building emissions by 2050 is also possible using existing technologies as long as support policies are urgently adopted and appropriate and necessary investments are put in place. The challenge, according to the UN, is not just the relying on a circular building economy, or rather a different idea of economics that focuses more on reuse and recycling, but more and above all of supporting this transition by including the implementation of a “progressive building code” and supporting investments in improving the energy efficiency of existing buildings. According to the Climate Tracker (CAT) total CO<sub>2</sub> emissions produced by the construction sector must be reduced at least by 45% by 2030, by 65% by 2040 and 75% by 2050 compared to 2020. (UN Environment Program, 2020)

### *Mobility*

In 2020, as the world stopped due to the Covid-19 Pandemics, it was clearly visible to see the effect that global fluxes of people and goods on one hand and of local displacement in cities on the other had on pollution. Yet, according to the IEA, the global transport sector emitted over 7 Gt of CO<sub>2</sub> in 2020, just 1,5 GT less than in 2019, coming to be the third category in total emissions, just after the sectors of *Industries* (8,5 GT) and of *Electricity*, and *Heating* (13,5 GT) (IEA, 2021). All these emissions come directly from the use of fossil fuels as part of the technological components of this sector.

The whole mobility category can be subdivided by type of vector: Light-duty vehicle, heavy trucks, shipping, rail, aviation. In order to

think of decarbonization strategies of the whole sector, two main factors should be considered, ranging from the innovation of policies, and the acceleration of research and technological innovation, as the evolution in patterns of consumption and of human movement.

According to the 2021 Recovery Plan, the European Commission is giving great importance to flagship projects, that among other areas, will develop the promotion of future-proof clean technologies able to accelerate the decarbonization process, guaranteeing a more sustainable and accessible public transportation system in the whole European Union (EU, Next Generation EU, 2020). Yet, it is still necessary that the governments exclude all kinds of fossil fuel subsidies, and also ban the sale of new internal combustion engine cars, in order to promote an effective transition.

While the transport sector has often been considered among the most difficult to decarbonise due to the lack of affordable substitutes to petrol vehicles, in fact this sector accounts for more than half of the global oil consumption (IEA, 2018), we now see that this fact is changing, as the price of batteries and of electrical vehicles has dropped by 89% since 2010 (ISPI, 2020), meaning that we are on the gates of a real, and much-needed technological transition. This represents the shift from internal combustion engines into electric vehicles as also the utilization of biofuels and hydrogen-based fuels.

It is notable that 18 of the 20 largest automakers have announced plans to introduce or to entirely make a transition to electric vehicle models by 2035, a choice that will only be accelerated by the recent plan announced by the European Union to end the sale of all polluting vehicles by 2035. In order to achieve an effective ecological transition, it is necessary to start an accelerated trend that passes from the actual 5% global car sales of electric vehicles to 60% in 2035. The same transition is expected in the field of logistics and freight management. In the field of aviation, to achieve Net-zero emissions by 2050 it is assumed that air travel, measured in revenue-passenger kilometres, needs to increase by only around 3% per year to 2050 relative to 2020 (compared with 6% in the 2010-19 period). This degrowth needs to be accompanied by a transition into bio-based fuels and a change in consumer trends shifting into high-speed rail mobility in substitution of long air flights.

Nonetheless, electrification, or the passage from internal combustion engine vehicles into electric vehicles does not guarantee a sustainable transition if a holistic approach to the matter is not guaranteed. It is therefore necessary to assure that the origin of the energy comes from renewable sources.

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## The impact of the building and construction sector



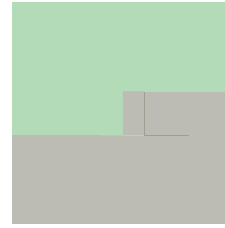
38% of global carbon emission



36% of global electricity consumption



can influence for the 42% of final energy consumption in Europe



can reduce the extraction of raw materials by 50%



can reduce water consumption by 30% in some areas

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Source: IEA 2020

Source: Global Alliance for Buildings and Construction, 2019

Source: Ecorys, Resource Efficiency in the Building Sector Final Report, 2014.

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The next shift relies not only on the before mentioned, and ongoing technological transition but actually on the evolution in the way in which we move, shifting away from the notion of private ownership to the *Mobility as a Service*<sup>7</sup> (MaaS), one that seamlessly integrates various modes, more efficient and more ecological; or also on micro-mobility, which might be owned or shared, and regards small personal devices such as e-bikes, e-mopeds and e-scooters, and that lately have seen a rise in trend use in cities.

As architects and planners, we must deal with the way the city is shaped and the way we cross and walk our way from one place to the other. Solutions can be found in policies and in a different way of dealing with urbanism, whether the dimension of international mobility and of the urban scale could find an answer through different strategies and actions.

## Ideas for a new world. Time, spaces, movement

Stefano Boeri

This text was written  
in 2020, for *Urbania*,  
Laterza, 2020.

This global trauma – the umpteenth, after the 2008 economic crisis and the terrorist attacks of 2001 - requires us to consider that today we are faced with an unprecedented urgency (that we didn't have before), and which forces us to deal with a necessary transition that needs to offer a new way of rethinking the space in which we live.

During the Lockdown period, when trying to reflect on how to transform a difficult and unexpected situation into an opportunity, I started working on that very particular capacity that time has to stop, to form almost what we could call buoys in our streams of thought, and to consider how this pandemic will impact the future development of our cities. Therefore, during that suspended time to which the pandemic has forced us to get used to (especially in the first lockdown between March and April 2020), I found chances to read and, more often, to re-read not just books, episodes, meetings or images but everything. It was like wandering through the texts, times and spaces of my life, thinking about the future of our cities, which deep down is my constant concern, even in this particular period of time. The result is a series of reflections that I try to retrace here and that gave shape to the book *Urbania*, collecting suggestions and perspectives on the future of our cities.

*March, 2020*

From today the whole of Italy is at home behind closed doors.

I can't say I didn't expect it. We have an office in Shanghai in China and for weeks we followed the spreading of the pandemic in Asia with concern and anguish, knowing that it would soon arrive in Europe and was probably already among us. And here we are. Everywhere in the world this unknown virus is invading the bodies of individual members of the human race, and being a biological organism, not digital as are today's most successful viruses, it advances by jumping from one human

to another, accelerating in dense areas and slowing down where there is distance, where empty space prevails.

More than any other similar infection, this virus seems to prefer inhabited spaces because it feeds off communal relations and suffers when it cannot use them to spread.

Moving between bodies and changing places.

Emptying them after having used them as containers full of life.

And while it forces us to water down our presences and contacts in space, the virus is also distorting our geography of time.

### *Time.*

Looking at our offices in Shanghai, in Milan, and in Tirana we noticed how these days, for almost a month, we have lived as if in three parallel universes.

In China the virus arrived two months ago: all offices, public places and work spaces were closed and in our studio in Shanghai we immediately started remote working. Meanwhile, in Italy we have begun to receive messages expressing fear and then terror, indications of caution and signals of serious concern. As a result, driven by concern for this imminent global threat, we also closed the Milan studio a month in advance of the provisions stated in the national decrees.

This has powerfully transmitted the idea that Covid drives us to live our time in parallel - and chronologically staggered - universes: today construction sites in China are starting to open again while in Italy it will take several months. Recovery time in other Western countries will probably be even longer, since the threat of the virus has arrived there with a greater delay. In the era of globalization in which we live this unbelievable contagion has paradoxically accentuated the creation of a kind of planet divided into temporal tectonic plates.

In the same way, as when we look at the stars we are seeing the past, when we follow the geography of the contagion we are moving through time.

One small parasitic organism has therefore united and cruelly divided us at the same time, not only in forcing us to drastically reduce our community relationships but also in our conception of time, split up into planetary fault lines not linked to tectonics, but rather to biology.

### *Space.*

We are doing everything possible to work remotely, we are doing everything to produce information and culture at a distance. In my own

small way I am trying to reconstruct a few passages of my thoughts and my intellectual and emotional experiences. This is enormously important in establishing a sense of discipline and thinking about developing overall ideas without degenerating into passive entertainment and life limited to WhatsApp, Instagram and Facebook or YouTube and Twitter, as well as phone, Zoom and Skype calls. We will soon be fed up with this, we have a tremendous need for physical bodies, the need to hug each other, to feel and understand everything through expressions and through those gestures that little by little we are starting to lose. We have an even more intense work mode but it is much colder and we are beginning to feel this as an absence. I think it is important to be very careful and I wonder how we can try to imagine a better future, which we all hope will come as soon as possible.

An issue related to time and space is the structural chronological variety of times within cities.

We are probably living through the conclusion of a long life cycle of our cities, which began two centuries ago with industrialization and its attractive power. Today we should ask ourselves if the pandemic crisis will give the coup de grace to that model of city that had its functional organization in the power of a few large condensers of bodies - factories, general markets, railway stations, slaughterhouses and stadiums up to shopping centers and airports.

As is well known, a progressive erosion of this paradigm began in the second half of the last century, following the processes of productive decentralization and delocalization of large industries towards territories and countries with lower labour costs. This phenomenon opened up enormous chasms in the modern European city, due to the withdrawal of the human presence from some of these large containers of crowds. Gaps opened up in the European city just as the anti-city was extending into the territory, encompassing portions of the countryside and historical villages, to the point of engulfing them in a continuous and very low-density settlement.

There is no doubt that the accelerated digital literacy and the pervasive experience of remote-working during lockdowns seem today to accelerate this process, marking perhaps the definitive sunset of the great urban spaces of human concentration, and opening for many individuals, families, and social groups the prospect of a substantial reform of their times and lifestyles; for some also of an effective delocalization of their expectations outside the perimeter of the city. This trend will be accom-

panied by a greater distancing of bodies in a near future in which digital technology will play an increasingly important role in connecting ideas and circulating information. This is a destiny that neither the Covid-19 vaccine nor the return to a forced normality will be able to substantially change, given that the risks of contagion associated with places of great congestion will not disappear immediately. These places, omnivorous of bodies and human life, embody an ancient - now obsolete - paradigm of economic and social development of cities, compounded by a structural crisis that for decades has been affecting the functionality of these large urban epicenters.

For these reasons, today it is important to anticipate and direct the trend of escaping from cities and, above all, to try and stop the dispersion towards territories with low building density, in order to avoid a disaggregating anti-city.

### *Movement.*

This is why I believe, and hope, that the future of the urban world will move towards a more controlled building density, in time and space, concentrated by areas, by neighborhoods or “urban villages” and zones of variable density rather than by single epicenters.

We must therefore change the city, if we want it to continue to be the primary habitat for our species. We must design urban districts where the spatial-temporal tripartition between work, residence and leisure is rapidly replaced by a progressive co-presence of all vital functions or, at least, by an intense osmosis in the destinations of use. Neighborhoods will have to become multifunctional areas suitable to allow the free flow of life choices, where multifocal parks, theaters, museums and cinemas can be located, according to polycentric spatial criteria.

Multidirectional and desynchronized dynamics would result in the urban world living the entire span of twenty-four hours, thereby favouring the decongestion of public and private transport.

A second point emerges from the use of open spaces, traditionally understood as areas of interaction and places for social practices. These in fact prove to be one of the great opportunities we have to make sure that public and cultural events which see the coming together of human bodies – with a significant collective imprint - can take place outdoors, exposed to the movement of air and not confined to closed environments. The de-synchronization of access times and the enhancement of open spaces are certainly two of the most effective strategies to avoid phenom-

ena of excessive concentration of human bodies and relative distancing, which we must consider.

However, this model of a “city by neighborhoods”, of a “city where you can find everything in 15 minutes” - taking up Carlos Moreno’s proposal for Paris - responds only in part to the demand for a general rebalancing of urban energies that the pandemic and climate crisis pose to all of us today. We must still intervene without delay and enact policies both immediately and urgently.

First, towards the energy transition. Renewable energies have now been transformed into fertile, useful and productive technologies. The time has come to really use them and as widely as possible: within a maximum of three years the fossil fuels era must come to an end. An urgency that was underlined even by the President of the European Commission Ursula von der Leyen, in her speech in Brussels (July 2021). Our task in the next few years must be to move towards a condition in which renewable energies really become the primary sources, towards the idea in which buildings, especially private homes - which are among the main producers of CO<sub>2</sub> - increasingly become decentralized collectors of renewable energy, moving towards areas of energy self-sufficiency. From this point of view, we have no choice but to take a step forward towards a fundamental transition: every house, building, condominium and tower block must become able to produce and store clean energy in such a way that it will be possible to set up production systems that work in energy management at a local level. Today, there are technologies, companies, international and national protocols that allow us to think that starting with large cities and metropolitan areas, there is scope for a change also in the tertiary and mobility sectors. For the latter, the goal of transforming private mobility must be imposed, both in terms of car sharing and electric cars. All of this, in Italy as well as in Europe, should be accompanied by a series of important and urgent decisions, ranging from investments in school buildings and public infrastructures to the replacement of million dilapidated, run-down, energy-hungry buildings. At the same time, this would act as a unique and extraordinary driving force for the whole economy.

Second: towards the enormous task of re-establishing our relationship with forests. Deforestation, the removal of those wooded and forested areas that guarantee a fundamental balance for the coexistence of all species, including ours, is one of the causes of the spread of interspecies viruses. Moreover, forests - which make up more than 40% of the surface only in Italy - are a resource that we still don’t

know and now, no longer take care of. This problem is directly linked to the abandonment of the historical Alpine and Apennine foothill areas, wonderful stretches of territory that we have forgotten. This is why, it is necessary not only to maintain the global forest heritage intact, in particular by ensuring the conservation of primary forests but also to start increasing the presence of greenery in cities and all other types of urban agglomerations.

The opportunity remains open and not to be missed to accompany a probable reshuffling of the human presence in the territory with the regeneration of the thousands of agricultural villages and historic hamlets that dot the inland areas of European countries. Above all, the theme of a new relationship with the sphere of phenomena that we usually define as “natural” remains open, that multitude of fauna and flora that escape our control and that we have tried to remove from the spaces of urban life, or to circumscribe within fences and enclaves.



Diana Lelonek

Aluminum Habitat, photography of the found  
object from the series: Center For Living Things, 2017  
courtesy: Diana Lelonek and lokal\_30 gallery



Post-electronic habitat, photograph of the  
found object from the series: Center For Living Things, 2017  
courtesy: Diana Lelonek and lokal\_30 gallery



Motherboard Nature, photography of the  
found object from the series: Center For Living Things, 2017  
courtesy: Diana Lelonek and lokal\_30 gallery



PET-environment, photography of the found object from the series: Center For Living Things, 2017  
courtesy: Diana Lelonek and lokal\_30 gallery

## Theories to protect Gaia – Biodiversity in global projects and networks

Simone Marchetti

The issues addressed in the previous section, listed as drivers of change, can be organised into one single vision that requires the ability to broaden one's gaze to include complex issues, which at first sight may not be immediately correlated. One essential point of reference which tries to give definite answers that will have a "global" effect, regarding the issue of biodiversity loss, is the UN *Strategic Plan for biodiversity 2011-2020* and the *Aichi Targets*, where an effort is already being made to give a series of precise indications as to the targets to be reached by 2020 and by 2050. We live in a complex world where it is of fundamental importance to analyze the full picture, and to understand the primary causes of distress. Sometimes, it is not enough to deal with related problems on a local scale, rather we should intervene on much larger scales, which will involve, for instance, a rethinking of the use of fossil fuels with a substantial transition to different, more sustainable production models in order to achieve substantial carbon neutrality.

The concept of carbon neutrality, or the need to no longer emit carbon dioxide into the atmosphere but rather to reduce its presence, is one of the future objectives of cities and the next industrial revolution. There is an increasing need to provide answers that have the far-sightedness of a global vision, in which not only the importance of the plant kingdom within our cities is put at the centre, but that questions all current economic management, production and communication models in order to achieve a real ecological transition on a vast scale; a shared plan that goes beyond the concept of nations and individual states through multi-centric and simultaneous actions. Far from having the presumption of being able to organise human knowledge, in the future there will be an increasing need for minds that put complexity into a system, collaborating side by side, amalgamating skills with a common goal.

In recent years, there has been a steady increase in the awareness of governments and communities of the urgent need to undertake effective pol-

icies and actions able to counter the alarming trend of the climate crisis. These actions also include the protection of terrestrial ecosystems, which are every bit as much at risk as the health and wellbeing of human society itself.

During the research we have been coming across a number of projects, that, at a global scale, have tried to reconnect complex systems of man-made landscapes, either artificially constructed, and the urban environments, together with the more protected landscapes, where the biodiversity is preserved. Moreover, these kind of projects have tried to globally reconsider the relationship between humans and nature, by providing a vision both working on the dimension of a different time and space, and on the issues of health, nutrition and the environment can go hand in hand and be addressed at a global level. There are several theories and projects that follow this concept, Paul Hawken is the one that comes closest to a more just, fairer, more sustainable world view, by proposing concrete answers to the complex dilemma. Other examples of this foresight on some of the issues - for example with respect to the theme of ecological connections and biodiversity, respectively, are Richard Weller's visionary "World Park", or the radical view of E.O. Wilson, who hypothesizes a world that in order to preserve biodiversity must protect at least 50% of the planet's land/water surface. Finally, projects like the Great Green Wall in Africa have pioneered a new multi-scale and multisectoral approach that has allowed us to experiment with new possibilities and pave the way for new approaches to complex problems.

### *World Park.*

The idea of the World Park as conceived by Richard Weller, architect and professor at Penn University, came out of a study of areas considered to be biodiversity hotspots; 160,000 protected areas, spread in a discontinuous and fragmented way over some 235 countries, plus the overlapping of routes that intercept those places considered world heritage sites by UNESCO. The key to the development of this vision came after the interpretative observation of the areas carried out by other studies such as the United Nations Convention on Biological Diversity (CBD) and the Pan-European Ecological Network (PEEN) which aim to connect green corridors from all over Europe. The PEEN was developed as a guide for a coherent vision of biodiversity conservation and it resulted in the drawing up of three maps (Central Europe and Eastern Europe, Eastern Europe and Southern Europe, Western Europe), produced by comparing the various national databases and bringing them together under a single mapping.

Weller also makes both quantitative and qualitative assessments regarding the possibility of increasing the biodiversity rate through this matrix of ecological connections: it will be necessary to ensure that at least 17% of terrestrial areas are protected by 2020; it will be essential to state the importance of the selection of places so that such a selection is “ecologically representative”; finally these sites must be well connected to each other. For this to happen therefore according to Weller’s vision, the future protected areas will have to be distributed within the ecologically representative macro eco-regions present on Planet Earth. (Weller R., *World Park in LA +*, 2015).

The greatest difficulty with this fascinating vision obviously lies in the complexity that an idea of this type proposes, exacerbated by myriad different jurisdictional boundaries and bureaucratic and administrative systems, as well as profound socio-cultural and economic differences. This factor represents a limit and at the same time a tremendous challenge.

### *The Half-Earth.*

The other theory is that of the famous American biologist Edward Osborne Wilson who in his book “The Half-Earth”, (Wilson E.O., 2016) describes how our species has managed in a very short period of time to become the creator and architect of the current climate crisis, so much so as to jeopardize our very life on Earth. What his theory proposes is to conserve half of the planet’s surface, including seas and land, in order to safeguard biodiversity and at the same time guarantee as much as possible the health of thousands of living plant and animal species.

The loss of biodiversity has already exceeded an alarming threshold and therefore for Wilson, the only real solution to answering this urgent issue is to protect areas of the planet from human interference in order to limit as much as possible the risk of other plant and animal species becoming extinct. The idea of dividing the Earth in half is obviously a metaphor and should not be interpreted literally: clearly a section of the Earth will still be usable by man. This visionary but controversial idea comes from the very simple and intuitive notion, which Wilson knows particularly well, that the more protected areas are reduced in size and area, the greater the risk of witnessing a decline in their biodiversity (Wilson E.O., 2016). The contradictory part of this theory is that the remaining half of the planet Earth, managed by man, will not be exempt from the same problems that currently affect it. Furthermore, it would also be desirable to overcome the dichotomy of two distinct kingdoms, the animal and plant one on the one hand and that of man on the other, however fascinating it may seem.

## Green Urban Oases - A world scale project

2019 - ongoing

Stefano Boeri Architetti

These visions, together with numerous cultural initiatives, meetings and readings have contributed to the development of several projects, one of which is *Green Urban Oases*<sup>1</sup>. This initiative drew its initial inspiration from another pioneering large scale initiative to emerge from a transnational and multisectoral approach, namely *The Great Green Wall*. In 2007, the African Union launched the *Great Green Wall (GGW)* project to restore Africa's degraded landscapes and transform millions of lives in the Sahel, one of the world's poorest regions. Once completed, the Wall will stretch for over 8,000 kms through 20 countries. The GGW initiative aims at restoring 100 million hectares of degraded land, removing 250 million tons of carbon dioxide and creating 10 million jobs by 2030.

While GGW is focusing mainly on rural areas, the Green Urban Oases project will focus on urban landscapes and involve urban municipalities and communities, with a focus on cities in drylands which are among the most vulnerable to the climate crises (due to the increased number of droughts, heatwaves, sand storms and landslides).

The development of the overall concept of Green Urban Oases (GUOs), coordinated by FAO, was supported by different groups, organisations and individual professionals, including FAO, Stefano Boeri Architetti, the Royal Kew Botanical Gardens Kew, the Arbor Day Foundation, C40, UN-Habitat, Cities4Forests, the Italian Society of Silviculture and Forest Ecology and the Urban Forest Research Centre in China.

The key idea behind the GUOs is to turn dryland cities into green urban oases, strengthening their adaptation through the implementation and integration of urban forestry and urban greening strategies, in order to achieve food, health, environmental and economic resilience. The project would use forests, trees and green spaces to improve the ecological continuity within and between cities to increase their resilience to the effects of climate crisis and, consequently, improve the livelihoods and well-being

<sup>1</sup> The initiative was originally launched as the Great Green Wall of Cities. It was then decided to rename it Green Urban Oases to avoid confusion and enlarge its scope beyond Africa.

of urban and peri-urban communities (the preliminary list of countries involved are located in Africa, Asia and North-East Africa. and includes: Cabo Verde, Namibia, South Sudan , Afghanistan, Mongolia, Chad, Jordan and Tunisia).

Urban forestry and urban greening might not be the only solution to climate crises, but on a regional and urban scale they certainly help to develop an adaptive response and adaptation to climate change by cooling the environment, protecting soils and preserving river basins while also and most importantly providing city dwellers and local communities with a wide range of ecosystems goods and services. The project will create a series of “green oases”, and integrate these points of discontinuity in the wider mosaic of landscape restoration interventions in semi-arid regions of the world, increasing the resilience of cities to external shocks and improving the health and wellbeing of urban dwellers.

In order to ensure its successful implementation the GUO programme aims to local communities in the entire planning design and management process, much as has already been done by the GGW project in Africa. This involvement should ensure that the solutions identified in the different cities responds to the most pressing needs of the local peoples and to local climatic and agroecological conditions, using different interventions at different scales through the creation of urban forests, parks, urban food forests, urban farms and even more technological solutions, if applicable.

According to a study published in *Global Change Biology* (Di Sacco A., Hardwick KA, Blakesley D., et al., 2021) there are certain rules in making forestation - afforestation and reforestation - projects work and these will help in defining priorities and which will be used as keystone elements for future development. But one of the rules listed in this research paper, which GUOs already had on its “activities list”, is to work closely with stakeholders and local people to develop participatory city-region forestry strategies.



*Green Urban Oases, sketch, 2021*

## Scaling down – from Global to continental

Simone Marchetti

The necessity to provide a global vision on biodiversity can be interpreted and reimagined into the continents. There are several scientific papers and existing projects in Europe, which aim to develop a solid network of ecological corridors. From the PEEN (Pan-European Ecological Network) mentioned earlier to the EUROPARC federation, they are all working across international borders with the goal of creating transboundary connections between different natural areas and habitats and ensuring ecological connectivity between different countries.

These corridors are vitally relevant for biodiversity. Recent studies state that connections between natural areas are essential for increasing numbers of species and facilitating their movement. Protected area networks are a tool used to conserve biodiversity by sustaining habitat patches across vast heterogeneous landscapes. However, our ability to design networks of protected areas that conserve biodiversity relies on our accurate understanding of animal movement as well as functional connectivity. The problem is that this understanding is rarely tested in the real world. There is substantial monetary and political capital investment in the safeguarding of protected areas but the investment typically ends at the border of the protected area, and the mechanics of biodiversity conservation within the matrix are often left purely to chance. Yet conservation tools cannot rely on either proximity or hope – we need to better understand animal responses to environmental heterogeneity, and we need a planned and protected matrix designed starting from accurate theoretical underpinnings to provide effective biodiversity conservation across protected area networks. (Stewart F.E.C. et al., 2019)

The effects of habitat loss, according to empirical studies, have large negative impacts on biodiversity (Fahrig, L., 2003). Most of the natural areas across the countries are fragmented and interrupted by human settlements or infrastructures and even though the effects of these fragmenta-

tions (which is considered to be different to loss, ed.) should be studied further, it is relevant for us as architects and urban planners to think about the natural environment and the ecological connections we are dealing with together with the “natural” biodiversity context while carrying out a project on a specific site. Along with a network of green and blue infrastructures (whose variety and complexity of nuances will be explained in the following chapters), ecological corridors within cities can improve environmental conditions and therefore residents’ health and quality of life, support a green economy, create job opportunities and most importantly enhance biodiversity and in certain regions and countries could well strengthen food security (in cases of agroforestry). Future steps should include the implementation of national ecological networks and the pursuit of international coherence through the development of these trans-continental ecological corridors. The big challenge is to develop a common approach among the different agencies that are responsible for biodiversity conservation, and among the different national and international jurisdictions, as we have already pointed out for the World Park project by Richard Weller. However, it is also a matter of design. Designing (or deciding not to design) in such a way as to let different species move across the anthropized landscape is a first step towards moving to a non-anthropocentric attitude and the first step in safeguarding other species and - at the end of the day- ourselves.

In light of the climate crisis, new approaches to urban planning, architecture and understanding the structures that govern the cities we live in, or the dynamics involving non-urban spaces, which are now an integral part of the anthropized territory, are more important than ever.

## A new Reciprocity Contract between cities and villages

Stefano Boeri

Referring to the chance of restoring a balance between natural and artificial spheres, together with the redesigning of cities according to the logic of urban neighborhood and forestation, I believe the time has come to launch a major national campaign to repopulate the abandoned villages found in inland areas, which in the past in Italy, France, Germany and Spain have been the safeguards of the European countryside.

On one hand we must do everything possible to ensure that the understandable desire for a different lifestyle that is both healthier and closer to nature does not result, as happened in the 1980s, in a rash of thousands of new villas and buildings that appeared across the country; those widespread, solitary masses of buildings that disfigured the Italian and European landscape.

Repopulating historic and rural villages means returning to that condition of building density that creates the conditions for an urban community, changing the size and breadth of domestic spaces within them and enjoying an extraordinary relationship with the surrounding landscape.

It is therefore not a nostalgic project of returning to the rural dimension but rather a contemporary project for economic investment in, and demographic development of a forgotten part of our territory.

Villages need to be rethought - especially in terms of their interior spaces - precisely because today they are places of tremendous potential. When some of us will be able to spend four or five continuous days staying outside a big city, it will be convenient to think of moving ones residence to a place immersed in an extraordinary landscape, where thanks to broadband we will enjoy a condition of both total connectivity and still that self-sufficiency of services close to citizens which in some parts of today's cities has now been totally rebuilt. Therefore, it is not a matter of encouraging the construction of second homes or of promoting new forms of temporary tourism, but of launching a real project of reform of

This text is a transcription of a lecture by Stefano Boeri filmed during the first lockdown between March and April 2020 as part of the "Tempo Ritrovato" series of readings. Published in Italian in S. Boeri, Urbania, op.cit

historical and rural villages, which reconstructs the authenticity of lifestyles, before the identity of the forms.

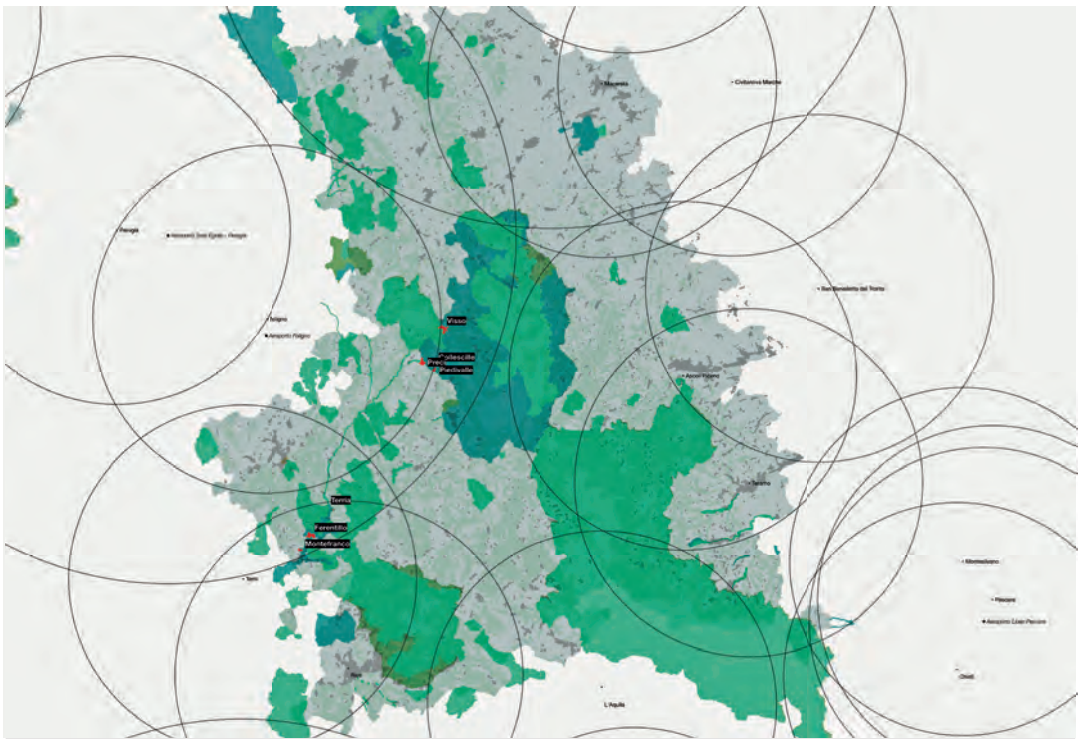
However, this can only happen with the drawing up of a genuine Reciprocity Contract - based on the French model, developed among the City of Brest and the rural area of Centre-Ouest Bretagne - with the nearest cities. They will have to act in collaboration, not in competition, with the neighbouring networks of historic and rural villages.

There is a huge debt - think about drinking water, clean air, quality food, wooden furniture and accessories - that cities have built up which is owed to the surrounding country spaces and their small settlements.

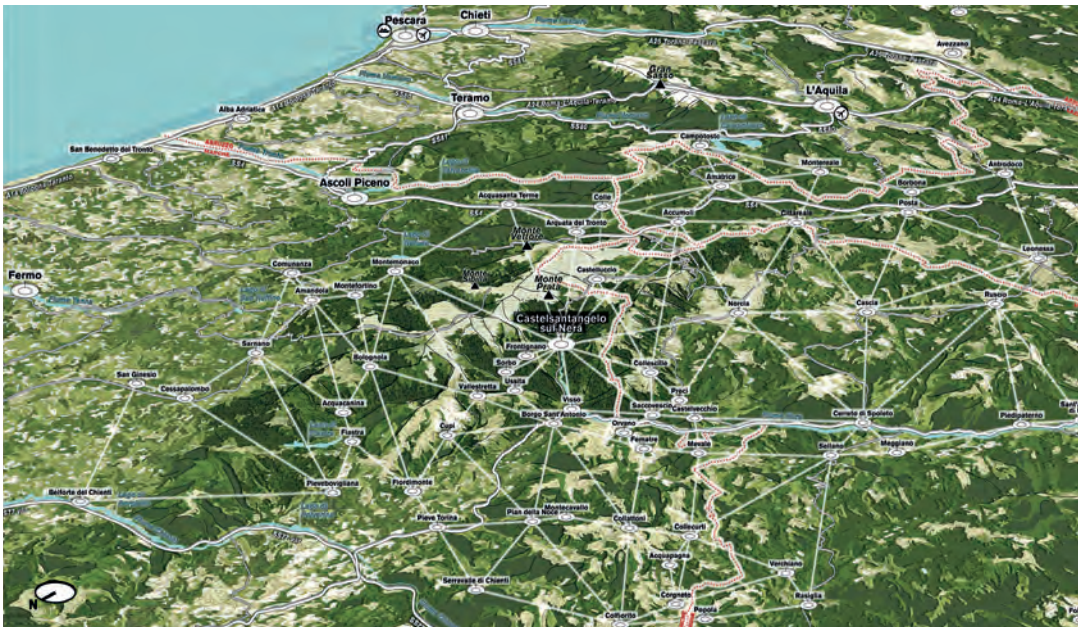
The time has come to settle this debt with a circular economy project that will allow those who move to live in historic old villages, whether they be farmers, intellectuals, craftsmen or entrepreneurs, to be permanently established in metropolitan catchment areas, and to take account of the extraordinary debt that there will be towards those who, by re-inhabiting small towns and villages, will continue to produce quality agriculture and be responsible for woods, seas, lakes and coastlines - the still beautiful landscape of our country.

We do not need a bucolic vision for villages, resembling Nativity scenes, but rather active small towns with which to protect a still extraordinary countryside, which could become even more appealing and attractive for a style of tourism that in the coming years will increasingly move towards the search for authentic places.

This radical reform of habitable spaces would ultimately be linked to the great challenge of creating the "Parco Italia". A system of Ecological Corridors that would cross the Peninsula from North to South and from East to West, uniting existing parks with protected areas, unprotected wooded areas, including a renewed constellation of small towns, villages and metropolitan areas that will be able to overcome the challenge of integrating nature into the urban scene.



The “Crater”, an area in Central Italy of 140 municipalities that were hit and damaged by Earthquakes in 2016 and 2017. Although the area is considered to be highly at risk due to Earthquakes, it has a great potential to be the place where the forest-based circular bioeconomy could take place thanks to the presence of great natural areas, tourism and a network of villages that could support this transition.



Castelsantangelo sul Nera. The project of the Implementation Plan for the Reconstruction of Castelsantangelo sul Nera aims at the reconstruction of the urban fabrics destroyed by the 2016 Earthquake. It is based on ten goals, including the reduction of seismic risk and natural risks, the protection and enhancement of environmental resources to preserve the naturalistic value of local biodiversity, the recovery of the historical heritage and the use of innovative materials, the production of highly sustainable energy and the relaunch of tourism.

## The National Scale – Parco Italia

2019 - ongoing

Stefano Boeri Architetti

After the First World Forum on Urban Forests held in Mantova in 2018, Stefano Boeri Architetti proposed a vision of “Parco Italia”, the main aim of the project is to develop a coherent plan of connections and green corridors between Italian National Parks, Protected areas and wooded areas throughout Italy, while including the 14 metropolitan areas, cities and villages in the plan in order to enhance biodiversity.

The wealth of Italy’s plant heritage is common knowledge. It is one of the European countries with the highest number of plant species and about half of those present in Europe are in fact found on Italian soil (Legambiente ONLUS, 2018). Protected land areas in Italy cover about 25% of the country while over 50% of this area is occupied by woodlands which are the great green infrastructure of the country. According to a Report by the Italian Ministry of Agriculture, Food and Forestry Policies (MiPAAF, RAFF Italia, 2019) wooded areas in Italy cover about 11 million ha, equal to 35% of the country’s surface area. Some protected zones also include peri-urban and (more rarely) urban areas, a rather limited part of which (about 4%) are lowland areas that are more or less in proximity to urban areas and areas with high infrastructural intensity. The rest, the vast majority, involve mountainous and to a lesser extent hilly areas (Salbitano F., 2019) so this is where we should try to work to establish virtuous processes of development and innovation.

However, in light of the second and last World Atlas of Desertification drawn up by the European Union Joint Research Centre, the need for action to stop the advance of desertification is clear. According to the report, Italy is among the thirteen European countries affected by the advance of desertification with a fifth of the territory at risk of desertification due to climate change.

In Italy, a comprehensive national vision of natural areas can provide support for their protection and for the growing forest ecosystems, while

on the other it can reinforce weighted growth in areas that could well represent future epicentres of development, such as the Inner Areas\*. The vision could also create or strengthen circular economies linked to the wood industry, which support an ecological transition necessary for every sector of society but most of all for the construction industry, which is known to be one of the heaviest contributors to air pollution.

What emerges from the studies carried out on ecological connections between the various countries of the world, is a substantial lack of connectivity and a much more generalized fragmentation of protected areas. From the study carried out at a European level on ecological corridors (PEEN) the need for an implementation of green corridors at the level of individual nations is clear, in order to proceed in a coherent manner that is shared between all member states.

The Parco Italia proposal is therefore to create a large network of new forests, that together with different protected ecosystems, creates an ecological infrastructure that physically unites urban and coastal areas with the existing large forest structures, including protected areas, natural areas, and inner areas.

From a national point of view, it is therefore important to propose the adoption of a country-wide project that has both a solid scientific base as well as the ability to involve as many sectors as possible (both public and private), while safeguarding the territory through targeted maintenance and management strategies and on the other hand, promoting an economic model based on ecosystemic services at the centre of the development process.

The inhabited centres spread throughout the country could thus become focal points or nodes of a vast green infrastructure, connected to the Apennine ridge and the Alpine system that runs down the entire peninsula. Only through the active involvement of small and medium-sized cities and acting against the effects of climate change, it will be possible to create a great new alliance between what is man-made and what is natural.

The main actions that the project aims at achieving regard the definition of a general unified plan for a network of wooded connections and ecological corridors between protected areas, existing forests, and other natural and semi-natural areas (biodiversity hotspots) throughout the country, including urban areas starting from 14 metropolitan cities; to encourage the reconnection of green areas and urban forests and the creation of strategic green infrastructures both within cities and those belt

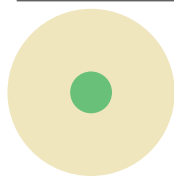
\* Italy's Inner Areas are rural areas characterised by their distance from the main service centres (education, health and mobility). According to the latest census, Inner Areas make up 53% of Italian municipalities, are home to 23% of the Italian population and cover 60 % of the national territory. (NSIA, September 2019)

areas with specific projects which, in part, have already been activated or are in progress, by actual planting of trees and shrubs, and to promote integrated governance and partnership models, as well as regulatory facilitation and funding tools aimed at encouraging the involvement of a sufficient number of people who will support the Parco Italia project.

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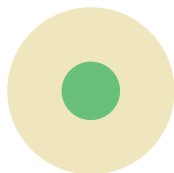
## Parco Italia – Initial Data

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### *Italy's Protected Areas*

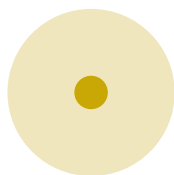
Italy's protected areas (marine and land) cover a surface of around 25% of the total country.



### *Woods – The Great Green Infrastructure*

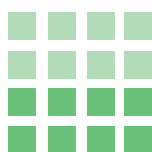
Wooded areas in Italy cover about 11 million Ha, equal to 35% of the country's surface area.

Source: RaFITALIA (2019)



### *Desertification - a fifth of the territory at risk of desertification*

According to the World Atlas of Desertification drawn up by the European Union Joint Research Centre, the need for action to stop the advance of desertification is clear. According to the report, Italy is among the thirteen European countries affected by this phenomenon due to climate crisis.



### *The Wealth of Vegetal Heritage*

The wealth of Italy's vegetal heritage is common knowledge; It is one of the European countries with the highest number of plant species and about half of those present in Europe are in fact found on Italian soil.

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Source: RaFITALIA (2019)  
Source: Joint research Centre

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## Inner areas and villages – 4 ideas: food for thought

2020 - ongoing

Maria Lucrezia De Marco, Corrado Longa, Simone Marchetti  
and Luis Pimentel

### *A holistic vision*

Today in Italy there are over 5.000 municipalities with a population under 5.000 inhabitants, this is around 69% of all the municipalities in the country and also these municipalities cover around 55% of the territory. This category, based only on the population, is composed almost totally with municipalities that are also catalogued as part of the Inner Areas (4.076) that are 51,4% of all the municipalities, 21,9 % of the total population and close to 60% of the total territory, with a larger concentration in Center and South of Italy, in the mountainous areas of the Apennines and on the islands of Sardinia and Sicily. On the other side of the known growth of cities and of the urban population there is the fact that small villages and agricultural areas are suffering the downside of this exodus of population. Between the years 2014 and 2019 the stable population living in these areas was diminished by 250.000 units, aggravating an ongoing demographic crisis.

A vision for the Inner Areas considers these local elements as essential in creating a unified vision at a national level, placing them at the center of strategic action, one that recognizes the value of these villages in the complexity of the landscape, and its potentiality in strengthening it, and by reciprocity accentuating the values of each one. Below is a number of issues that this holistic vision aims to address:

### *A network of new and old forests and ecological connections.*

#### *Villages and towns as guardians of the territory on a green journey.*

It is important to develop a unitary territorial plan that will promote small towns and villages and create space for future potential, not least by developing the network of wooded connections and ecological corridors between protected areas, existing forests and other natural, and semi-natural areas (biodiversity hotspots) in this way overcoming fragmentation,

throughout Italy, and including urban areas, the 14 metropolitan cities and small towns and villages in a deep relationship with the landscape.

The territory can be considered as a constellation of small towns, villages and urban centers.

These villages could well become focal points for monitoring and managing natural and forest resources as well as natural parks and the hydrological network. This would make it possible to guarantee the project's security on a national level with local safeguards and at the same time make room for an economy based on the ecosystem services of the territory. It will be necessary to go back to incentivizing maintenance through public allocations and redistribution of tax revenues in the area, along with constant supervision of the respective geographical areas.

Working within this constellation of villages will mean working towards a concept of low density while avoiding a new wave of urbanization. This means prioritizing renovation and retrofitting over new constructions and further soil consumption, which might well become the first post-pandemic response in the face of the growing fear of the city and its density and which could further degrade soil and forest resources. There is a need to create a demand for residence and quality of life that can find optimal places for expression in small towns.

*Circular Bio economies. The wood supply chain, tourism and potential new opportunities.*

Virtuous processes linked to the wood supply chain need to be developed, in order to support a necessary ecological transition through the circular bio-economy while revitalizing villages in isolated areas and creating new green jobs.

Through enhancing and developing resources and the existing heritage, small towns and villages thus become interconnected hubs for new businesses that follow the logic of circular and bio-economies, from small-scale handicrafts to new 4.0 manufacturing and moving towards productive platform on a regional scale, this means that villages work as part of a diffuse economical network, that connects local resources and cultural knowledge, while connecting it with a much larger and global market. This active flux of supply chains will necessarily have to interact and dialogue with existing natural resources, without damaging them and creating virtuous circular processes.

Furthermore, with the establishment of national parks and new connection systems between protected areas, tourism and slow tourism

routes can be revitalized, thus creating new jobs. Small towns and villages have the potential to become central nodes for an area with high usability tourist potential.

Parallel to this potential economic driving force, small towns and villages must be able to enjoy excellent services at a regional and local level, which would allow the maintenance and coexistence of large segments of the population, covering both older and younger generations. To guarantee this, in parallel it will also be necessary to initiate tax exemption policies and the activation of new permanent economies in contraposition to the usual seasonal economy.

*Digital and Energy Infrastructures. Self-sufficiency and renewal.*

Small towns and villages could be able to acquire a new centrality through efficient, high speed, digital networks, currently present in only 37% of the internal areas, which will allow them to easily take advantage of fast connections, in order to implement local markets and supply chains, as also monitoring the forest and water infrastructure. Modernizing the logistics infrastructures, moving towards diversified management of the flows of goods and people. A well-thought-out digital infrastructure plan must be put in place, able to create and strengthen both the widespread telematic health network (telemedicine) and the school network, as allowing also to new settlers to work remotely, distant from cities, thereby recognizing and sustaining the resident human population that currently safeguards these areas. Another necessary factor for an ecological transition will be improving the efficiency and safety of the urban fabric. This must be redeveloped in terms of energy and architectural performance, interventions must be implemented from the point of view of net zero and bio-based materials, for example through the implementation of the use of wood for construction and with the use of local labour, thus promoting a decarbonisation policy together with a circular bio-economy model. Some case studies of this approach have been developed with 60 international students from Politecnico di Milano, who explored social, economic and architectural regeneration of small towns and villages, within the framework of the Urban Design Studio lead by Stefano Boeri.

Working on the case studies of Gromo (Bergamo), Pescara del Tronto (Ascoli Piceno) and Brugnello (Val Trebbia) through the research phase and in dialogue with private and public stakeholders specific urban planning strategies have been designed in order to establish new modalities of reinhabiting the villages, in strong relation with the closest cities,



Parco Italia. The Parco Italia project aims at strengthening the Italian green corridors, enhancing biodiversity, throughout the connection of already existing green areas, protected areas, national parks and new-born forestry projects in its territory. The project aims to gather under its vision tree planting campaigns and all the afforestation and reforestation projects at the national, regional and local scale in order to boost unity between natural areas, enhance biodiversity, and reduce ecosystem fragmentation. The Project aims to involve metropolitan cities, middle sized cities and other smaller cities and villages in this process, through Urban and peri-Urban Forestry planning and new forest-based practices and circular economies.

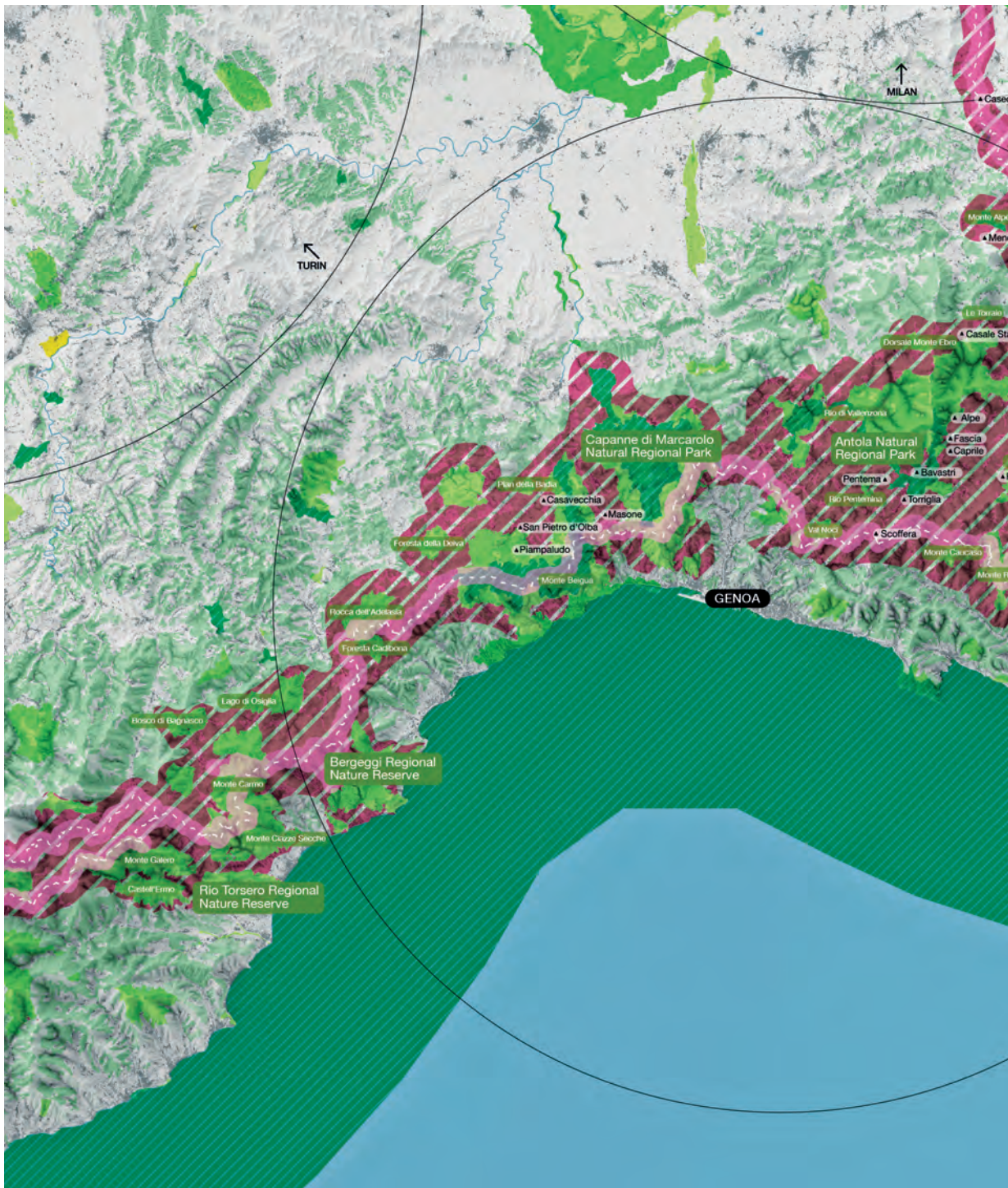
triggering new economic resources and promoting facilities and public functions able to open perspective of sustainable - also financially- development of inner areas.

*Governance. A national observatory for the Internal Areas*

It is important that a national observatory for inner rural areas is set up which is operationally capable of developing a unitary territorial vision, a long term planning, comprised of multiple actors and disciplines, gather territorial data and anticipating demographic changes, and support local administrations via the creation of “best practices” and technical support. All aimed at activating policies focused on creating active relations of reciprocity between small local communities, and rural territories and large cities, promoting economic exchanges, sharing environmental strategies and supporting everyday life, while also coordinating European resource redistribution methods at a national level.

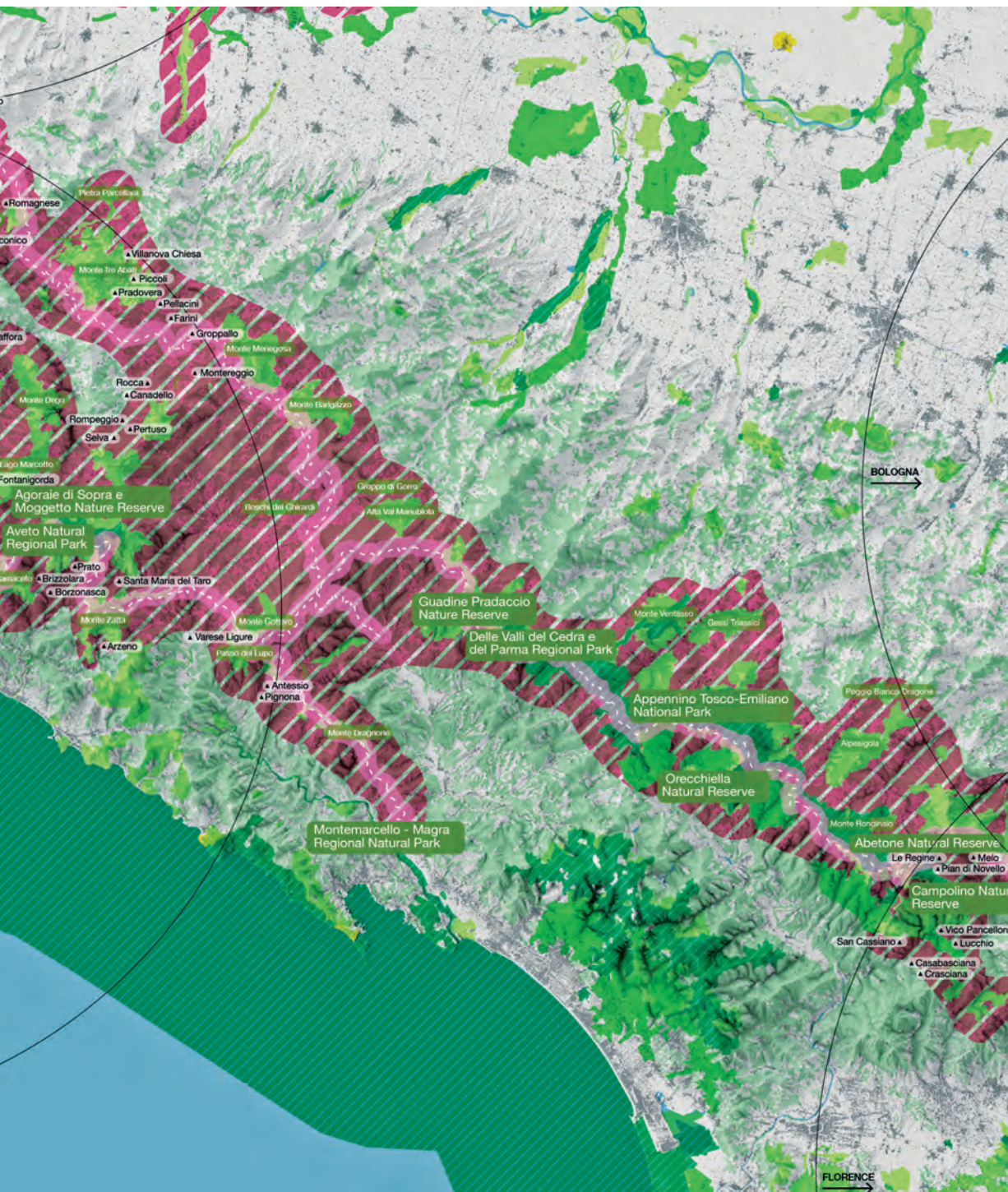
It is fundamental to guarantee the presence of strong social links together with a solid commitment and political vision at a local level, trying to bring decision-making levels regarding a national vision down to the local level, promoting the importance of an integrated national vision that is closely linked to extremely local features and characteristics.

For example, a national-scale project could identify criteria and action methods as well as facilitate administration processes within rural areas, along with applied research, techniques and technologies all aimed at creating new ecological connections between protected areas, in addition to strengthening the green corridors between urban areas and small towns and villages and feeding the wood supply chain, and local bio-economies. To achieve this it will be necessary to work in parallel with the Planning, Design, and Management sectors.



Parco Italia – zoom in on the Ligurian/ Tuscany Coast.

Parco Italia is a multi-scalar project that connects natural areas by creating new green corridors or intervening in already protected areas, that aims to involve 14 Italian metropolitan cities, small cities, and villages along its route. The pink path represents several already existing CAI (the Italian Alpine Club) hiking paths, that are connecting different natural areas and which represent a cultural heritage for the territory. Parco Italia project represents an important asset for slow tourism, but also an active protection tool of the territory itself, for the management and safety of new and already existing forests.





III

# The Urban Framework

# Three Dystopias

Stefano Boeri

Today there are three major dystopias regarding the theme of sustainability, all coexisting and all aimed at proposing a sort of reconciliation between Nature and the city. The first is technocratic in nature and invites us to believe that by improving and installing devices for capturing and accumulating renewable energy everywhere, it will be possible to achieve a sort of compensation between nature and the human sphere: as if man's gigantic footprint all over nature could become lighter thanks to a formidable technological effort that will reduce energy consumption to a minimum. Then there is a second dystopia, which proposes a reconciliation based on the idea of extending cultivation practices, as if agriculture in the form of using the land for production purposes could simply become a great panacea for the evils of urbanization and thus the hypothesis of an increase in the agricultural use of land both inside and outside our cities. Finally, the third dystopia recognizes nature as having absolute primacy of autonomy with respect to the anthropic sphere and seeks a reconciliation based on a principle of coexistence: the city must know how to manage its land and respect completely natural wild areas in which multiple plant and animal species can grow and develop in total autonomy, beyond human control.

These three dystopias have carried considerable weight in the world of architecture. The technocratic vision was re-launched by an architect, William McDonough, and a biochemist, Michael Braungart in a publication in which it was proposed to extend the principle of metabolization and

This text comes from an interview with Stefano Boeri, by Pietro Los, published on Klat magazine and Abitare in 2009.

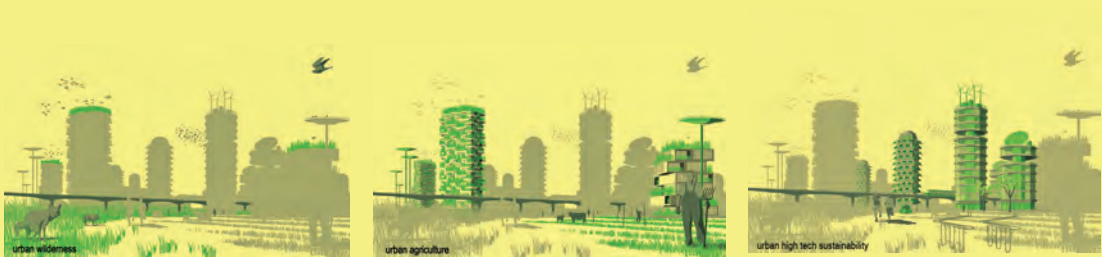
the recycling of all human artifacts to include construction and urban planning, inspired by the idea that architectural buildings can function like plants and trees, and are therefore able to absorb the energy of the sun, the Earth and consume it without producing residues. The agro-productive dystopia, the second on the list, has its origins in the thinking of radical architecture, and in particular the activities of Andrea Branzi whose work has always reflected the compatibility between urban artifice and the plant world. This dystopia promotes the enhancement of agriculture and any urban space available for green areas. Nature is cultivated in the form of a garden, a vertical wall, a forest or agricultural land towards desecrating urban spaces and transforming them into vegetal surfaces.

The third dystopia is the most extreme, the most edgy but also the most interesting. It denies artifice and recognizes Nature's absolute autonomy, to the point that it cannot be cultivated or reproduced. Nature is understood as an independent plant/animal sphere in which one cannot intervene, hence the idea of a third scenario developed by the landscape architect Gilles Clément, who sees the germs of a new, unpredictable and unconditional spatiality of urban design in that vast set of urban spaces abandoned by man and reabsorbed by nature (railway tracks, infrastructures, industrial areas, bramble-covered warehouses, scrublands, wild and residual vegetation and weeds). The thing that interests me most about this last dystopia is that it finally poses, although in an extreme way, the question of the non-anthropocentric urban perspective as part of a discipline that eventually considers areas of total natural autonomy even within urbanized areas.

These concepts are both well known and close to my heart, and already referred to in a manifesto signed with Jeremy Rifkin and other international architects in 2008 during the 11th International Architecture Exhibition at the Venice Biennale, in which Rifkin takes up above all the first dystopia and links it to a suggestive hypothesis of democratization of technological innovation: each building must function as a source of energy. The manifesto has the great advantage of making an urban sustainability

policy socially and economically desirable, as well as realistic. It is an ecological vision of the city that requires individual responsibility and which aims to promptly involve designers in the building of smart local networks, thus introducing a political dimension into architecture.

From a design point of view, the visions of William McDonough and Jeremy Rifkin are interesting because of their political dimension, since they introduce a form of ground-up sustainability: we should all be involved in the idea that a building functions as a power plant, or that a neighbourhood works as a local network of energy production, consumption and distribution. Branzi's vision, which calls for a substantial vegetalization of the city, has instead the most impact on the world of architecture, recalling a long history of projects and research ranging from green buildings to our own Milan Vertical Forest project. The rhetoric of the third concept instead allows us to think about spontaneous and unexpected fragments of the natural landscape, still uncontaminated in some ways and as somewhere to consciously exercise a creative renunciation. All three visions, which holistically reflect three issues related to sustainability, feature the promotion of biodiversity as an absolute core value and indicator of the health of each ecosystem.



1. City of animals – urban wilderness

2. Cultivating the city – urban agriculture

3. Nature made technological – urban high-tech sustainability

*Sustainable Dystopias for Abitare*, Biennale of Venice, 2008

Sustainable Dystopias is a research project that explores different ideas surrounding the reconciliation of city and nature. In today's cosmopolitan metropolis, rich in cultural and anthropological variety, the presence of nature is being rethought and redesigned around three radical scenarios. Capable of creating significant improvements in the daily lives of millions of people, the visions can also lead to disastrous or worrying outcomes: the crossroads depend on variables that can be neither controlled nor predicted. In these three futuristic scenarios, the boundary between utopia and dystopia becomes a very fine one.

# The Urban Framework

**David Miller**

Director of International Diplomacy, C40 Cities

Our planet faces significant environmental challenges – indeed, the global spread of COVID -19 and other pathogens like EBOLA and MERS demonstrates the fragile link between humanity and the health of our planet. Studies show that the destruction of the environment makes these health emergencies more likely – and environmental problems (like poor air quality) at the same time make the impact of these health challenges far more serious. In addition, of course, the same forces are leading us to a climate crisis, the impacts of which are already being felt.

It is very clear that it is our behaviour, our economic systems and our disregard for the natural environment that are causing such serious stress on our planet. We see the impacts regularly in the great cities of the world – impacts like Hurricanes Harvey, Sandy and Katrina in the United States; massive flooding in Jakarta, and of course the wildfires in California, British Columbia and Australia that have so affected rural and urban dwellers alike. These impacts are often felt by the least well off within a society and between countries.

The good news is that the solutions to these environmental challenges can also lie in the world's great cities. In this century, for the first time in history, the world became more urban than not – and this trend is growing. So, what are the solutions? In principle, we know that if we can make some changes to the way we live in these large cities we can make people's lives better, our cities more socially just and economically successful and also address greenhouse gas emission reduction and other environmental challenges.

Studies for C40 Cities – the organization of the Mayors of the world's largest cities - attribute about 70% of the world's greenhouse gases to activities undertaken in an urban area or the activities necessary to maintain them (such as electricity generation, which is included even if the plant is outside the city). By addressing greenhouse gas emissions in cities

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you can dramatically lower the world's greenhouse gas emissions. Generally, these emissions come from four areas: how we generate electricity, how we heat and cool our buildings, our transportation and how we manage our waste.

In each of these areas, significant action can be taken. We can turn our electricity generation much more to clean energy and we can have buildings that can perform far more efficiently. Today, it is possible to build carbon positive buildings. There are at least 35 cities around the world committed to having only carbon neutral buildings by 2030, and numerous cities are dramatically lowering emissions by retrofitting existing buildings – and creating significant numbers of jobs at the same time. We can manage our waste better, particularly utilizing industrial scale composting to address methane gas emissions from landfills, and we can change the way we do transportation. We are already seeing numerous cities make changes to create cities where people can choose to walk more, bike more, and take more public transport – cities like Paris, Milan and Bogota. And others like London are leading in helping private transport to electrify so it can run emissions free. All of these things are possible today without new inventions – just by choosing action over inertia.

It is quite clear, supported by scientific studies, that climate change impacts low income people unfairly. It is not fair whether you look at it within a city, or between cities. For example, when Hurricane Sandy hit New York City, the biggest impact was on the low-income communities and it took them years to recover. Or whether you look at it between cities, North to the South, and the very significant impact of flooding on people living in Delta Cities in the developing world. It is essential when thinking about how you address climate change, how you address these inequalities – this means that solutions need to be equitable, inclusive and consider the economic opportunity and social benefit.

Urban forests, for example, can be a source of social equity as well as a positive force for the environment. In what neighbourhood trees are planted, how you plant them and even who you pay to plant them can have a positive impact on low income communities. Can these neighbourhoods be cooler in the summer, can their public spaces be better so that people of all income backgrounds can enjoy and use them and thereby help people be healthier? Can you undertake these programmes in a way that hires local people to do the work? If so, you will also be helping mitigate and adapt to the climate change that is already occurring and building needed (and significant) resilience into our cities.

Finally, the impacts of both pandemic and of our environmental challenges show that cities need to be adaptable and flexible. We know that the best are built around a very strong public transport network, because if you have a network, people can choose to live in different neighbourhoods and still be part of the life of the city. Flexibility in planning matters as well, and the role of natural infrastructure, sometimes called green infrastructure, is critically important. The city of Boston for example, is facing sea level rise that is very serious. Boston was built essentially below sea level and is now building new public parks to accommodate extreme weather events. The parks are in low income neighbourhoods and provide better communities for people to live, more activities for children and better green space.

These kinds of programmes build cities where people from all backgrounds can live meaningful lives – and lives with clean air, clean water, and a good environment. These are the types of cities that people want to live in – and Mayors want to help build.



Sebastian Mejia  
*Quasi oasis*

The palm tree caught my attention because it is immediately recognizable and yet an incongruous presence in Santiago de Chile. It is a powerful vertical line marking the urban landscape. The trunk rising up above translates a strategy for survival: concentrating the energy in order to reach high up for sunshine and avoid the shade of surrounding trees, an interesting evolutionary solution. The way in which it defies gravity is also moving to me. We are all confronted to similar constraints, and the palm tree elegantly handles them, reaching up above our heads like a monument that has witnessed the city changing at its feet.





## The Role of Cities

Luis Pimentel

To say that cities represent man's identity card, one of humanity's greatest inventions and that they have contributed substantially to shaping the lives of each of us, is stating the obvious. It is precisely through the history of cities that we can trace our main characteristic, the fact that we are nothing but social animals, along with our need to create social networks and to connect with each other. This essential factor is present in our genetic codes.

In his books "The Social Conquest of Earth" (Wilson E.O., 2012) and "The Meaning of Human Existence" (Wilson E.O., 2014), the biologist Edward O. Wilson explains how man, as well as certain species of social insects such as ants, are examples of "Eusocial" species. This rarely recognized phenomenon in the history of our planet has allowed a particular evolutionary path. Species denominated "Eusocial" are communities which through collaboration, communication, training of individuals - who live with different generations of the same species - and where there is a subdivision by work tasks, have the peculiar characteristic of carrying out acts of altruism for the benefit of others even if not directly for the benefit of the individual animal itself. Through Wilson's theories, which illustrate the history of other animal communities, we can also partly understand our own nature as a community. We can see how cities in their various developments and conformations throughout the history of humanity have accompanied us by demonstrating themselves to be a product that is more extraordinary and obvious than the evolution of man itself.

Cities are the means through which encounters are generated. In fact, Sociologist Richard Sennett defines the city as: "... a human settlement in which strangers are likely to meet" (R. Sennett, 2018).

Historically cities have always been the cradles of great social achievements, that in contemporary terms, we would describe them as sort of *incubators of innovation*. The invention of democracy in ancient Greece comes to mind as a method of management, control, and sharing of power as well as

of consultation between the different social castes. In addition, it was a method of governing frictions generated by the intensity of human exchanges in the “urban” Athens of that time. During the Renaissance, the emergence of outstanding cultural and artistic advances, a manifestation of humanism had as an epicenter the city of Florence. This also coincided with a period of economic well-being and intellectual development through a process of the creation and transmission of artistic knowledge which has certainly borne fruit. Just think of characters like Leonardo da Vinci, Michelangelo Buonarroti, and Sandro Botticelli.

Even today it is cities that act, as a result of the accumulation of human and intellectual capital, as hotspots for the creation of tremendous technological advances. Like cities in “Silicon Valley” such as Cupertino, Palo Alto, and Mountain View, which together with San Francisco and Universities such as Berkeley and Stanford create a real corridor of technological innovation as stated by Manuel Castells.

In all these successful cases throughout the history of humanity, it is clear that cities have been leading human achievements: they have been the focal points for the intensity of exchange, the accumulation of human capital, and the concentration of diversity and educational systems, all of which have allowed the taking of fundamental steps forward for our evolution through the organization and dissemination of a set of shared values.

Despite these success stories, it is only relatively recently that the world’s population has undergone a shift towards cities. Richard Sennett, Ricky Burdett, and Philipp Rode have defined our historical period as the “Urban Age” - another way of describing the Anthropocene – as part of a lengthy research study carried out by the London School of Economics which looks at the transition of populations to cities (R. Burdett, P. Rode, 2018). Through a historical excursus on the evolution and growth of cities starting from 1900 where only 10% of the population was resident in the city, LSE research suggests that in 2050, the resident population in cities will reach about 75%. As early as the 18th century, cities began to witness one of the first great transmigrations from the countryside, with all its associated difficulties. In London for example, had the largest number of inhabitants during that century, before the installation of the sewerage system life expectancy was about 40 years of age for men and 42 for women, while between 2017 and 2019 life expectancy rose to 80.9 (Office For National Statistics, UK).

Even more recently, cities have become symbols of the failure of modernity’s vision of urban planning and of progress: think of the wave of violence due to crime and drug abuse in New York in the 1980s, or the failure of De-

troit as the result of industrial dismission that began in the 1950s - and it's still visible -, or the contrasts between the centre of Paris and its suburbs in terms of social and economic conditions.

Cities are the challenge of the future. If it is true that they represent the source of about 75% of global carbon dioxide emission production (UNEP, web), it is also true that they are the centers of progress and economic and political power. Thus they represent the real challenge for coming decades as places where the transformative power of human nature is emerging most strongly. For their very survival, cities must necessarily make a transition from being the cause and victims of the global climate crisis to the keystone regeneration process that we as a species are in dire need of.

Cities will be in dire need of reflecting on several fundamental aspects, these include adaptation and resilience to every possible climatic risk, issues of public health (not only in terms of pollution but also being able to deal with future pandemic events) (UN SDGS Report 2020), the integration processes of different communities and future migratory flows, and finally urban ecosystems, environmental services, and biodiversity.

### *The political role*

Despite the numerous failures associated with cities and planning, there are still theorists who are optimistic about their future roles. One of these is Edward Glaeser, an economist specializing in the study of the role of cities in the transmission of ideas and the creation of well-being, who tells us how cities have been successful thanks to the force generated by the powerful weapon of human collaboration, to ideas whose transmissibility increases in denser environments (E. Glaeser, 2011). Cities can attract different levels of socio-economic population, precisely by virtue of their centralizing force, but their social discomfort could be often experienced both in the suburbs and in the central areas of large cities. This comes as no surprise. It will always be both a challenge and the great strength of cities, evidence of the transforming power of these great “platforms of opportunity”.

By entering the *Urban Age* we are rediscovering the power of cities and their political role, and if we recognize their innovation potential, we should also promote their potential in drawing up global policies, their pragmatic ability to solve problems, to adapt to environments, and to the demands of their inhabitants. Today we are experiencing a renaissance of city-states, driven by the concentration of economic capital and political power as well as the creation of new networks of territorial relations around the world. In fact, cities are the engines of progress in the era of globalization, and cities,

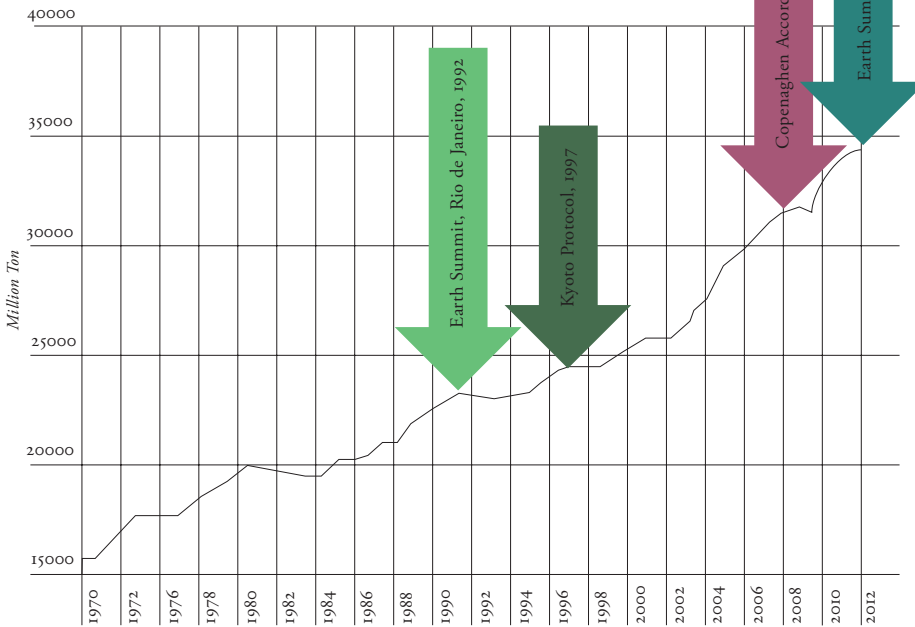
whose borders are no longer visible, are redesigning the world in almost total autonomy from central powers. We are entering an era where cities matter more than nations, and flows of goods and human capital will count more than those same borders that divide countries. (Khanna P., 2016).

Unlike nations, it has been cities that have increasingly acquired a leadership role in the fight against the climate crisis in recent years. More than a hundred years after the discovery of global warming, more than thirty years since NASA scientist James Hansen gave evidence of the effects of greenhouse gases in the atmosphere and after about two decades of climate diplomacy, to date, there has been very little verifiable progress. Today, cities are on the frontline of climate change and are also well-positioned to play a leadership role in driving global actions to battle the climate crisis. An example of Cities' leadership on climate change is the coalition called "We are still in" - led by the former New York City Mayor Michael Bloomberg and the California governor, Jerry Brown -, where cities and states have autonomously pledged to follow the Paris goals when Trump's administration decided to the withdrawn U.S. from the COP21 Agreement.

Cities need to connect further within networks and organizations and create synergies that can help them address issues related to resilience, social inclusion, and the achieving of the minimum objectives regarding accessibility to nature. Examples such as C40 (Cities Climate Leadership Group), one of the most important virtuous networks for the future of cities. It is a global network of cities that allows the implementation of concrete actions against the effects of the climate crisis. Started in 2006 through the work among others, of former London Mayor Ken Livingstone, the network had the support of about 20 cities while today it includes about 96 cities all over the world. The potential of city networks is vast: it allows the exchange of good practices, the transfer of technologies, and the promotion of partnerships between the public and private sectors. To cite just one example, the standards set by C40 members for clean energy buildings in waste management and sustainable transport systems substantially exceed existing standards set by intergovernmental negotiations.

Other organizations such as Resilient Cities Catalyst, the World Mayor Council on Climate Change, the Sustainable Cities Network, FAO, ICLEI, Global Platforms, and Sustainable Cities, and many others have accumulated sufficient experience and organizational influence to make a significant mark in 2018 in international arenas such as COP24, the United Nations Conference on Climate Change. In addressing climate change in mitigatory and adaptive terms, institutions and large international organizations recog-

## CO<sub>2</sub> Global Emissions (1970 - 2013)



Source: EC, European Commission, Emission Database for Global Atmospheric Research (EDGAR)

nize the central role of cities. This concerns both direct relations regarding planning, design, and management of urban areas, as well as the ecological, cultural, economic, and political responsibility for decisions regarding the governance of the territory, which goes far beyond the limits of the actual physical influence of cities. These networks of consolidated cities allow the transmission of complex methodologies and the creation of new ideas, the use of immediate techniques and solutions that can be applied on a large scale to other urban situations within the same city network, thus reducing the enormous commitment that the drawing up of a plan from scratch would entail. Connections and relationships between cities make it possible to strengthen their resilience and their adaptive response, intervening in a preventative manner on future risks and their possible consequences.

### *Planning or no planning*

It is highly likely that the historical obsession with creating “ideal” cities or pieces of architecture and utopias closely linked to the idea of a perfectly

functioning, peaceful, and progressive society is part of a profound need to imagine new ways of living together. From the very beginning of Western thought, we have been engaged in creating or imagining the ideal society which has its greatest imaginative expression in the ideal city. Thomas More in his book (*More T.*, 1516) describes the island of “Utopia” as discovered by a member of Amerigo Vespucci’s crew in the lands of the New World. The island contained 54 cities and was an example of representative democracy with the coexistence of different religious beliefs and equality as its foundation, an example of a socialist state in which private property did not exist and there was access to health and education for all. Even long before More, Plato’s “Republic”, around 370 BC, the ideal city was the one that reflected the “kosmos” on the one hand and the individual on the other. The ideal city or “polis” was based on justice and human virtues. It was a form of social and political organization that allowed individuals to maximize their potential, serve their fellow citizens, and live by universal laws and truths. For the philosopher, the ideal form of the city was inseparable from its political form, both in strength and form.

Despite the evidence that imagining functioning ways of living and of cities in history, is something that today can be translated academically into the discipline of planning. Urban planning as a practice has gone through huge theoretical and ideological conflicts, due mainly to major failures that have resulted in considerable mistrust towards the discipline, especially in terms of the ability - or inability - to control, administer and prepare for understanding the present and even more, the future of cities. Urban planning has also been harshly criticized because of regulatory tools that far too often are considered slow, outdated, and sometimes ineffective, regulatory systems that too often lead to delays in the execution of actions that, effectively nullifying their role and significance. Criticisms of planning as a discipline arise to the point of the creation of a “negationist” version known as the Non-Planning (Fontenot A., 2015) the critics have come even from well-known figures outside the discipline such as Friedrich August von Hayek, Nobel laureate in economics in 1974, one of the greatest critics of state intervention in economics, with relative repercussions in terms of urban planning. Jane Jacobs was also contrary to the classical tradition of planning. In *The Death and Life of American Cities* (Jacobs J., 1961) says: “Since theoretical city planning has embraced no major new ideas for considerably more than a generation, theoretical planners, financiers and bureaucrats are all just about even today. And to put it bluntly, they are all in the same stage of elaborately learned superstition as medical science was early in the last century, when physicians put their faith in bloodletting, to

draw out the evil humors which were believed to cause disease.” For Jacobs, this is first of all because where planners assume that essential information in planning decisions can be obtained through abstract principles and statistical aggregates, she emphasizes the importance of local knowledge, for people on the spot. Second of all, argues that decentralized planning is the best way to get the local knowledge needed to reap the best benefits from it in terms of design insights. Another well-known figure who declared the failure of urban planning was Rem Koolhaas, who in “What Ever Happened to Urbanism?” (Koolhaas R., 1995) wrote: “In spite of its early promise, its frequent bravery, urbanism has been unable to invent and implement at the scale demanded by its apocalyptic demographics. In 20 years, Lagos has grown from 2 to 7 to 12 to 15 million; Istanbul has doubled from 6 to 12. China prepares for even more staggering multiplications. How to explain the paradox that urbanism, as a profession, has disappeared at the moment when urbanization everywhere – after decades of constant acceleration – is on its way to establishing a definitive, global “triumph” of the urban condition?”

Despite following this rather rocky route along which planning as a discipline has been severely damaged and criticized due to the inadequacy of its tools as well as the failure of great urban projects promised by the progress of modernity, in recent decades it has become clear that increasing attention is being paid to the issue of planning and adaptation. This is also due to the ever more urgent issue of the climate crisis, which has forced the disciplines of planning and design to necessarily rethink and update both their tools and their theoretical foundations. Sustainability and resilience have become authentic guiding principles of urban design.

Yet, today we find ourselves in the need to recognize the role of pioneers, that with their foresightedness, and their particular interest in nature, at such a moment in history, manage to start a very particular current in the field of planning: Around 1890's Ebenezer Howard and his Garden City, a balanced vision that sought to integrate, in the midst of a capitalist market-based economy, the pros of a city and that of living in contact with nature, he tried to answer the question of “How to restore people to the land” as manifested in *Garden Cities of Tomorrow* (Howard, E., 1989), simple yet revolutionary question. Even before - around 1850 - Frederick Law Olmsted, today considered the father of American landscape architecture, was one of the first to promote the value of public parks, not only in terms of aesthetics or even recreational value but actually as part of the strategy of urban design thought together with a reform of sanitary guidelines in the United States - of which he played one of the leading roles-. Parks were to be the “lungs of the city” where to breathe





clean air; And not to forget, Sir Patrick Geddes wrote “Our greatest need today is to see life in its entirety, to see its many sides in their right relationships; but we must have a practical, as well as a philosophical interest in such an integrated vision of life” (Mairet P., 1957). Geddes, advocated a design approach that included “bio-regional” integration as well as cultural and worldview changes. This was an invitation to collaboration and multidisciplinary, a synthesis of knowledge that incorporated economic, social, and cultural considerations in an understanding of the ecological limits of the biosphere. It was similar to the study “Limit to Growth” (Meadows DH, Meadows DL, Randers J., 1972) which saw the collaboration of a team of researchers from all over the world in an attempt to understand the limits of our existence on Earth in terms of resources.

Precisely in light of the role that cities have assumed over the centuries in terms of human and technological progress, urban and/or architectural design can and must act as a glue or binding agent between different disciplines and facilitate a cultural transition towards sustainable human civilization during the 21st century.

### *Resilience in Planning*

The inclusion of concepts such as resilience in planning and in particular the lexical and methodological changes within the discipline, are not to be considered as exceptional events but rather as intrinsically connected to social, cultural, and design approach changes. The word *resilience*, originally used in contexts related to the fields of research, ecology, psychology, and physics, meant the measurement of the ability of systems, objects or individuals, to survive external irruptions or disturbances while maintaining acceptable levels of functionality and promptly returning to previous operating levels. Resilient systems are also characterized by their ability to learn and adapt: when a human or ecological system loses its resilience, it becomes increasingly vulnerable to disturbances that could previously have been absorbed.

Although resilience has been explored in many areas, it has only recently been applied to describe a condition of adaptation and responsiveness within an urban context. The importance of resilience in the metropolitan environment has also been underlined by several United Nations documents, including the New Urban Agenda adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador in 2016, in which numerous stakeholders and institutions supported the commitment to develop policies, programs, plans and actions for the “construction of urban resilience”. This concept was also echoed in the Sustainable Development Goals developed by the United Nations, the so-called

SDGs, which propose the adoption of resilience plans by cities in line with the Sendai framework for the reduction of 2015-2030 disaster risk (SDG 11) and the development of resilient infrastructures with which to support sustainable development (SDG 9) (UN Department of Economic and Social Affairs, 2015). It is also fundamentally important to consider resilient and responsive systems that apply to all those informal settlements which make up the first form of access and entry into urban life for millions of people, but which unfortunately are more subject to the effects of the climate crisis, thereby worsening the quality of life for their inhabitants and exacerbating conditions of extreme discomfort. Following what has already been said about Geddes' thinking, and integrating it with the concept of resilience and therefore of interconnectivity between the various biological and anthropogenic systems, it is entirely possible to hypothesize that individual cities cannot be considered "sustainable" or "resilient" without taking into account their dependence on ecosystems and resources in other regions of the world. If this was genuinely at the heart of urban planning, it would force a change of approach that would impact heavily on a local and regional scale, taking into consideration the responsibility for global connectivity in environmental terms, and the footprint of cities in terms of resource consumption.

The (positive) transition to urban resilience mainly covers four domains. These are 1) the urban landscape and urban ecosystems, including the supply and use of ecosystemic services, 2) infrastructures, which include buildings and services, 3) people, communities and their capacity to reclaim, thrive, and innovate and 4) Institutions and governance, which are not limited to adaptive governance but rather include collaborative decision making and collective and individual behavioral changes. Finally, it is essential to reiterate the importance of the ability to involve the community in the proposed initiatives and the propensity of intelligent governance concerning decision-making processes aimed at coordinating and negotiating initiatives with the various players involved in the urban environment. Very often, however, these initiatives remain confined to an urban scale and interact and integrate with the natural capital on a regional and national scale with great difficulty.



Lorenzo Zandri  
*Vegetal Resistance*

The urban forest is increasingly recognized for its economic and social value as well as its environmental and historical benefits; despite it, many green areas are still struggling to expand themselves spontaneously, especially those ones at the edges with other kind of infrastructures or confined zones. 'Vegetal Resistance' is an ongoing visual research investigating significant and curious examples of green resistance in different urban scenarios of London. From some old and well-known historical trees to other anonymous bushes and greenery, generally most of them appear to be suffocated and trapped in the urban context, living in a physical sense of constraint. Partially led by the human hand, others have been activated a process of appropriation of the surrounding sole, growing around - instinctively and not - and generating a process of natural invasion of the built environment.







## Urban Forestry - An introduction to a landscape ecological urbanism approach

Livia Shamir

On June 30th, 2021 in the town of Lytton in British Columbia, Canada, a heatwave record was set when the temperature hit 49.6 °C degrees and lingered over three days. Authorities attributed hundreds of deaths across the region to the heat, even before wildfire arrived and burnt most of the village to the ground.

Before the flames approached one local told the *New York Times* that she'd noticed green leaves dropping off the trees, apparently unable to tolerate the heat. On the coast to the west, millions of mussels and oysters cooked and died in superheated shallow waters.

Human settlements are critical sites in understanding global ecological change.

Humanity became over the last century an urban species; more than half of the global population, counting today around 4.4 billion people, now live in cities (United Nations, 2018), and by 2050 two-thirds of it is projected to be living in urban areas.

The next 1.5 billion people, expected between 2020 and 2040 will all be urban and half of them will be joining the urban poor conditions. Eighty-three percent of this population growth is expected in Asia (52%) and in sub-Saharan Africa (31%).

Meanwhile, two colossal changes are heavily influencing a global condition. On one hand, a huge urbanization process is leading to changes in land occupation, topography alterations, and consumption of resources; on the other, there is a disruptive degradation of natural systems concerning biodiversity deprivation, macro and microclimate changes, freshwater droughts and an increase in pollution.

Addressing such trajectories means reconsidering and interconnecting large-scale environmental transformations while rethinking urban agency at large.

As explained by Chris Otter in “The Technosphere: A New Concept on Urban Studies” (Otter, C., 2016), the entire planet and its atmosphere have been subordinated to the metabolic demands of large human settlements.

While urban activity is globally considered responsible for climate change, the effects of climate change are most noticeably suffered within cities.

Otter argues in this instance that cities cannot be considered as sole agents, recalling instead a much bigger responsible entity, the Technosphere. The Technosphere is a fossil-fuel-powered artificialized environment that includes the total of Earth’s physical infrastructure and thus the network of cities and smaller human settlements. In this foresighted interpretation, agency related to climate change is part of a distributed process which concentrates in knots, disperses across networks, and refers to biological, chemical, and physical interactions.

Within an urban space, an infinite amount of interactions among organisms, built structures, and the physical environment are constantly happening. In this case, organisms include microbes, plants, and animals; built structures entail all the human-related constructions; while physical environment refers to air, water, soil, and to invisible elements such as sound (Forman R.T.T., 2014; Hardoy et al., 2004). Humans act here as other biological agents that harness and channel infinite reactions.

Urban Ecology, which emerged as a scientific discipline in the 1970s thanks to the work of two farseeing botanists - Paul Duvigneaud and Herbert Sukopp -, has studied these diverse interactions gaining tremendous significance and leading ultimately to integrative approaches towards understanding cities as systems that necessitate trans-disciplinary approaches and solutions for the transition towards resilience sustainability and responding to growing disruptive climate change effects and scenarios (Wu et al., 2014).

It is of major importance to envision the urban ecology subject on two spatial scales: the regional/metropolitan scale and the urban area scale. Cities lie at the centre of urban regions, areas of active interactions between cities and surroundings (Forman R.T.T., 2008). Metropolitan areas, the continuum of a city and its adjacent suburbs, are surrounded by a regionally interdependent ring. These entities are closely tied together by in-and-out flows and movements. This approach involves understanding large-scale systems first and allowing them to inform smaller-scale ones, in order to develop schemes able to engage with ecological and social dynamics.





Understanding how climate change affects the complex metropolitan and urban ecosystem structure, metabolism, and services requires a diverse set of expertise currently found within the expanding boundaries of urban ecology (McPhearson et al., 2016).

In this context, changes in urban areas can forecast modifications driven by global environmental changes, and building urban ecological models can help identify biophysical metabolic patterns and processes (Collins et al., 2011).

Cities are incredibly vulnerable to shocks and stresses associated with climate change. Within urban areas growing phenomena such as extreme weather, heat waves, elevated CO<sub>2</sub> levels, heavy rain and droughts as well as natural disasters, potential resource shock, or scarcities (Russo A. and Cirella G., 2018) are felt more acutely.

With average temperature rising globally, cities will experience the worst scenarios, with a projected increase between 2 °C and 4.5 °C above current levels. As the world warms, the effects of climate change will grow and become more and more unpredictable, leading cities and their dwellers to mitigate damages, adapt, and survive the hostility of the urban environment.

In cities, the built infrastructure is often overestimated as a line of defense and technical solution against hazards and disasters. Globally, urban infrastructure is aging and often proving inadequate while a static response for protecting city dwellers and ecosystems.

In contrast, green infrastructures (GI) in urban areas result in far more flexible, diverse, and ecologically based elements (Felson et al., 2013). Nature, especially living nature, has dynamic features, it is in constant change, displaying a self-sustaining development and trees play many roles in urban ecosystems.

In 2010 Mohsen Mostafavi promoted the concept of ecological urbanism to imagine an approach that had “the capacity to incorporate the inherent conflictual conditions between ecology and urbanism” (Mostafavi and Doherty, 2010). In “Ecological Urbanism” Mostafavi drew strongly on landscape ecological urbanism, offering a potential strategy to bring ideas from landscape urbanism and urban ecology together to create new territories able to reflect natural and cultural processes concurrently.

Landscape urbanism was largely the invention of Charles Waldheim, who coined the term in 2006. As a student of architecture at the University of Pennsylvania in the 1980s, Waldheim was influenced by Ian McHarg and James Corner, both engaged at the time in a heated debate

about the future of landscape architecture (Wheeler S.M. and Beatley T., 2014). In the Landscape Urbanism concept, Waldheim integrated McHarg's ecological advocacy together with Corner's urban design vision.

According to Frederik Steiner (Steiner F., 2011), landscape ecological urbanism suggests three possible research directions: an evolution of aesthetic understanding, a deeper understanding of the human agency in ecology, and reflective learning through practice.

Further advancements opened then theoretical developments, addressing key concepts such as urban metabolism, ecological and biophilic cities, bio-mimicry, and material coupled human-natural systems relations.

Assuming urban ecology and landscape urbanism as acknowledged holistic concepts and practices, it became hence necessary to insist on an overall new biophilic and green urbanism approach, referring to natural elements as purposeful features in urban landscapes, able to address increasing climate change challenges and local ecological processes.

Starting from awareness of the longstanding practice within urbanism of relying upon the relation between the built and the natural environment, suites of concepts and approaches have been launched over recent years to promote urban nature and green cities.

By way of example, the objectives identified by the United Nation Millennium Development Goals (MDGs) should be remembered, within which urban greenery has been included in a broader context relating to the value of the landscape to be protected and considered essential for the maintenance of urban biodiversity (United Nations, 2000).

In 2015, the importance of urban areas as living environments for most humans was reflected by the United Nations Sustainable Development Goals (United Nations, 2015). Among these, Goal n.11 highlighted urban areas, under the heading 'Making cities inclusive, safe, resilient and sustainable'.

Subsequently, Nature-based solutions were clearly defined for the first time in the final report of the Horizon 2020 Expert Group as "solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions." (EC, 2015).

The concept of Nature-based solutions embodied new ways of approaching the restoration of degraded ecosystems, socio-ecological ad-

aptation, improved risk and resilience management, with equal reliance upon social, environmental, and economic domains.

In order to implement the urgent transition to more sustainable and green cities, it is necessary to insert Nature-based solutions within a new paradigm of thinking that makes the design, development, and sustainable management of our cities possible. Nature-based Thinking (NBT), a new concept stated by Randrup and Konijnendijk (Randrup T.B. et al., 2020), requires a holistic and trans-disciplinary approach, drawing on the ecological transition of cities by considering the interconnection between the social, cultural, ecological, and economic dimensions, thus allowing a new long-term broader and inclusive vision of urban nature.

As multifunctional Green Infrastructure (GI), Urban forests are considered among the most efficient Nature-based solutions (NBS) that could play a crucial role in coping with various urban climate-change-related urban stressors mentioned before.

Urban and peri-urban forestry (UF-UPF) is the practice of managing metropolitan forests, to ensure their optimal contribution to the physiological, sociological, and economic well-being of urban societies.

Urban Forestry is an integrated, interdisciplinary, participatory and strategic approach to planning and managing forests and trees within cities and in their surrounding areas. It includes assessment, planning, planting, maintenance, conservation and monitoring of urban forests and can operate at different scales, ranging from individual trees to landscapes (including street trees, trees in parks and gardens, forests, and other natural areas and green infrastructure).

Urban forests are the backbone of Green Infrastructure (GI): they connect rural and urban areas while improving the city's environmental footprint.

In “Guidelines on urban and peri-urban Forestry” (FAO, 2016) five main typologies of UF are clearly classified: Peri-urban forests and forests; City parks and forests (>0,5ha); Small parks and gardens (<0,5ha); Trees in streets or squares; Other green areas with trees.

Within urban and peri-urban contexts, forests and trees can make important contributions to the planning, design, and management of sustainable and resilient cities and landscapes (FAO, 2016).

To these typologies, a sixth element, that of living infrastructures, should be included. Green buildings, green walls, and green roofs represent an efficient urban forestry strategy, capable of multiplying the number of vertical and horizontal urban surfaces dedicated to greening.

These new urban models support the variety of living species, apart from humans.

It is common knowledge that forests, trees, shrubs, and vegetation in general provide human beings with a vast range of key benefits (Nowak et al., 2008; Elmqvist et al., 2013). The mere aesthetic-social and recreational considerations of urban greenery have long been outdated; urban forests are recognized as providers of Ecosystem goods and services (ESS). In fact, the value of urban forests is recognized in providing environmental, economic and social, and health-related benefits and services which, correlated to each other, contribute to the construction of a sustainable and resilient city.

From an Urban Ecology point of view, we could consider Ecosystem Services (ESS) as the wide range of benefits that flow from nature to people within cities. ESS can be divided into provisioning benefits (e.g. clean air and clean water, food supply, material provision), regulating benefits (e.g. climate regulation, water regulation, disease control, nutrient cycling, pollination, and fertile soils), and social benefits (e.g. well-being, cultural and spiritual benefits, recreation). The range and flow of these benefits depend largely on biodiversity and ecosystem condition (EU, 2019).

Trees and woody vegetation function as carbon sinks by sequester and store CO<sub>2</sub> through their photosynthesis process (McPherson E.G. and Kendall A., 2014). The physical presence of urban forests can impact local microclimates through direct temperature mitigation and moderation on urban heat islands (UHI) (Armson et al., 2012), helping cities cope with extreme heat events (Stone et al., 2014).

Urban forests are a key green infrastructure tool in the management of stormwater during intense rainfall events (Livesley et. al., 2016), and in the insulation and shelter capacity from the wind, allowing buildings' energy consumption to decrease thanks to an improvement in internal comfort and less use of air conditioning and heating. Another important ecosystem service provided is air pollution reduction (Nowak et al., 2013, 2014); whereas vegetation contributes to the removal of air pollutants (NO<sub>x</sub>, SO<sub>x</sub>, O<sub>3</sub>, PM<sub>10</sub>, PM<sub>2,5</sub>) absorbing them through the stoma or capturing fine dust on the leaves' surface.

Many plant species are able to absorb the pollutants present in the soil thanks to a phytoremediation process.

Trees and vegetation include a noise mitigation action, providing natural habitats with a consequent increase in local biodiversity, and improving the urban and peri-urban landscape.

A global understanding of the ecology of Urban Forests -their composition, functions, services, structure, and their ecological interaction with the urban environment- is essential for wise planning and management of this resource.

Green Infrastructure (integration, strategic planning and the delivery of networks of connected greenspace), Nature-based Solutions (technological, scalable design solution inspired by nature), Urban Forestry (the planting, maintenance, care and protection of urban tree populations) and Ecosystem Services (a systematic overview of benefits for humans) need to be placed in a broader framework, a new comprehensive paradigm on how we develop, design, and manage spaces, looking at the relations between the technosphere, cities and nature in a more cyclical way and deriving inspiration from nature with its long-term and cyclical ecological processes.

The massive demand for new infrastructures related to urban population growth and a growing environmental crisis represent therefore a key opportunity for using broader nature-based and ecological approaches, understanding how the many interacting components and subsystems together create patterns and processes able to influence the Technosphere's system dynamics.

The Technosphere concept, matched with an adaptive ecological urbanism approach, appears particularly relevant at this time, as it implies forms of territorial outposts of very large portions of territory, guaranteeing and soliciting forms of cohabitation and habitability of natural landscapes that are different, distant but still linked to the urban core.

## Tirana 2030

Tirana, Albania / 2015 - 2017

Stefano Boeri Architetti

In 2014, Stefano Boeri Architetti was awarded the Masterplan for the City of Tirana. The Tirana 2030 project (TR030) is the vision for the future of Tirana in the guise of a plan for reconquering the landscape.

Promoted by the Central Government and drawn up in close collaboration with local administrations, the TR030 is part of a programme that will affect all the major Albanian cities, but which will be a serious litmus test for the city of Tirana. This, after all, is a region which following the fall of the communist Enver Hoxha regime in 1991, experienced a decade of institutional urban chaos in which the confirmation of a “reclaimed” right to private ownership was effectively transformed into an unregulated and headlong rush resulting in the construction and dilapidation of large interstitial areas of land.

Although Edi Rama, former mayor of Tirana between 2000 and 2011 and current Albanian Prime Minister tried to stem the effects by pushing through precise and timely land reorganization initiatives and the reclamation of public spaces, the building boom has continued to expand in neighbouring towns and cities. The administrative reform of 2014 may have filled that gap but it has presented another situation: the new borders of Tirana have in fact expanded to cover the area by a factor of twenty-five, including areas within it of extremely diverse intensity and polarizing the city into consolidated dense chaos on one hand and poorly populated peri-urban areas on the other.

This “kaleidoscopic city” may well be able to count on a new coordinated plan for its own management, with a wider remit. The TR030 consists of three elements: a metropolitan Fresco based on 10 broad themes (biodiversity, polycentrism, widespread knowledge, mobility, water, geopolitics, tourism, accessibility, agriculture and energy), an Atlas comprising thirteen strategic projects solidly set within the territory, and finally a Charter developed around five existing metabolic systems (nature, infrastructure, city, agriculture and water).



*Tirana 2030, Stefano Boeri Architetti, 2015*

The main objective concerns a necessary and no longer avoidable containment of soil consumption, the discontinuity of urban fabric, the fragmentation of the built environment and possibly the exploitation of a certain level of verticality to further free up ground space. The Tirana city buildings are not particularly high yet their density is one of the highest in Europe, as if they had been compressed while sacrificing all open spaces. Utilising the void to generate public space is therefore the key, along with focusing equally on nature and agriculture, to enhance diversity around the new urban boundaries.

The project's approach to Nature led to a number of different strategies. These include the following: an unbroken circular system of woods, intended to establish three million new trees around the metropolis by generating a limited boundary beyond which no building construction is permitted and which would include parks and protected natural oases for preserving and sustaining the existing biodiversity; new ecological corridors along the Lana, Tirana and Erzen rivers; a circular green ring at the centre of greater Tirana intended as a linear public space for movement and connected with the revitalising of minor towns and villages as a widespread network of tourist, agricultural and productive centres in communication with the green areas. This last concept is an integral part of the greater theme of Tirana as a polycentric city, as well as urgent issues such as mobility and accessibility (in a city expanding without rules in which the most essential urban structures are often absent). The project's approach to polycentrism is developed in different ways. On a larger scale it envisages new metropolitan production areas outside the city as well as expansion dedicated to culture, city services and leisure.

## San Marino 2030

The Republic of San Marino / 2016 - 2019

Stefano Boeri Architetti

In 2016 Stefano Boeri Architetti was commissioned by the Republic of San Marino to draft the new General Plan for territorial and urban development.

San Marino is located in a particularly striking and unique territorial setting. It is rare if not impossible to find such unmistakable elements as the Rocca and the city's historic centre, the slopes facing Montefeltro and the plain below anywhere else in Italy, along with a formidable variety of microcosms which contain an entire autonomous state all in such a small area of land.

For more than two decades, San Marino has been deprived of Regulatory Plans and has undergone urban changes and transformations that are inconsistent with the ecosystem and biodiversity in which it is set. A similar anthropization of the land has profoundly changed its natural structure by reducing 10% of wooded areas, making them extremely fragmented and lowering the quality of the water in streams which are now heavily compromised by urban and industrial discharges.

Amidst mountains, rocks and plains, the San Marino 2030 Plan developed from the enhancement of the Republic's important environmental resources and agricultural landscape, giving rise to the concept of a development oriented towards the vision of a "Garden of Europe" and a "Microcosm of biodiversity". The strategic project concentrates its strength on the aim to generate new relationships in a wider context formed by a range of territorial conditions. The "mosaic of landscapes" is thus the cornerstone on which to establish territorial, spatial and urban attention. The sense of reciprocity between urban centres and castles allows San Marino to develop as a multi-centred territory based on a series of actions aimed at generating, reconsolidating and enhancing the existing building heritage.

In fact, the geological matrix of San Marino is characterized by the widespread presence of gullies and ravines – 11% of the territory – and by

frequent landslide phenomena caused by poor maintenance of the land and its abandonment. To deal with this condition, the project envisages the identification of areas of potential instability and particular seismic vulnerability which are then subjected to the application of a series of regulations aimed at making them secure even in cases of natural disasters.

In this context, a specific role is reserved for agriculture, an activity historically present in the City of San Marino, but also for its role in determining territorial quality control. Today confined to a marginal role – 10% of rural areas are in fact uncultivated or underutilized – and fragmented in distribution terms, agriculture is reviewed by SM2030 in a new sustainable and active form, based on the multifunctionality and differentiation of products and with the objective of transforming it into an agri-environmental model. The last essential point of the intervention program is the total redefinition of energy policies. Currently deprived of its own energy production plants and without sources of fossil fuels, the Republic is totally dependent on the importation of this resource from outside, while a similar condition affects waste disposal and water supply. SM2030 therefore plans to transform San Marino into a self-sufficient and cutting-edge model in the use and production of clean energy.



*San Marino 2030 (SM2030), A garden for Europe, a microcosm of biodiversity, Stefano Boeri Architetti, 2016*

## The Green River

Milan, Italy / 2016 - 2017

Stefano Boeri Architetti

In 2014, the Municipality of Milan and Sistemi Urbani (the National Railway system Group) invited a number of Architectural firms to provide a vision for the former railway yards system that all together occupy more than 1 million square meter within the dense urban environment of Milan.

On this occasion, Stefano Boeri Architetti provided the vision called Fiume Verde, by considering that the seven freight terminals could, thanks to the continuous system of large spaces linked by the unused railways, engage in the transition to a polycentric metropolis capable of offering its inhabitants an advanced balance between the natural sphere and the urban sphere.

The core of the vision is to create a continuous system of parks, woods, oases, vegetable gardens, and areas for sports and rest - linked by green corridors created on the buffer strips of the railway tracks - which occupy the greatest part of the seven abandoned freight yards. A real “Green River” that could loop through the urban body of Milan.

On the perimeter of this “Green River”, it was envisioned to build high-density urban borders, which further enrich the city with new services, on a metropolitan and neighborhood scale, in an idea of living and of a city that is accessible and usable for citizens of all ages. The new stations, as landings of the great river, could accommodate neighborhood libraries, day centers, highly recognizable and accessible spaces, networked together could become new reference points for the neighborhoods, adding also the much-needed offer on housing: a quota of 3,500 innovative apartments at a controlled price for students, young couples, city users, creatives.

The Green River project also proposes to create a circular path ring-road and a public rail mobility line (a circle line that while intercepting the underground networks partially overlaps the existing Passante Fer-



*The Green River*, Milan, Italy, Stefano Boeri Architetti, 2016

roviario) able to connect the intermediate districts of Milan that today remain unconnected.

The occasion of the seven disused railway yards, combined with that of the barracks reuse, cannot be dealt with as an ordinary question of standards, of GFA (Gross Floor Area), or functional destinations, as if it were a simple operation of “recovery” of state property. Without a large unitary project, without a Fresco that anticipates the future of all these areas in a unique vision, there is a risk of losing the potential collective value as a public good that these areas hold. Thinking of a large Green River that connects eight new parks/oases, therefore, means abandoning a quantitative logic of unlocated “building rights”, entering a planning logic that decides that construction must always take place on the edges of large central green spaces. That means deciding that at least 90% of the surface must be green (much more than the 50% foreseen in the regulation agreement for this area), a result that can be reached by an increase in density and height (and therefore also the intrinsic value of real estate near or overlooking a large park) of the building volumes.

The Green River imagined in the heart of the city, a continuous system of natural areas allowing Milan to double (+225,000) the number of trees in the city, improve air quality and enhance the biodiversity of living species. The railway tracks that connect the disused railway yards to each other would instead be transformed into ecological corridors, accompanied for 45 km by a pedestrian and cycle path that run along the entire ring. The ring will host a circular line of fast public transport - the M6 - a ring on rail for the distribution of goods and - thanks to a system of interchange hubs - it would have networked the links of public transport in Milan, favoring the goal of a car-free Milan.

The energy ring, running below the “Green River” makes it possible to build, on the scale of the entire city, a geothermal circular system that uses the groundwater temperature to drastically reduce consumption for heating, air conditioning, and production of hot water in Milan, some of the main polluting factors for the city. The clean energy generated by this groundwater geothermal energy system could provide about 400,000 MWh / year.

The Green river means dreaming of a Milan ready to face the future great challenges of the planet and open to young people from all over the world. A City that welcomes thousands of forms of nature and living species. A small extraordinary metropolis, innovative and generous, which is proposed to the world as a model of a new urbanity.

# The Vertical Forest

Emanuele Coccia

After just a few days, my language had changed. I was no longer going home: I was going back into the woods. I wasn't leaving the house: I was coming down from the woods. The change in language was the most superficial symptom of a deep psychic transformation. I kept telling myself, for example, that my love for skyscrapers was due to the fact that they allowed me to rediscover the sensation that the Hominins must have felt within the ecological niche from which they had emerged: the tree canopy. It seemed to me that my body was not made for walking on the ground, but for spending my days perched between branches. It wasn't just a fit of madness. The bedroom had a floor-to-ceiling window and what you could see were mostly tree branches coming up from the downstairs balcony. Only through the leaves could you perceive the skyscrapers, which stood a few hundred metres away in front of the room, and the park that spread down to the ground. When I woke up, every morning, I had the impression as I opened my eyes of being in a human nest or by chance in the canopy of an enormous tropical tree. The balcony that opened onto the living room was inhabited mostly by four-metre tall trees. It was hard to tell if I was the roommate of a forest that had settled on the mineral structure of that tower or if instead it was the trees that accompanied my days as a dog or a cat might do. It was difficult to understand if living in that apartment meant repeating the choice made by Cosimo Piovasco di Rondò, the protagonist of Italo Calvino's *Il Barone Rampante* (The Baron in the Trees) to live in the trees, or if instead it was the trees that had decided to go and live where human beings live.

The two Milanese Vertical Forest towers, inaugurated for the first time in Milan (Italy) in 2015, were conceived by Stefano Boeri, who took up and radicalized the intuitions that had previously guided Friedensreich Hundertwasser and Emilio Ambasz. They immediately became a global icon, so much so that they were replicated in Holland, Egypt, China

Emanuele Coccia is an Italian philosopher and professor at the *École des hautes études en sciences sociales* since 2011. His research evolves towards the theory of the image and the nature of living beings. In 2010 he published *La Vie sensible*, in 2017 *La Vie des Plantes* received the *Prix des Rencontres philosophiques de Monaco*, and has been translated into eleven languages. His last book is *Filosofia della casa*, published by Einaudi. In 2019 Coccia was scientific advisor of the *Nous les arbres* exhibition at the *Cartier Fondation for Contemporary Art* in Paris, France.

and Mexico. What struck me most in that handful of days spent within those walls was the ability to transform the psychic experience of city and home. Cities have been built for centuries as a form of human monoculture that associates individuals belonging to our species with stones: technically, these are projects of desertification of the Earth. With this same gesture, the city has pushed what has a non-human nature back to its margins: it has called this residual space forest, from the Latin *sylva forestis*, the forest that lies outside the city or at its gates. Despite all the romantic passion usually associated with this term, 'forest' is the equivalent of 'place for strangers': a refugee camp for everything that does not have our form. To think of forests as the solution to our problems, to think that it is enough to increase biodiversity in this refugee camp for non-humans and not within urban monocultures, is tantamount to the attitude of those who, in the face of migratory phenomena that call into question the futile chessboard of ethnic identities, affirm that foreigners should be helped "at home".

In that apartment, any opposition that characterized modern architectural and urban planning culture became unthinkable. The trees were no longer outside the city: they were inside the house or rather, they seemed to be the house itself. The forest was no longer an exotic, distant reality: it was a domestic fact. Starting from Marc-Antoine Laugier - the first to imagine that the first house of the human species was built by tying together the branches of some trees - European modernity has never stopped imagining that we could go back to living in the forests, that we could build a house in the forest: the symbol of this romantic return to nature has been the 'hut'. From Thoreau to the present day, the hut has served this paradoxical and symbolic function: to embody the model of the zero degree of the artifact, a house that hides the fact that it was built, its own artificiality, to become a *trompe-l'oeil* of non-human naturalness, as if it were an *acheiropoietia* image of ancient Christian theology. Rather than bringing the house into the forest, the Vertical Forest brought the forest into the house. Instead of seeing nature as that which precedes history and modernity, modernity, in its most iconic symbol, the tower, or the skyscraper, brought it inside. In this inversion, even the idea of the forest seems to take on another aspect: because if the forest is a skyscraper then every forest is a technical, engineering fact which no longer has anything 'natural' about it.

Bringing the forest inside the house, turning it into a domestic fact also means changing the experience of the house from another point of

view. Because of the massive presence of trees, the balcony was populated by a fauna of insects and birds that I had never seen before in Milan. It was as if the opening of the house to species other than our own had exploded the very idea of living space or ecosystem: I had opened my apartment to trees, and they had opened their home to birds and insects. The presence of one species no longer drives out the others: the settlement of one species allows for the arrival and installation of others. The home is transformed into a multispecies embedding device: the home of each species is the body of another. The house is then always someone else's house, a space already occupied by other living beings.

That such a revolution in the idea of domestic space occurs through the redefinition of the relationship with trees is by no means accidental. Home has not always been associated with the city. Often being at home has not been synonymous with being in the city or wanting to build one. The home was nomadic, capable of travel and often built with animal materials rather than stone. It was the garden that made the house something urban, stable, fixed to the territory and therefore mineral. When mankind decided to tie its destiny to a series of trees or pluriennial plants that rose in a place, houses stopped traveling and became fixed to the territory, just like plants. In a sense, one could say that all urbanized, stable, non-mobile houses are a form of plant bovarism. Jules de Gaultier had identified in the attitude of Emma, the protagonist of Flaubert's novel, the symptom of a tendency that has nothing pathological but which defines the deepest trait of human nature: "the faculty given to man to conceive himself differently from how he is". Humanity is not a form among forms, a species among species: it is the form capable of pretending or believing to be all the others. Every time we fix our home to a stable territory, every time we think of home under the guise of the city, we are pretending to be plants, we are imagining ourselves as trees. The city is a series of human individuals dreaming of being a forest.

The idea that it was the garden, and thus agriculture, that captured the home in the city has long been cherished by anthropology. Its first paradigmatic formulation was that of the celebrated archaeologist Vere Gordon Childe, who first described the appearance of agriculture around the twelfth century B.C. in terms of the "Neolithic revolution": it was, in his view, the "first revolution that transformed the human economy by giving it control over its own food." "Man," writes Gordon Childe, "began to plant, cultivate, and improve by selection of edible grasses, roots, and trees. And he managed to domesticate and attach certain species of ani-

mals firmly to his person in exchange for the forage he could offer them, the protection he could afford, and the foresight he could exercise.” The ‘urban revolution’ is merely a consequence of agriculture and the ability to accumulate and store food in the same place over the long term. The city is an emanation of the garden.

If one takes this intuition seriously - which in more recent times has been restated by Gilles Clément - then it is the very idea of home that is transformed. In fact, the houses we inhabit are originally multispecies projects: there can only be houses where there are trees or plants. Conversely, the domestic plants we host in our living rooms are not references to what exists outside the city, but evidence that our home has stopped moving only because it has anchored itself to some form of plant existence. It is the love of plants that allowed us to give up nomadism, it is the obsession with gardens that allowed us to organize homes in the city. Gardens are never the opposite of the urban fabric: they are its original core. In the same way, Stefano Boeri’s ‘Bosco Verticale’ is not just a programmatic anticipation of an ecological future: it is a contraction of time that makes the future coincide with the city’s ancestral past. It is as if through those skyscrapers, mankind could return to its origins in order to get rid of it for good.

## The Vertical Forest as an icon

Stefano Boeri and Guido Musante

“She swayed rhythmically in the void, her legs swinging back and forth enjoying the moving air, her hair licking the yellow and red leaves, flashes of bark, occasional and repeated tiny strips peeling off. The improbable horizontality of the limit, or the childhood challenge of jumping from the highest point, suspended just a moment before dropping back down. The bare knees, swinging right under the minutely embroidered light white hem. The gaze followed the curvature of the tibiae like a drop of water on a smooth surface, the thin skin taut until it reached the tibial tendons and, after crossing the ankles, it climbs the twin hills of their backs and then the chains of the juxtaposed and stretched toes. A slight movement and the eye focused on the background 90 meters below.”

“They called it “The tree house where people lived”. Well, the tree house was what it really was now, but the people had gone. The guests had taken up their tents. Gone, overnight, as if they had been kidnapped and taken to another Planet. They call it “The Vertical Forest”, but in reality there are two towers. And they are empty, like things are in autumn.”

In 2004, Google acquired the Keyhole programme from the California-based software company of the same name which specialized in geospatial visualization applications. The result was Google Earth: a free software programme capable of generating virtual images of the Earth using millions of satellite images obtained through remote sensing, aerial photographs and topographic data collected and processed by a GIS platform. Taking advantage of Google’s already dominant position, the system spread rapidly on the Net thanks to its ability to provide reproductions of a three-dimensional journey in every part of the planet, allowing viewers to travel through it almost as if taking part in a video game.

The pervasive and all-encompassing potential of that three-dimensional vision was such as to raise more than one critical voice. Primarily there were various international political commentators who expressed

concerns regarding the security of sensitive military and strategic sites, places whose high-resolution images could be viewed simply through an internet connection. At the same time, Google Earth seemed almost a manifesto of globalization: an illusory yet democratic and three-dimensional representation instrument of global cities and regions, yet altered by innumerable visual hierarchies linked to the level of resolution and the number of photographs and 3D models available for different areas of the Planet.

Equally, the questions raised by this real form of visualization of globalization provoked profound reflections on the part of various exponents of urban research and the culture of international design. Thus from the pages of *Domus*, figures such as Dan Graham, Enzo Mari, Hans Ulrich Obrist and Joseph Rykwert questioned the potential and criticalities of a space “smooth and accessible to all, which provided a flat and illusory representation of the complexity of the world and its infinite folds and local variations” (Boeri S., 2005). The inhabited planet filtered by Google Earth’s homologating representation algorithms appeared to be a sort of large widespread non-place: the map of an anthropized territory lacking in identity, relational and historical characteristics.

However, from that monotonous and low-definition imagery flattened into pixels, small groups of spaces and buildings emerged, contrarily demonstrating a powerful identity and/or relational or historical character. There were also anthropological finds capable of attracting the attention of the news and public opinion and rising to a higher level of collective language, like vast signs with polyglot codes decipherable by all: the reference height of the Petronas Towers, the religious magnetism of Mecca, the instant power of Ground Zero, the eccentric form of the Guggenheim in Bilbao and so on.

The entry of what were described in *Domus* as “Superplaces” into the “Global Semiosphere” shifted the heart of architecture from its primordial stone status towards the ethereal dimension of the digital image, conveyed and amplified by the media and generating simulacra for use and consumption of the imagery distributed worldwide.

In this way, the success of an architectural project was no longer primarily assessed in relation to its ability to interact with everyday behaviour, local energies or the inherent qualities of spaces, but rather with “its ability to correspond to dreams, nightmares and the expectations of millions of the planet’s inhabitants”.

Paradoxically, one might add today that the success of such examples of architecture could therefore be measured directly in proportion to their failure as architectures “in themselves”. The fate of those buildings seemed to be settled rather in a dimension of transcendence and redefinition of role, as happens for example, in the case of artistic performances (A. B., 2002).

The first Vertical Forest should probably be added to today’s list of the Planet’s Superplaces, quickly assumed to be the new symbol of Milan and reproduced in the global communication schedule as an unjustifiably credited example<sup>3</sup> of an increasingly marked inclusion of the new paradigm of biodiversity in architectural design.

The ability to use biodiversity elements as tools with which to moderate the impact of high temperatures, capture rainwater, reduce pollution and act as a CO<sub>2</sub> absorber quickly transformed the Vertical Forest into a shared model for the objectives and the technological-regulatory codes related to the policies of the so-called Nature Based Solutions.

On the other hand, the ability of the Vertical Forest to attract attention and consensus but also disagreement, is closely linked to its widespread immediate recognizability and significance in the global system of sustainable ethics or in other words, its having become a universal manifesto of the green city. It is no coincidence that the architectural complex is symptomatically used for example, as the leading image on the homepage of the C40 institutional website: launched as a platform for the consultation of shared policies in the fight against climate change and the reduction of greenhouse gas emissions.

Combined with the ongoing dynamics of multiplication and technical modeling used in the unavoidable urban scenarios created for the cities of the future, similar characteristics make the Vertical Forest a sort of ground-breaking autopoietic or self-maintaining super-place (to use the term coined by the Chilean biologist and sociologist Humberto Maturana in 1980): at the same time, both a part and the whole of a superorganism capable of continuously redefining, sustaining and reproducing itself from within. Similarly to an autopoietic system, the Vertical Forest is also comparable to a network of processes of creation, transformation and destruction of components by several species which through interacting with each other, continuously support and regenerate the system itself: it is thus an architectural organism capable of modifying itself, but also of reproducing itself in an ever-changing form. The process of global dissemination of knowledge and awareness of the Vertical Forest,



*Vertical Forest*, Milan, Italy. Boeri Studio, 2020. Photo credit: Dimitar Harizanov



already underway and carried on the winds of media distribution that blow through the new Semiosphere of the sustainable horizon, is in fact generating an atmospheric Forest City around the globe, growing today in about 20 different places scattered over five continents.

In a perhaps somewhat paradoxical interpretation, the Forest Cities emerging in various parts of the globe could also be seen as the result of a process of dispersion. The paradox lies in the fact that the Vertical Forest was also envisaged as an “anti-sprawl device”, in other words “an alternative within the city to the proximity of trees, shrubs and plants that normally only occurs in the suburban construction of houses with gardens: a form of building that consumes agricultural and natural land, which has now become unsustainable because it is energy-intensive, expensive and far from the collective services present in the compact city” (Maturana H., 1972).

But this widespread anti-city builds non-specific, generic and homologating anthropized territories which lose character as they occupy land. On the contrary, like a seed carried on the winds, the Vertical Forest is dispersed across the Planet in a discontinuous and dust-like manner, without eroding portions of the countryside but rather doing the exact opposite, reintroducing sections of biodiversity into built cities that then bring a powerful component of specificity with them. In this process, the Vertical Forest is spread and reproduced worldwide, constantly changing in a lively and vital way and interpreting its floral, faunal, architectural, technological and human natures on a local basis.

The permanent positioning of Superplaces in the highest echelons of the Semiosphere is not always stable. Some retain a maximum intangibility and “positioning” in the imagination for decades or centuries, such as those with a religious matrix, while others are transitive and transitional, mores rapid and more or less integral: sometimes in substitute mode (the Burj Kalifa has become today’s Petronas towers) and sometimes transient (Ground Zero today manifests itself in a luminous form once a year, like some natural phenomena).

When Domus began reflecting on the Superplaces of the World, the Vertical Forest had still to be conceived, yet within the group of cases considered it would have been an eccentric element inasmuch as it was the only architecture for living in, something that was perhaps not just taxonomic happenstance. In addition to being the oldest architectural theme, living is probably also the most complex and a prism through which it is possible to decipher the design vision of those who work with it and their ways of linking man, space and society in great clarity and

detail. Elements that can elevate it to a great universal model such as monumentalism, symbolism, gigantism, asceticism and so on are rarely included in the traditional DNA of a house if at all. With the exception perhaps of the White House, all the other super-place houses are either uninhabited or belong to almost sectorial circuits of knowledge and sharing. Perhaps another exception is Marseilles Unité d'Habitation: an architectural case closer to the Vertical Forest from this point of view and one which also lends itself to sharing its self-reproductive attitude, but completely opposite in terms of anthropic vision.

Traditionally, and first of all in the Unité d'Habitation, the architecture of the house was conceived using man as the yardstick. Historically the apportioning of "super-local" powers to spaces designed to be inhabited can be risky or sensationally rejected as happened with Rome's Corviale, Italy's most infamous example. Yet the specific nature of the Vertical Forest, its "superpower" lies precisely in this attempt to abandon first and foremost this type of yardstick, or form of measurement which is subject to numerous cultural, historical, linguistic and aesthetic variations. Yet its "source code" as a "house for trees" and only secondarily "also inhabited by humans", creates a universal and universally understandable image, well beyond any unavoidable human differences and more precisely, beyond the myriad cultural, historical, linguistic and aesthetic variations that accompany these places. The tree house is a cliché, an illustrated fable, a myth from human childhood and adolescence that needs no words: the memory of its earliest illustration is sufficient and one which perhaps runs deep. Today's model is just a little more grown up, in step with the times and entirely in high definition (as opposed to Google Earth): every time you look at it, the number of leaves is different, likewise the shape of the branches and the colour of the foliage and flowers. Yet it is still the same tree house known and fantasized about since childhood. The semantic specificity of the Vertical Forest does not lie in its changing during self-reproduction in different places: it lies in its changing in itself while remaining always recognizable and identifiable, as a living being or a feeling. A tree is a tree, King Vidor would say. Or, a rose is a rose is a rose, Gertrude Stein would add.

Just as each Superplace varies over time, so the tools of global representation are subject to equally powerful changes. Compared to ten years ago, the influence and reach of Google Earth today seems to be greatly reduced, especially when compared with the growth of two-dimensional satellite navigation maps which provide more abstract rep-



Elisa Galluzzo  
*Vertical Forest*

Commissioned by Stefano  
Boeri Architetti for L'Espresso  
Magazine, *The Commitment*  
issue, November 2020.

"I was asked to present the Vertical Forest from a new point of view. The overwhelming possibilities of nature are hard to imagine from the ground and below. You can see that it is a vertical green line but it is difficult to perceive how it would be while up there. With ninety-foot plant species, nature approaches you from every direction – branches from above, trees from below, turtle doves flying around. The relationship with the surrounding green areas of Milan is as compelling as the life within the communities around it: the elderly gathering under the shade during hot summer days, children playing around the Biblioteca Degli Alberi's Park."







resentations but also broader and more immediate information, and above all with the exponential and revolutionary growth in the effects of social networks, starting with Facebook. At the same time, today the word “globalization” often seems weakened when considered as a context for comparison, exchange or conflict as opposed to vast shared objectives, such as the global environmental balance on the one hand or the defence of static localisms on the other. In both cases, a new style of plural narration seems to have taken over in the global sphere of communication, “vertical” but not “solitary”, to paraphrase Roland Barthes, and capable of inserting pauses and changes in rhythm within the smooth-running text of a story relating the differences.

As an illustration of the latter, the Vertical Forest is rapidly becoming presented as the universal model of a home, a genuine urban, familiar and perturbing metaproject found in every corner of the globe. On the other hand, it is a unique and precisely geolocated case, but in perennial transformation through the continuous variation of vegetation, birds and insects. As a multiple entity, globally branched and rooted, the Vertical Forest multiplies by absorbing and emitting indeterminate transformations, minute specificities and living pulsations all amplified through the process of global dissemination in which it is ineluctably involved. Its architectural nature is thus continuously subject to a dynamic of splitting between the one and the many, the local and the global, the specific and the imaginary.

However, such a process is perhaps even more ramified. The Vertical Forest is the first project-attempt to bring together languages of different kinds, partly the result of reflections on the relationship between Globalization and Super-places, and in particular of the latter being also “other” rather than “pure” architecture, the Vertical Forest is the first project-attempt to bring together languages of different kinds. For this reason, the project takes a step back from traditional anthropological codes of form and style to leave room for a plural form of language which also penetrates unknown territories.

Beyond the relationship between the founding prototype and its urban scenario, and between the single built fact and its projection onto the global imagination, there is the condition of duplicity dictated by the coexistence in a single architectural individual of two cognitive and conceptual spheres which possess partly different, partly overlapping natures. The interaction of all these conditions produces a pluralization of architecture. At one end, there is the action of the powerful,

rapid and unstoppable energy of the global system of information and feeding of imageries which pressurize individual primordial architectures, increasing their “potential” and stimulating the process of rapid and sustained growth through different habitats. At the opposite end, there is the condition of slowness of everyday life experienced within the two Milan skyscrapers, a calibrated and local process marked by the rhythms of the vegetation and the passage of the animals and which induces the human sphere to reflection and internalization. In psychiatry, the “personality split” or more precisely “dissociative disorder”, is characterized by the clear distinction between two conditions existing within the same individual: Jekyll does not communicate with Hyde and vice versa. In the case of the Vertical Forest the reverse is true; the two identities constantly interact, sustain each other, experience conflicts and define harmonies: they exchange energies. In this case we could perhaps be referring to bipolar architecture: a place in which two different energy conditions – “Hi” and “Low” - act on two fronts, feeding and compensating each other, in a way that is never symmetrical and always partially unpredictable. The same individual architecture can thus experience the “manic state” of being erected as a model for the Planet, and at the same time as a place of bringing together and decompression for all the species that inhabit it.

## Vertical Forests - Experiences and perspectives

Maria Lucrezia De Marco

Since its construction, the Vertical Forest in Milan has become the symbol of that capacity for innovation that the city has always demonstrated. Together with the Porta Nuova district and the nearby Piazza Gae Aulenti, the Vertical Forest is increasingly used in advertisements, movies and books, not only as a background and metonym for a very specific area of the city but also as an icon of progress that few other contemporary architectures in Italy manage to convey.

Therefore, in addition to the conceptual value linked to the genesis of the Vertical Forest and the environmental value for the city in terms of generation of biodiversity, absorption of particulate matter and CO<sub>2</sub> (it has been calculated that the Milan Vertical Forest absorbs 320 tons of carbon dioxide per year and stocks about 16 tons of CO<sub>2</sub>/year, emitting about 19 tons of oxygen), it is undeniable that the Vertical Forest is associated with an economic value that has grown exponentially by virtue of its media and public recognition, which has made it one of the most attractive urban places to live.

However, it is true that the case of the Vertical Forest in Milan, designed in the context of an urban regeneration project unique in Italy in terms of size and investment, has been viewed with prejudice by some because it is considered too elitist. This criticism is not particularly deep if we consider that from the beginning - even before the project took the shape of two towers covered with greenery - the request from the client was to design a luxury residential building that would fit into the new urban development, integrating its functions.

Thanks to the possibility of mobilizing substantial investment, it was possible to develop a long, challenging - and above all never dealt with before- research process. From structural resistance to the issue of public safety - which led to imagining a series of anti-fall devices for the branches - from the management of common spaces to insurance issues, a series of

challenges that go well beyond the pure architectural design were for the first time evaluated and carried out in the Vertical Forest in Milan.

In this way, the Vertical Forest represents a model: the model of a new type of architecture, with potentially infinite possibilities of expression. This is a model that is perhaps perfectible but nevertheless impactful and which has inspired very different projects, conceived around the same starting idea: to integrate trees, plants and living nature within the architecture as an essential and primary component.

Starting from this, from the model and its imperfections, from the experience gained and the mistakes made, the Vertical Forest was not only the point of arrival after years of projects and research, but above all the starting point for new experiments.

After Milan, Stefano Boeri Architetti's second Vertical Forest project was in Chavannes-Près-Renens (near Lausanne) with the Tower of Cedars, which in 2021 saw work resume after a period of interruption, not uncommon in architecture.

Here, the choice of vegetation defines the design of the facades and the articulation of the interior spaces, of which the greenery and the terraces become an extension. Already from this example we can see a clear change from the initial model: due to the climatic conditions of the place and the need to optimize the light entering the apartments, the Tower of Cedars incorporates the system of vases in the architecture of the loggias, so that the greenery is flush with the floor of the terraces. In this way, the view - not interrupted by the presence of the pots - is totally open to Lake Geneva, in full continuity between indoor and outdoor space and in immersive dialogue with the surrounding landscape.

The search for luminosity in the interior spaces also characterizes the Tirana Vertical Forest, where the relationship with the green - mainly Mediterranean wood typical of the local context - and the view of the city is enhanced, thanks to a system of floor-to- ceiling glass windows.

A third way of interaction between green and architecture is the one designed for Wonderwoods, the Vertical Forest that will rise in Utrecht, where the continuous loggias form a backdrop between the external public and the internal private space, creating a filter space able to reduce the temperature range and consequently reduce energy consumption.

Wonderwoods - on site in 2021 - will be characterized by a high functional mix: it will host apartments (of different types and sizes), together with recreational and commercial spaces, offices, areas equipped for sports activities and the first Vertical Forest Hub, a documentation and research laboratory on urban forestry in the world.

A common functional mix also enlivens the Nanjing Vertical Forest where the two towers, one 200 meters high and crowned at the top by a green lantern and the other 108 meters high, include hotels, offices but also a museum and a Green Architecture School.

In addition to functional integration, another essential element for conceiving the Vertical Forest - or any other architecture - within an urban context as a real Metropolitan Tower is social inclusion.

On this point, the studio has worked to ensure the possibility of a drastic reduction in construction costs through prefabrication, and maintenance costs through proven systems of management and monitoring of the green areas, allowing to make sale/rental budgets accessible also for lower incomes.

The result is the construction of the Trudo Vertical Forest, inaugurated in Eindhoven in 2021, and the Easyhome Huanggang Vertical Forest in China. The two projects, designed to host residences in social housing, represent a keystone and an important perspective for the future of contemporary cities where it will be increasingly necessary to build with a low economic impact, in order to supply the growing demand for housing by young professionals, couples and students.

In the same way, due to the lack of available areas in urban contexts and in order to stop the consumption of land in peri-urban areas, an urgent direction to be taken is the reclamation of the existing architectural heritage, through forms of redevelopment and technological and functional adaptation of buildings that are often energy-consuming, obsolete or not suitable for meeting contemporary needs. In this regard, retrofitting as a solution for interventions in cities is a tool to restore value to buildings subject to high management costs or underutilized; a particular example, after a period of lockdown, are the offices emptied during smart working: rethinking a conversion of large office spaces, transforming them into facilities throughout the city or into residences, is an extremely interesting challenge today, which the firm is exploring in projects in Luxembourg and Brussels. The same goes for the idea of improving the quality of small apartments, integrating an external façade system that attaches to the existing structure, expanding the useful surface or including pots for greenery and climbing plants - as in the project for Prato Urban Jungle - and opening up investment prospects that could find fertile ground in Italy and Europe. In a global perspective, broadening the view to other geographical and climatic contexts, the research into urban forestry has particularly interesting implications in tropical or desert regions. From this point of view, the pinnacle of experimentation is the Vertical Forest project in Cairo, currently underway as part of the broader vision

of Greener Cairo, which envisages demineralization strategies for the Egyptian metropolis, moving towards the ecological conversion of the city.

In addition to being particularly significant for its specific location - an unprecedented and complex challenge - the project in Egypt is part of the group of green buildings that Stefano Boeri Architetti is creating on the model of the Milan Vertical Forest but with alternative modalities compared to the development in height, typical of the Milanese skyscraper.

Among these, the Ca' delle Alzaie project in Treviso as well as the Green Palace in Antwerp - both completed in 2021 - as well as the Milanese *Bosconavigli* show how the possibility of including greenery and living nature in architecture is not an exclusive prerogative of luxury towers but rather an extremely flexible and adaptable modality which from the first model of the Vertical Forest up to today - seven years later - has given rise to architectural configurations that differ in contexts, functions, costs, interaction between interior and exterior, local specificities and design choices.

Still in Milan, back in the Porta Nuova area, the latest - chronologically speaking - design advancement on the Vertical Forest model is Botanica, the residential tower designed in the context of the regeneration of Pirelli 39, for which Stefano Boeri Architetti won the competition together with the New York-based studio Diller Scofidio + Renfro.

Botanica will have a mixed prefabricated structure in wood and steel that will drastically reduce CO<sub>2</sub> emissions during construction and solar panels that will cover its energy needs: it will be a self-sufficient building, which will integrate the most advanced technologies in the field of sustainability, from the reduction of consumption and energy saving, to life cycle assessment in all phases of design, construction, use and dismantling of the building.

At the same time, it will become a "vertical garden", a new complex urban ecosystem and a landmark for the city, enriched by the changing chromatic rhythm of the biodiversity of vertical natural landscapes, which will alternate from floor to floor.

In conclusion, the Green Obsession that has led to the budding of Vertical Forests as well as large-scale projects and urban plans will find its strongest expression in the Forest Cities, medium size urban settlements that will combine the challenge for energy self-sufficiency with the aim of increasing biodiversity and effectively improving air quality in urban areas, thanks to the multiplication of green surfaces. From China to Mexico, the Forest City is not just a utopia, but the chance of a drastic transformation of our urban environment, towards the fulfillment of a deep integration between city and living nature.

## Botanica / manifesto

2019 - ongoing

Stefano Boeri Architetti

*Botanica* is a new urban ecological transition device, facing the great challenges of a global environmental crisis and sustainable urban growth.

*Botanica* provides exceptional technical facilities and solutions, optimized to address all future environmental urgencies as well as social needs, health, and well-being demands.

*Botanica* is an unprecedented vertical catalyzer of urban intensity (mobility, work, leisure, sports, facilities), landscape diversity (mix of urban sceneries, functions, vertical landscapes), and functional variety (hosting botany, science, art, and healthcare); a new model of stratification of living within a building.

*Botanica* is a new model of a garden tower, hosting the typical vegetation of the ornamental garden, improving the urban biodiversity by promoting the coexistence and interdependency of flora, fauna, humans, and architecture.

*Botanica* has a striking capability to concentrate unlimited vegetation on a limited urban surface; it hosts countless trees and shrubs, able to absorb and stock CO<sub>2</sub>, capture significant quantities of particulate matter and produce tons of oxygen per year.

*Botanica* records the passage of time; it reflects the cyclical changing of the seasons by alternating in a sequence of horizontal landscapes (floor by floor), the flowerings, and all the vegetative phases of hosted plants.

*Botanica* is a self-sufficient and integrated building; it produces, consumes, recycles, and regenerates primary resources, supported by a continual waste resource stream. The large amount of vegetation that extends over the building's floors allows a significant reduction in temperature on its façades, providing considerable overall energy savings.

*Botanica* is the first timber-constructed tower to apply a sustainable life-cycle approach to the entire construction process, from erection to disassembly. Its structure consists of prefabricated mixed wood and steel elements, allowing a substantial reduction in construction times and a significant decrease in CO<sub>2</sub> emissions.

*Botanica* generates clean renewable energy, thanks to the continuous installation of photovoltaic panels on its façade, providing up to 65% of the building's energy requirements.

*Botanica* is a monument to biodiversity; that of animals, that of plant essences, and that of the life of the human species that inhabit it. The variety of all living beings and of functions that populate this complex ecosystem form a significant and innovative urban vertical community of biodiversity.



*Pirelli 39*, Milano, (Italy). Diller Scofidio + Renfro and Stefano Boeri Architetti, 2021.



IV

Trees towards Cities,  
Humans towards Forests

# Zoonosis, Deforestation. The perspectives for Urban Forestry

Stefano Boeri

Today I struggled to find a book by Michael Crichton called *Congo*. Sometimes what happens with books is what happens with our loved ones: they are so important and so present in our thoughts and our memories that we lose sight of them. They slip from our minds, we don't know where they are. Anyway, I haven't found it yet, but it's an extraordinary novel from 1980 which was turned into a rather poor film. I was a big fan of Michael Crichton, who passed away 12 years ago, and some of you may know that he was not only a novelist but also a great screenwriter. Effectively most of his novels, from *The Andromeda Strain* (written in 1969) to the box office smash *Jurassic Park* (1990), *Rising Sun* (1992), *Revelations* (1994) but also the screenplay of *Westworld*, were written to be transferred to the big screen. They are techno thrillers but they are based - and this is an aspect of Crichton that I have always identified with - on his training: he was a doctor and a scientist and I have always been very impressed that he graduated from the Salk Institute, one of Louis Kahn's most extraordinary buildings near La Jolla in California. The thing that has always excited me is that he studied in this fascinating space that I remember visiting with my mother in the 1980s, probably while he was finishing his studies. I was a kid and I remember this incredible place from which you could perceive the ocean, without it being visible.

The architecture of this campus of laboratories and accommodation for researchers and students, with its central section that is materially slim but powerful in impact and perspective and which leads towards the sea – it

This text is a transcription of a lecture by Stefano Boeri filmed during the first lockdown between March and April 2020 as part of the "Tempo Ritrovato" series of readings. Published in Italian in S. Boeri, Urbana, op.cit

has a great overhang above the ocean so that the sea is almost heard when you enter - evokes something that is not there. I think this extraordinary sense of architecture had a great effect on Crichton's intellectual training and in his construction of the narrative, which is done with a very simple but very syncopated language, always in contact with reality and current events. *Congo* is based around a secret expedition of American geologists, in league with another Japanese expedition. They go to Kenya, in particular to the volcanic Virunga region near Lake Victoria to find diamond mines, in an unknown area that was yet unexplored.

The first of these expeditions is attacked by a tribe of gorillas. It becomes clear as the book progresses that they are in fact a new breed of animals with a specialised form of intelligence, able to communicate with each other and even apply military tactics. The bulk of the novel revolves around the attempt at a second expedition which includes an ethologist and a primatologist who brings a gorilla with them who has learned, by being with humans, to manage sign language and who therefore acts as a mediator between the humans on the expedition and the grey gorillas, who are intelligent and highly aggressive. The expedition attempts to find a compromise with these gorillas who feel dispossessed, who have taken ownership of an area of land hitherto untouched by man and who feel endangered, which is why they react aggressively. This is the strategy used by this group of geologists who work for an American private company with an economic interest in recovering diamonds from alluvial deposits. As such it is a story that was interpreted as one of Crichton's less interesting narrative proposals but I must say that numerous of the points raised by the author in *Congo* have remained very topical and it is in some respects more interesting than his more successful novels, such as *Jurassic Park* for example.

There is an important, indeed, unavoidable issue raised here concerning the breaking of a pact or, if you like, of a sort of basic agreement between our species and other animal species. The story of this invasion by a group of

scientists (and incidentally also by unscrupulous financiers) of a natural habitat, provokes a reply in the form of a giant leap in species development. This is not the leap in species development we are talking about these days in which a virus passes from a bat, possibly to a human and which has led to, as we know, an extremely invasive and very dangerous pandemic, but rather a cognitive leap in species development. Once threatened, the gorillas respond by demonstrating that they have acquired a level of intelligence that as primates brings them even closer to the human species. But of course the film and also, as we have seen, the novel, ends violently with the confirmation and establishment of anthropocentrism as the dominant force. The grey gorillas, after mediation through Amy, a gorilla raised by humans and who knows how to talk to grey gorillas and humans are eventually all killed off. There is even an eruption by the volcano which buries them under the lava. I must say that, apart from an obvious reflection on the relationship between animals and primates, in recent years there have been extraordinary advances in the possibility of interpreting the language of chimpanzees and thanks go to Dr. Jane Goodall, an extraordinary ethologist and primatologist and the true pioneer in this field. Yet although when it was published, the novel opened up an unprecedented point of view in terms of its subject matter, the relevance of Congo today is that it poses the problem of what we would call spillover.

There is a quite incredible book called *Spillover*, written by David Quammen in 2012. It anticipates what has happened with the Coronavirus and tells us, through a certain style of writing (Quammen is a journalist who has spent his life following scientists working on spillover, the term referring to a biological leap from species to species) about the possibility of an infection that can turn into a pandemic and which is the result of a relationship of incongruous proximity between a wild species and a human. This book opens an incredible series of perspectives on the fundamental theme of zoonosis, a term little used except in the scientific academic world. It is essentially the passage of an infection from the world of

animal species to the human world. Zoonosis has different forms but when the passage of the disease, or the virus, occurs between animals and humans (as in this case) it is called anthroozoonosis or if the opposite occurs, as has happened in some cases, it is known as zooanthroponosis. The extraordinary thing about this book is that it talks about scientific research into the subject of zoonosis that is already advanced and how the issue of diseases passed from animals to humans is studied and followed by study centres around the world. About 60% of infectious diseases are estimated to come from wild animals and this has long been under observation by a world of scientists and research centres.

But as in many other studies that can easily be found on the web, there is much more in this book on the theme of the relationship between deforestation, climate change and pandemics. In these studies into zoonotic pathologies, we are beginning to think about the principal causes and it is easy to imagine some of them: excessive urbanization, in the form of humans multiplying and expanding urban spaces, and coming to occupy spaces that were historically inhabited by other species. These species have then found themselves having to move or in any case accept forced coexistence and co-habitation. These phenomena are unfortunately highly prevalent in those parts of the planet which have undergone a demographic explosion. Intensive agriculture has drastically lowered levels of biodiversity, a highly significant element in the balance between species, but also other processes that we know about, such as the trade in wild animals, or the presence of certain invasive species.

There is no doubt that one of the most significant causes of zoonosis is deforestation. Unfortunately this plays a leading role by destroying a habitat rich in biodiversity and replacing it with a poorer one, it creates space for the emergence and proliferation of insects. Since becoming areas with a low level of biodiversity and anthropized by the presence of humans. For instance, it has happened that humans have been exposed to easy contagion by certain types of mosquitoes which are carriers of viruses

previously found in other species. However, it must be said that deforestation in all its forms, is not the only cause. As many studies point out, there is also a theme closely linked to the emergence of situations of absolute poverty. Let us imagine that we bring all the cities of the world together into a single point. This would occupy about 3-4% of emerging lands, and 33% of this huge urban Pangea would be made up of shacks, favelas, slums and unplanned villages. In most of these situations, people live in conditions of absolute poverty where forced co-habitation with other species is often a present and sometimes dangerous factor. But more than this, there is also sometimes a habit of consuming and using wild animals, sometimes living, which have nothing to do with habits established over centuries, in which peasant culture and historical zoo-technical culture has known how to manage the presence of animals in the vicinity of man. Then there is the overwhelming topic of intensive farming. This naturally causes a series of forced cohabitation phenomena in which by expanding our types of presence on the surfaces of the planet's emerging lands, we somehow drive other living species out of their natural habitats.

By modifying and changing the food cycle, the balance between living species also changes. For example, an article published by The Guardian in March 2020 (Ratcliffe R., 2020), describes an invasion of monkeys in a Thai tourist centre where in the absence of tourists, the monkeys have become aggressive and go looking for food to the point where they have started entering the central areas of the city and appropriating it. This is nothing new: the incongruous presence of non-domestic species in cities has become a common topic as witnessed by well-known images of wild boars entering the outskirts of Italian cities. We know how much these animals have been an emerging species on the edges of Italian cities, partly because we have invaded their territory, and partly because in other situations the planning of food and waste cycles has brought them extremely close to tourist sites, as well as to urban outskirts. There are numerous examples both far away and closer to home, such as hyenas being bred

in African countries. There are many cases like these, documented in the astounding BBC series *Planet Earth* by David Attenborough, the latest edition of which has an entire chapter devoted to animals in cities (*Planet Earth II*, episode 6 “Cities”, produced by Fredi Devas, BBC in 2016). Another example is that of leopards chasing wild boars in the Mumbai favelas or slums and actually entering these areas at night. This has led to the astonishing coexistence of humans, feral cats and wild boars in an incredibly uncontrollable situation.

Now this is one of the most startling examples of incongruous urban phenomena and behaviour. But there are also well-known experiences which tell us how climate change has an unfortunately disruptive function in generating zoonotic phenomena. To be more specific, let me cite the warming of the oceans and the creation of unexpected meteorological phenomena. This often leads to events in which certain species of mosquitoes and flies proliferate ominously in spaces overwhelmed by floods, which again generates enormous risks for the survival of our species.

This more general concern is linked to a very important issue that we cannot ignore: we have to look at a different balance, a different form of cohabitation. Without shirking the issue, we have to ask ourselves to look at the problem that this pandemic has forced us to face up to. It won't be the last time but it is certainly the most significant time that we have to consider the question of a new relationship with other living species, especially non-domestic ones. Please note that this is not something concerning just the large deforested areas of South America, or peasant settlements in China or the slums in countries in Southeast Asia. This is something that closely concerns our own cities: this is directly related to those images of how polar bears have lost much of their habitat as a result of global warming, and who in order to find food are approaching Russian cities, towns and inhabited centres. The question is what we should do. I do not have the necessary skills or qualifications to answer, I can simply offer solutions based on my competence and experience as an architect and

urban planner. I think that first of all we need to understand the reasons for these pandemic risks. The fact that they are produced by zoonotic agents and therefore by forms of contagion that pass from wild species to humans: bear in mind that in the past measles, smallpox, flu and diphtheria came from processes of this type as do Ebola and AIDS today.

So most of the infectious diseases come from 'wild' nature. The point here is to understand precisely how today we can try to rebalance this relationship, which is clearly not just linked to the animal world but obviously also that of plants. I don't think the answer to all this is the abandonment of what in simplistic terms could be called anthropocentrism: rather it would be much easier instead to learn to no longer be at the centre of everything, in the role of those who dominate the planet and who are therefore able to control and determine the habitat and living spaces of other living species. That is not the idea, the sense of abandoning anthropocentrism and thus leaving the Anthropocene. Instead our great task in the coming decades will be to create a new type of anthropocentrism. I do not think it is possible - or even legitimate, at this moment in time - to deny our own responsibility to the point of not feeling the enormous obligation to restore balance where we have brought imbalance, to restore co-habitation and awareness where we have brought conflict and destruction. We need to bring back the coexistence between species where thus far we have brought violent domination and at times the total destruction of habitats as well as of species, along with industrialization and transformation of nature. It is sufficient to think of the large-scale intensive livestock farming of entire species for consumer products.

I believe that the theme should be that of a new anthropocentrism arising first of all from awareness. We must learn to better study the needs and habitats of other living species. We are starting to do it with plant species, so there is no reason why we cannot also do it with other animal species and especially with those species that live with us in cities. I believe we have to recognise their

intelligence. The concept of intelligence is relative, it cannot be defined starting from our idea of intelligence. There is extraordinary intelligence in the lives of ants, there is extraordinary intelligence in the habitat and relationships of dolphins. There is an intelligence in animals which is not necessarily at a lower level, since this approach to measuring it starts from our intelligence. Animals have their own autonomy and must be appreciated and understood, even before being judged or placed in a hierarchy. Finally, the third major element that it is essential to understand, is that there can and must be balanced cohabitation. As with forests, so with the countryside - we obviously have the responsibility to reconstruct and rebalance, we can find space for this form of cohabitation.

I would like to finish by referring to a few recent experiences. I owe a lot to Andrea Branzi, an extraordinary and visionary architect with whom I began to think about the theme of a new balance between humans and other species living in cities 15 years ago. Together we developed a project for the competition for “Grand Paris”, the Parisian metropolis, in which we hypothesized forms of coexistence between humans and the sacred bovine world learned from large-scale Indian cities. We simply modified the idea for coexistence in Paris with the world of birds. In this sense Paris could become the first non-anthropocentric city, accepting the coexistence of species and giving every living being its necessary space. All this was then featured in an editorial entitled “Giù dal Piedistallo (Down from the Stand)” in which I tried to think about the possibility of non-anthropocentric ethics, in the sense of ethics which, while constantly looking from the point of view of the human sphere, questioned the needs, demands and evolutionary trajectories of other living species.

This theme, among others which have received considerable coverage in essays, writings and reflections, can be traced, as we said, also in *Laudato Si* Encyclical by the Pope, which forcefully states that today the point is not the refusal of our species to accept responsibility but rather the opposite: we must be the ones to take charge of this balance, and of the needs of other living species.

Perhaps the most interesting (and I have to say highly amusing) experience concerning these issues was a two-year course at the at the Politecnico di Milano, which we called *Milano Animal City*. In 2015-2016, while teaching in the fourth year of the Polytechnic along with Azzurra Muzzonigro, Matilde Cassani, Michele Brunello, Francesca Benedetto, Livia Shamir, Giorgio Zangrandi and Saverio Pesapane, I taught classes of about 80 students, 80% of whom were foreigners and we began to think about the idea of entrusting each student with an urban living species.

We started with the normal domestic species but we ended up with a bestiary of about 100 species, including different types of rats and rodents, ravens and crows, frogs and toads, otters and even seagulls. Talking about seagulls, I'd like to remind you why the presence and transformation of hierarchies in bird species in cities is perhaps one of the most striking elements. We had invited Enrico Alleva, a great ethologist who explained to us how seagulls, following the cycle of waste, have supplanted other species of birds in metropolitan and suburban areas. He also said that crows today are so important in cities like Milan and have, (returning to intelligence), extraordinary levels of intelligence. I think everyone has seen how crows know how to intercept traffic flows and the changing colours of traffic lights in order to eat acorns, since they make sure that the cars at the traffic lights crush the acorns, which they place on the pedestrian crossing and then wait for the light to turn red so that they can then eat them. So, thanks to Enrico Alleva and others such as Leonardo Caffo who has written important articles on speciesism, we began to think about the habitats of animals. The idea to entrust each student with a species meant that each student put themselves into the perspective of and assume the habitat of a worm, a mouse, a robin or a wild boar. It was an apparently frivolous but very serious exercise, because each of these students had first to build a space-time map of the life cycle of these different species in the city and then to create a co-habitation project.

The projects took on a range of different forms. These included the possibility, bearing in mind above all the large

abandoned industrial areas in Milan and always starting from the point of view of the animals, bees for example, of imagining that there were special zones where non-human, non-domestic species could find a space for independent existence. Then there were more radical projects, such as the temporary autonomous areas, reserved for the life of non-domestic animals within the city, where the animals were watching the humans, almost reversing the presence of the great control institutions - to cite Foucault - that are like zoos from all points of view. Yet other students had imagined the possibility of using skyscrapers to house some species of birds or bees. The bestiary is on the web and has in one form or another remained a piece of material on which I continue to work.

I believe that in general, like other works currently under way, these projects offer encouragement and strength in helping us to understand that what is happening these days has a universal significance. It questions our relationship with other living species and it poses the problem of a transition, as we said, towards a new world in which awareness of the intelligence of other species and our responsibility defining a new balance must become central elements if we do not want the great and very difficult battle against this virus to remain one based around limiting its effects and examining the symptoms, without going in-depth into the underlying reasons for this pandemic.

## A brief history of the forest and the role of agriculture

Simone Marchetti

### *A definition*

By agricultural landscape, we mean a landscape with a strong anthropic character which is “the result of a long and systematic operation of leaving traces on the natural landscape by man” (Sereni E. 1961). Furthermore, the agricultural landscape is associated with a set of characteristics that are not just geomorphological, climatic and hydrogeological, but also a set of factors related to culture, economy, political, and social conditions and forms of property which are also expressed and reflected in the shape of the agricultural landscape.

Forests and trees are often considered the undeniably most distant entity from the civilized world, yet from reading the history of forests we can see how the plant world, especially that of forests and woods has been strongly influenced by the hand of man, so much so that it is also the result at least in part, of a cultural anthropic process. But as Hansjörg Küster reminds us, it “is by no means an immutable reality, rather it consists of an ecosystem of animals and plants that alter during their lives; thus the forest as a whole is in perpetual change” (Küster H., 2019). Therefore the current forest and woodland system is nothing other than the result of a series of constantly changing processes which are not always directly related to humans. The forest has its own history and evolution and it is important to analyze it, even if only briefly, in order to understand its key role within the Earth’s greater ecosystem.

On the other hand, the trees that we see today along with their ancestral species have changed with us and, long before us, they conquered and established a predominant place on Earth. The first land plants appeared about four to five hundred million years ago following an extremely slow transformation process that allowed aquatic plants such as algae to survive outside their marine habitat, developing a sophisticated technique for transport water to the distal portions of the plant. This gave rise to the earliest types of shrubs and plants and it was around this time that they settled on land. (Küster H., 2019).

The reason why it is so important to understand the history of forests is that it also represents our own history: it is precisely in the undergrowth that most living animal beings, presumably amphibians and reptiles, must have lived. The presence of the first hominids on Earth would date back to about 2.5 - 2.6 million years ago and therefore long after the conquest of the Earth by living vegetable beings. This consideration should make us reflect on the role and importance that the plant

kingdom has always had. Tree species developed, changed their phenotypes and began their migration around the world long before us, not to mention the fact that they managed to survive mass extinctions that were catastrophic for most of the species belonging to the animal kingdom.

Despite this, it is true that already starting from the postglacial period, the extension of forests, or at least part of them, began to be influenced by the presence of man who together with the discovery of new tools with which to control the plant kingdom, created the first examples of deforestation. This was for various purposes including the use of wood as a building material or for combustion as well as making space for land to be used for the production of food through agriculture, which we can trace back to about 10,000 years ago (Eldredge N., 1998). This period, mainly in sub-tropical areas, saw the development of “a specific agronomic culture, characterized in each place by the cultivation of indigenous plants. (...) Man therefore artificially created clearings near his settlements” (Eldredge N., 1998). This could partly have been motivated by reasons of visibility and defence against potentially dangerous “external agents”, and partly for reasons mainly related to cultivation, or for hunting. Initially however, the relationship between agricultural land and wooded soil had perforce to be extremely limited; only under particular climatic conditions (seasonal climates with dry summer periods) and only in the vicinity of sparse wooded vegetation would it have been possible to develop agricultural activity (Eldredge N., 1998). This activity was increasingly successful because it was possible to guarantee the necessary sustenance for the entire community that used it. So here, therefore, the first co-evolution between species must have begun, probably without our hominid ancestors being fully aware of it. This concept of co-evolution was studied by Charles Darwin and other scientists, and was something which Stefano Mancuso, defined as an extremely close relationship, indeed almost symbiotic with some species in particular. Fairly obvious examples resulting from this are wheat, corn and rice, which provide “60% of the calories consumed by humanity” (Mancuso S., 2017) and whose intensive use has allowed their spread and colonization of huge surfaces of the planet. This is just one of the examples of a quid pro quo between species which produces a reciprocal benefit. The unwritten agreement between plants and our species became even more consolidated as man stopped being nomadic and started to settle. At the dawn of agriculture, however, the location and settings of the first agricultural fields must have been different to how we imagine farming today. Initially it is more probable that this





type of soil management was present in higher altitudes, and it was only about eight thousand years or so ago that agricultural practices moved from mountainous areas to more hilly areas or valleys (Agnoletti M., 2018). Thus the first real distinction between wooded areas and open areas was created, given that the best and most fertile soil for cultivation was found in the vicinity of wooded areas. Consequently, the first deforestations took place, partly to make room for land to be cultivated but also to provide wood as a material to be used for artifacts, tools and more. This boundary between “open” and wooded land was not so fixed and continued to change over time, hence the relationship between two spaces conceived initially out of necessity, then out of culture, for different uses. The dividing line between the two areas gradually became clearer and clearer and “this combination of cultivation began to constitute mankind’s agricultural landscape” (Agnoletti M., 2018). This is a fundamental step because it takes for granted the idea that the landscape is the result of a rich and abundant cultural history that is not only human, but also that of plants and trees although there was undoubtedly the hand of man in this process. The relationship between countryside and forest, if observed over the last few centuries, has seen the distinction between the two become ever thinner, thereby threatening one of the most important resources of the entire terrestrial ecosystem. Never before has there been such a strong conversion of land to agricultural use as that which took place from the 1950s to today. If we analyze the data on forests we notice a falling trend, which saw about 15 billion hectares of forests in the 1950s become about 4 billion hectares today (IPPC-SRCLL, 2019). This trend certainly sees agriculture playing an important role together with other factors. Based on current understanding of land use in the carbon cycle, the impacts of future land use on terrestrial biosphere-atmosphere exchanges have the potential to modify atmospheric CO<sub>2</sub> (Prentice I.C. et al., 2001).

### *Food security and its impact*

Forests and related ecosystems play an essential and important role by absorbing 29% of the gas emitted by man from the atmosphere, (Valentini R., 2019) through the photosynthesis process that transforms CO<sub>2</sub> into plant tissues. Unfortunately, as temperatures rise these ecosystems are coming increasingly under threat, and for this reason, it is thought that due to the climate crisis, forests will slow down their absorption capacity eventually reaching saturation point (Perugini L., 2019). So given that they represent a fundamental resource that guarantees the absorption of huge quanti-

ties of carbon dioxide, what can be done to ensure proper soil and land management? How can we create a form of management that takes into consideration not only the cultural and historical importance of agricultural landscapes but also their fundamental role in guaranteeing the food security of millions of people? And finally, how can we concretely manage the impact that intensive land exploitation for agricultural use has on forest ecosystems?

One answer could come from the Natural Climate Solutions (NCS) proposed and developed by a team of researchers in 2017 (Griscom B.W. et al, 2017). This is a set of 20 actions for conservation, restoration, and improved soil management on three biomes in particular: forests, wetlands and grasslands and which include safeguards for food, fibre and habitat. It is suggested that these NCSs be used to reduce the carbon dioxide produced by land use conversion, trying to capture additional CO<sub>2</sub> from the atmosphere and ultimately improving the resilience of natural ecosystems. According to the study, forests have a particularly high climate mitigation potential, especially if their management is improved and the following options are pursued: reforestation, reduction in changes in forest land use, better management of natural forests, an improvement in arboriculture systems, a reduction in the use of wood fuels and better strategies for managing fires. Moreover, the use of these NCSs would reduce and mitigate emissions by 37% by 2030 (Griscom B.W. et al, 2017). Yet the management of agricultural land use is still unclear. How can we concretely manage a considerable demand for food, which comes mostly from cities, and at the same time limit the expansion of agricultural areas that meet this need? In order to try and answer this question, we must first understand the impact that agriculture has on the entire planet. According to the IPCC (Intergovernmental Panel on Climate Change) from 1950 to 2005 farmland (cropland plus grazing land) increased from 28% to 38% of the global land area (Smith P. et al., 2014) and overall food systems were responsible for about one third of GHGs emitted into the atmosphere, if the contribution of agriculture is added to that of land use change and forestry. (Crippa M. et al., 2021)

If we look at the data provided by FAO, (United Nations Organization for Food and Agriculture), it emerges that forests seem to occupy about 31% of global land area (FAO and UNEP, 2020) while soil destined for agriculture is estimated to be about 38% of global land area, with an area equal to 5 billion hectares. (FAO, 2020). Therefore, the data shows an imbalance that is not only between the area dedicated to agriculture and that dedicated to

forests but also with respect to the role of agricultural land as a driver of deforestation and air pollution. Conversion to agricultural land is estimated to be the main cause of forest fragmentation and deforestation and their related loss of biodiversity.

Agricultural expansion is determined primarily by large-scale commercial agriculture, primarily cattle ranching and cultivation of soya beans (80% of it is used to feed livestock, according to WWF), oil palms (responsible for 40% of the deforestation of tropical forests) and by local subsistence agriculture (responsible for 33% of deforestation) - (FAO and UNEP, 2020). These numbers should also be evaluated considering the percentage of global anthropogenic emissions of carbon dioxide attributable, for example, to livestock farming. This last in particular is often cited by many activists who denounce the unsustainability of our diet, attributing an extremely high percentage of total man-made emissions to the meat industry. According to the FAO, in fact, the meat industry alone produces 14.5% of all anthropogenic GHG emissions. This percentage should be enough to make us reflect on the need to change not only our diet in particular but also more generally to rethink the way we produce, supply, and consume food on a larger scale (Gerber J.P. et al., 2013). One crucial and fundamental factor for discussion is precisely that of understanding how to provide food for urban centres in a sustainable way, especially considering that a number of already dramatic situations will be exacerbated by increasingly scarce access to food resources due to the climate crisis. Some cities around the world are already geared up to establish food policies that positively impact the supply chains around their geographical area, promoting “neighbourhood” or local products along with responsible consumption models and the reduction of food waste (positive examples can be seen in Milan, Toronto, Paris, and Detroit).

### *The current state of the forests*

If we investigate the growth trend in European forests, we can see a particular positive indication. The merit for this inversion is an increasingly high abandonment of agricultural land and the reconquest by trees and shrubs of those soils left uncultivated. Yet the situation is not the same everywhere: the increase in forest areas in Europe corresponds to an increase in deforestation and soil degradation in other countries, primarily in countries where the agricultural sector is of primary importance (mainly for exports). The situation regarding forest ecosystems presents two opposite trends: if there genuinely is a growth trend in temperate and

boreal forests, which appear to be expanding, on the other hand tropical forests have suffered a reduction over the years. On a yearly average, between 1990 to 2000, this reduction was 7.84 million hectares per year, which then passed during the following decade to about 4.74 million hectares per year, which in any case represents a very large area. (FAO, 2020).

However, if we look at this reduction trend over a longer period, we can see that the reduction of the Amazon forests is slowing down, despite the fact that we are talking about several thousand hectares. Having said that, claiming that the trend is improving can lead to justifying irresponsible attitudes and give rise to policies that go in opposite directions. For example, it is a significant fact that since 2018 the Brazilian Amazon rainforest has been deforested more than in previous years. Above all, however, there is the risk that this decline in the reduction of the wooded area could well change, especially in relation to the Amazonian forests, as a result of policies that do not adopt strategies to contain deforestation, or even worse, which exponentially increase the deterioration.

When we talk about forest degradation we are talking about factors that contribute to deforestation, which can be both direct and indirect drivers. Among the direct drivers, as mentioned above, agriculture is an important factor (as in the case of tropical forests but the situation varies greatly from country to country). However it is not the only one: mining and the expansion of urban infrastructures, for example, account for about  $\frac{1}{4}$  of total estimated deforestation, but this percentage too varies greatly from country to country. One example is that of the Brazilian Amazon rainforest, where it is thought that about 9% of deforestation is due to industrial mining (Sonter, LJ et al, 2017). The extraction of wood, together with activities related to timber and its exploitation and its transformation into forest coal, as well as illegal activities, all play an important role in determining the degradation of forest surfaces and the enormous pressure on its resources. Alongside the direct drivers there are also indirect

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### Agricultural expansion is determined primarily by large-scale commercial agriculture



Primarily cattle ranching and cultivation of soya beans  
*80% of it is used to feed livestock, according to WWF*



Oil palms  
*responsible for 40% of the deforestation of tropical forests*



Local subsistence agriculture  
*responsible for 33% of deforestation*

drivers that generate deforestation. These include demographic growth for example, which can generate greater pressure on the availability of forests in terms of demand for products (firewood), or socio-economic development in non-tropical countries, which can lead to indirect pressure on tropical countries, causing further degradation of their forest ecosystems.

Forests have a fundamental role in containing the climate crisis but if not managed they also represent a problem since they can also exacerbate its effects: on the one hand, forests fix carbon dioxide, thus “conserving” it in plant fibres (either in the root system in the soil or in the case of boreal forests or in the foliar system as in the case of tropical forests), but on the other hand if we look at the data regarding global anthropogenic emissions linked to deforestation, environmental degradation or processes such as combustion, it is easy to see how these practices are responsible for a large share of anthropogenic emissions of carbon dioxide. This problem can be limited by creating a wood supply chain that extends the life of the products as much as possible and avoids their combustion, thus avoiding re-emitting into the atmosphere that which has been stored during the entire life of the tree, but also and above all with strong governance able to guide a systemic transition towards protection, management, and maintenance of the forest heritage of our planet and which is capable of providing the correct space for the healthy and controlled growth of forests.

## The Expo and Agriculture

Milan, Italy / 2009

Stefano Boeri

For Expo 2015 to be a success, Milan must immediately promote and develop its preminent position as the city at the heart of one of the largest and most productive agricultural regions in the world, the geographical capital of a large plain covering 46,000 sq km and inhabited by 15 million inhabitants and which produces 35% of national agricultural production and 55% of animal husbandry.

Now that today's virtual world seems to have invaded every sensory sphere, the only way to ensure that any visionary view of the future can exist as a truly unforgettable experience is to create a real and physical landscape where this future can genuinely be lived, touched, walked through and be perceived by our senses. It is not enough to inform, document or simulate: we must transform exhibition sites into unique and tangible experiences for thousands of young people from all over the world. We need to design an Expo where policies for greater equity in the distribution of agricultural resources and alimentary products, projects designed to reduce food waste, and the battles for sustainable agricultural production are not simply displayed, presented, and documented, but are one with the architecture and the exhibition landscape.

We must consider the next Expo as a tremendous opportunity for offering land, territory and space to all those in the world who are facing the great challenge of food security.

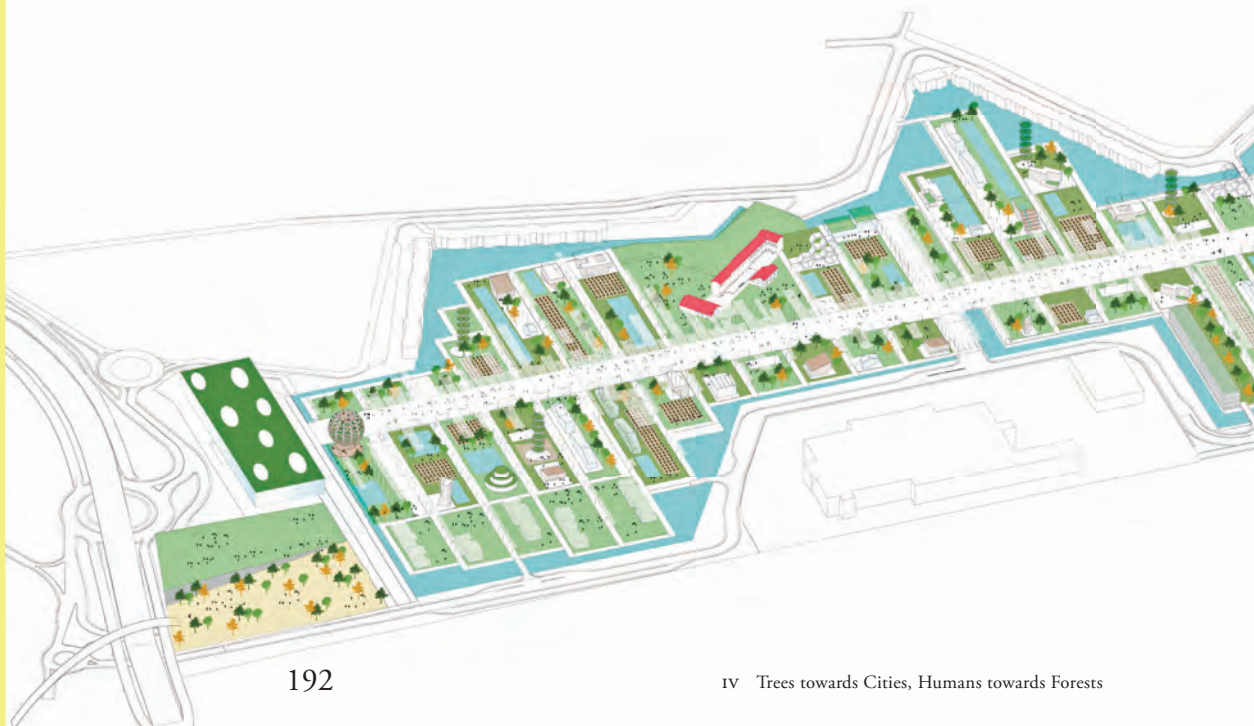
The site of the event should not be something that could be built anywhere as previously, but a brand new landscape, never seen before and designed specifically for Milan; a place where all the agricultural cultures of the whole planet are cultivated, transformed and brought together.

The Expo is an opportunity to enhance the cosmopolitan and multicultural nature of a city that is already today a World-City, a space open to those peoples and their languages who have decided, either out of free choice or by necessity, to work and live here. The 70 farmsteads located around the outskirts of Milan are landmarks representing a local history

*The International Exposition held Milan in 2015 was the occasion where to start a discussion on themes such as Nutrition, Food Security, and Innovations in the Food Industry. Stefano Boeri was Member of Architectural Advisory Board with Herzog & de Meuron, Ricky Burdett (London School of Economics), William McDonough + Partners. The project here described is the proposal for the concept masterplan for Expo 2015 developed by the Advisory Board, published in Biomilano (Boeri S. et al, 2011)*

of agricultural roots, community values and social generosity and in the coming years could well become places where the agricultural character of the city is rediscovered, but also spaces where the multi-ethnic communities that inhabit Milan today will be able to find the most suitable places to develop their own material cultures. Providing land means starting to sow today, cultivating tomorrow, and in the future reaping the fruits of this effort in order to start solving the great problems of humanity. It means rooting in the memory of millions of people the experience of a world that in Milan in years to come will try to deal with and overcome a decisive challenge.

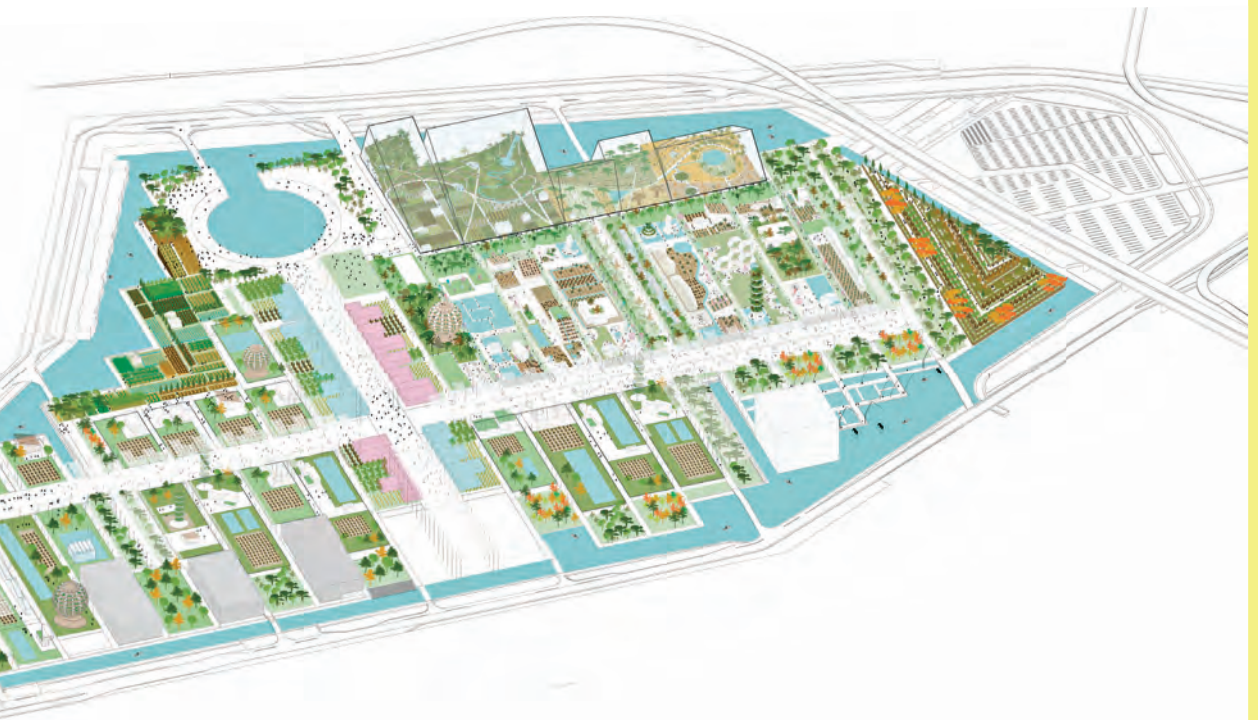
This is because the point is not only to think about and plan the territory, but also the type of demand that today can generate active and/or practical communities. This type of demand must be established together with the place, the local companies, and encouraged by institutions. Here I would raise a question concerning major issues. We need to look hard at what it means to rethink the working practices of communities based around the issues of production or marketing or distribution of agriculture. We think of energy and the possibility of self-production with communities that become entrepreneurial forms of producing, accumulating



and selling clean energy. The Expo and farmsteads are a new and different way of using the territory as a metaphor for new social dynamics, a place where the mapping of social dynamics allows us to glimpse new forms of creating policies in the areas that affect the public sphere.

Nutrition, food sovereignty and the related imbalances in food distribution and seed ownership were the major topics of the investigation looked at in-depth during Expo 2015. Based on these, the Architecture Advisory Board featuring Jacques Herzog, Ricky Burdett and myself and our respective professional studios conceived and oversaw the creation of an exhibition platform with unprecedented characteristics on which to represent and develop similar issues at a local level, starting with the Expo site itself: the city of Milan. The result was not simply a sequence of pavilions and commercial products but rather a place capable of simplifying and condensing the profound meaning of the great and inescapable challenge that the Planet is called on to deal with today.

The Universal Exposition in Milan was thus imagined as being within a large Planetary Garden: a portion of specific and local space reinterpreted as land offered for agricultural use and agro-nutritional traditions from around the world.



*Expo 2015, Feeding the Planet, Energy of the Future, details, Milan (Italy).*  
Stefano Boeri Architetti, Herzog & de Meuron, Ricky Burdett (London School of Economics), William McDonough + Partners 2009

### *The Planetary Garden*

The Planetary Garden was developed as the prototype for a new form of landscape, able to exist in cities all around the world and featuring a varied and cosmopolitan style of agriculture yet rooted in local conditions: a new generation form of agriculture which also represents an essential component of an evolved model of social and economic development. It is a small area in which all the global energies capable of launching a serious challenge to the great catastrophes of hunger, food waste, imbalances and injustices in the governance of food processes can be implanted and implemented in experimental form – in other words, a place for a virtuous alliance between the technological and research resources and the traditions of agro-nutritional biodiversity. The fields in the Planetary Garden are cultivated through the application of the most advanced agricultural production technologies. There are spaces for representing activities carried out by food and catering supply chains: special gardens where farmers' communities and businesses can come together to combine their talents and agri-food traditions, large greenhouses in which to reconstruct the bioclimatic conditions of the different areas of the Planet.

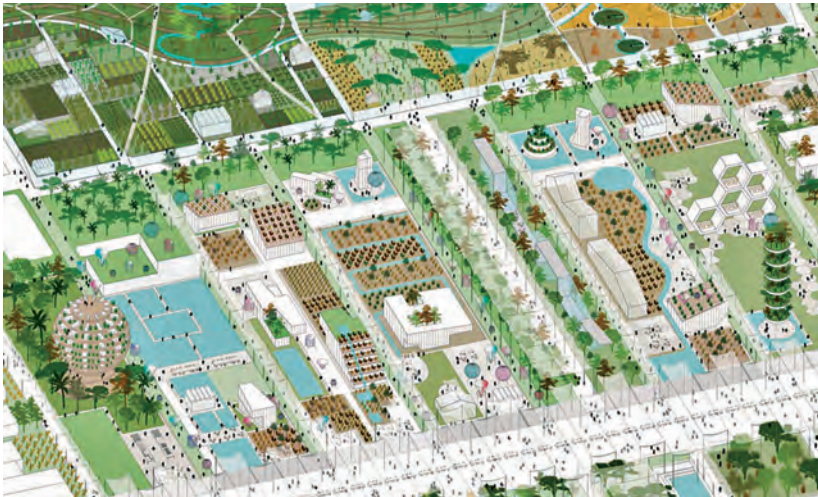
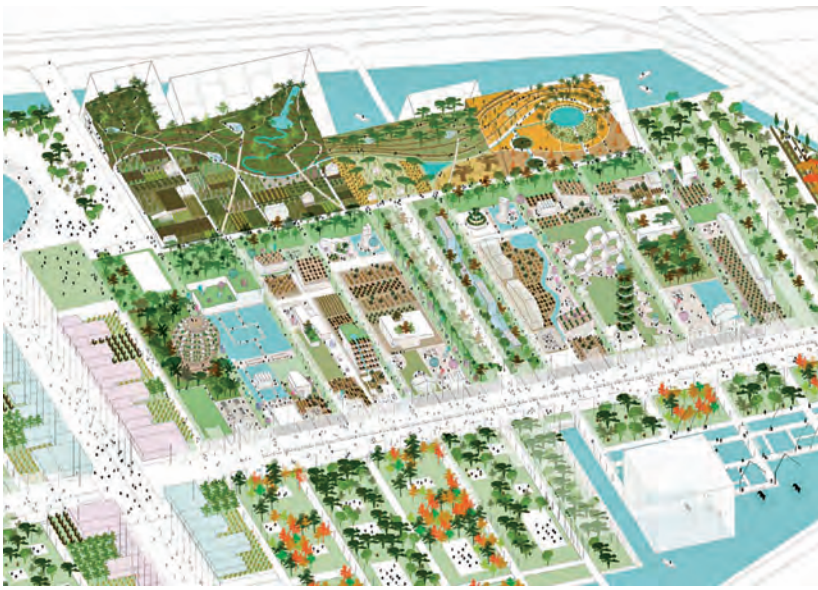
### *Landscape-matrix*

In this way, the project defines a new agriculturally-driven “landscape-matrix” that is both varied and cosmopolitan yet rooted in local conditions, since it is supported by cultivation practices managed by open and inclusive urban communities. This is new generation agriculture that is also an essential component of an evolved model of social and economic development.

In addition to being a setting with tremendous appeal and cultural density, the Planetary Garden is also presented as a territorial device, able to work into different local production chains.

The daily practices of food cultivation and transformation promoted by metropolitan communities are just one example of “neighbourhood agriculture” that can guide a new scenario for nutrition at a global level.

Together with the decision to allocate large woodland areas to the production of wood in addition to generating a new and extraordinary urban landscape, the peri-urban peri-Urban Forestry, reforestation and forest maintenance projects can reactivate areas dedicated to the production of furniture and prefabricated buildings. Furthermore, the development of multi-functional agriculture is presented as an effective obstacle to an extensive and now no longer sustainable model of urban growth. The enhancing and developing of a new rural dimension able to exchange economic and cultural values with



*Expo 2015, Feeding the Planet, Energy of the Future, details, Milan (Italy). Stefano Boeri Architetti, 2009*

cities might well be defined as the necessary condition with which to restore a balance between urban and non-urban areas while respecting the differences and values of both.

### *Masterplan*

The masterplan for the Planetary Garden is based on the idea of the Latin *castrum*, structured around two main perpendicular axes, the *cardo* and the *decumanus*, which meet in a central forum. The two axes, in this case 1.5 km and 350 m long respectively, generate a grid on which the pavilions and *hortus* - or enclosed gardens - are arranged, while a system of perimetral waterways surrounds the whole area. The network of channels has been redesigned to focus attention and resources on the issue of reclamation and redevelopment of farms and the extension of the vital energy of the exhibition site to the wider area. The decumanus, the “Avenue of food and nutrition” is where visitors interested in the various products can experience the results of food chain cultivation and production at first hand. Among the pre-existing farmsteads in the area, the most important is the Cascina Triulza: an ancient rural construction which was typical of the Lombardy agricultural system and renovated and redeveloped for the occasion to host the Exhibition’s headquarters. Subsequently, it has become a museum dedicated to the themes of agriculture and nutrition as presented and explained to children.

Thanks to Expo 2015, Milan will create the first Planetary Agri-nutritional Garden: a prototype for an unprecedented and experimental landscape to be preserved in its integrity (even in the years following the event) both as a resource for the city and also as a model that can be applied in different local contexts. The tremendous legacy that Expo 2015 leaves to Milan, Italy and the Planet consists precisely in the vision of a new expression of the peri-urban countryside: a revolutionary and paradigmatic territorial device that can inform and guide the future of a vast number of cities the world over.

## Forest-human relationship. Meanings and Identities

The symbolism behind plants and trees

Simone Marchetti

Through the use of drawings and dreams over many years of research, the psychologist Carl Jung explored the unconscious of a number of patients from different cultures and backgrounds. Fascinated by how often his patients dreamed of trees, he drew up a list of various meanings associated with it through images, dreams and fantasies. In short, the most frequent associations were growth, life, source of life, protection, solidity, permanence, old age, personality, death and rebirth. Jung concluded that the tree is an archetype: an element belonging to the collective human unconscious and that albeit with different shades of the same meaning, it can be found in all cultures (Jung, C.J., 1967).

When writing this book, we asked ourselves where this respect for trees and forests comes from and if it derives from a cultural process. The truth is that we could not have written a book that was anything other than a paean in praise of nature in all its various forms. The reason for this is on the one hand the result of profound reflections on the importance of forest ecosystems and trees for the entire planet and therefore the product of a rational logical process, while on the other hand there is the fact that trees are considered an iconic entity of the conservation of nature and its destruction by mankind, and is associated as such with an emotional state deriving from a complex stratification of meanings. In both cases then, it is linked to the cultural state in which we are immersed. So where does this complex layering of meanings come from that allows us today to look at nature and trees in this way?

If it can be said that today we have managed to attain a certain level of sensitivity towards nature, the landscape and issues relating to the climate crisis, we owe it not so much to the fact that nature has become a shared good, or that everyone is aware of its meaning, of its importance and value in terms of the beneficial contribution made by trees in cities, but possibly considering a simpler historical explanation: we have passed

from an industrial society to a post-industrial society. The position of centrality that trees and their related ecosystems have assumed within the urban scenario, whether political, cultural or economic, is due to the transformations that have taken place within our society. These include the transformation of its essential character, from socio-cultural changes to urban changes, and the ever increasing developments in mobility, as well as new forms of settlement and housing methods and increasingly refined forms of strategies for mitigating the effects of the climate crisis, such as the creation of genuine green and blue infrastructures within cities. These latter represent an attempt to break down that modern condition of contrast between what is considered “artificial” and “natural”.

In fact, if modernity has seen the prevalence of the former over the latter, artifice over nature, the role of the tree and its ecosystem in our contemporary condition is being re-evaluated, thereby creating a new vision of the urban landscape.

This new sensitivity towards nature, forestation, trees, and their associated ecosystems is the result of a primarily cultural process that has changed over time. To date, the influences that create and inform our vision of the world are multiple and multifaceted. In part, contemporary thought is the result of intermingling between the development of post-humanist theoretical/philosophical thought and other regenerative theories, and anthropocentrism which, however, is shaping its own centrality in the “ecological” context, that is to say, it has a particular sensitivity towards data emerging from the scientific community regarding the climate crisis and which lays the weight - and responsibility - on mankind for its own ethical choices towards the environment.

If we go back in time, it is clear that the conceptualization of landscape and nature underwent a change over the following centuries but left traces that can still be found in contemporary thought. According to Rainer Maria Rilke, the idea was to acquire a non-anthropomorphic view of Nature and to entertain a silent and contemplative relationship with it, accepting its greatness and its indecipherability. This concept of nature as something external to us, to be observed as if we were not part of that given natural landscape, goes back to ancient times and sometimes still persists today. Occasionally, certain elements of the natural sphere take on a life of their own that cannot be controlled and they are therefore perceived as a threat. An example of this lack of consideration or disregard towards Nature can also be found today, where the expression “the ugly virus to be eradicated” was perhaps the most commonplace analogy used with reference to 2020 and 2021. This expression

embodies a multiform mass denial, including primarily our inability to see ourselves as being immersed in the Pangaea of organisms that populate this planet. We therefore return to the eternal dilemma of fighting each other and living together which has led to numerous highly interesting sociological and anthropological phenomena that are well known throughout the history of humanity. (Silvestri, G., 2019).

Georg Simmel, in his essay *The philosophy of landscape* (Simmel, G., 1913) stated that it cannot be called “landscape” where the human being spontaneously feels in communion with naturalness, and therefore also not where he doesn't feel the presence of nature as something foreign and alien. Foucault “condemned” this error during his famous conversation with Chomsky in Eindhoven in 1972. (Chomsky N., Foucault M, 1974). His position, in a nutshell, was that it is a mistake to consider Nature, as well as human nature, as something that belongs to a sphere that is external to us. Nature is something that is basically recognized not in an exterior sense or context but rather within the profound interior nature of our own lives. (Boeri, S., 2018).

In actual fact, “landscape” goes far beyond this definition and cannot be thought of separately from how we perceive, conceive or imagine it. “Therefore this leads to the idea of landscape as a container that brings together “infinite elements” and many of the problems that afflict us today: climate change, environmental degradation and pollution, belonging and social alienation, the opening and closing of borders, post-colonialism, scenarios depicting migration and war. It is the heritage and memory of places. The relationship between humans and their environment is never “neutral” or unidirectional (whatever the direction). Every time we enter the landscape we work on it, and it works on us, whether as individuals, communities or nations. It is a concept under constant tension and lies at the basis of history, politics and cultural representations. It plays with borders and mixes up territories.” (Lingiardi V., 2017).

Nature is therefore culture, and “even the landscapes that we believe to be most independent of our culture can, upon closer observation, turn out to be the product (...), a construct of the imagination projected onto forest, water or stone”. (Schama S., 1995).

The European Landscape Convention approved a similar definition of landscape in which human perception and the interaction between human and natural play a fundamental role: “Landscape” means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. (European Landscape Convention, 2000).

### *Meanings and identity*

Trees and forests are therefore part of our cultural history. Our minds are characterized by a series of images, emotional states, cultural influences, and metaphors that arise from a close bond with forests and the presence of trees in our lives. The image of a tree or a forest is anchored in our minds: the tree has constantly been not just a tool, our first weapon with which to defend ourselves, the trunk and branches the first place under which to shelter from the elements, the first home, but also an entity linked to fantastic imagery.

One example of this is the ancient Mayan civilizations which considered the tree as “Axis Mundi” or “the axis of the world”, and attached considerable symbolism to the natural world. The tree represented a genuine bridge that connected the celestial sphere with the underground world, while at the same time expanding its presence on the horizon above the Earth’s surface with its own foliage. The tree, usually represented as a “Ceiba” or the largest species of tree which dominated the rainforest skyline, represented the beginning of creation and the richness of the entire forest ecosystem as it provided shelter and was the home for multiple communities of living beings. (Stone A., Zender M., 2011). Some of these concepts, including the idea of a tree as the axis of the world, have been reused and developed in a contemporary key in the development of a manifesto and a Masterplan idea for the Cancun Smart Forest City in Mexico.

This is an extremely different approach to Dante Alighieri’s vision of the forest or of medieval society, still extremely closely linked to Christian mythology in which words such as bestiality, (as in cruel or depraved behaviour) fallenness, errancy, and perdition were associated with forests (Harrison P.R., 1992). Charles Darwin was one of the first to take the side of the plant kingdom by observing it from a completely different perspective. He was the first to clarify, for example, that the evolution of plants was not only linked to a natural selection of the same but was interdependent on the parallel evolution of insects. Natural selection allowed the apparatus used by some insects for food to correspond exactly to the structure of the flowers. This incredibly close correlation, as Darwin observed, represented a profound biological meaning: colours and scents, as well as the three-dimensional shapes of flowers, plants, and trees, were the result of detailed and careful selection and modification that took place over time, with all stratagems and “devices” modified with the ultimate aim of widespread dispersion and fertilization.

Oliver Sacks’ book *The River of Consciousness* (Sacks O., 2017), presents an interesting analysis of the role of plants, looking precisely at the botanical studies carried out by Darwin. In one passage in particular, Sacks states that Darwin,

well before the discovery of auxins (plant hormones that “perform many of the functions performed in animals by the nervous system”), had hypothesized that there was a “chemical messenger transmitted downwards, from the ‘sensitive apex of the seedling towards its motor tissues’”. At a time when the plant world was still frowned upon, much less studied with interest - at least not as much as the animal one -, this could perhaps have been an early attempt by the famous biologist to demonstrate the intelligence of certain plants. Even today, despite the fact that more than a century has passed since Darwin’s death, it is still difficult to accept that they are intelligent, they can communicate, they have developed their own intelligent way of surviving and that they do so with a deal of success. From a cultural point of view, therefore, we are not too far from Darwin’s cultural milieu which was so hostile to the plant world. For example, we are not yet able to understand, perhaps out of laziness, perhaps out of selfishness, perhaps out of lack of knowledge, how much the world we live in is interconnected and how much every single inorganic or living organic form on this planet is in an interdependent and therefore mutually reciprocal relationship.

In his book *Forests. The Shadow of Civilization* author Robert Pogue Harrison offers an interesting consideration on the meaning of living in the light of the new ecological conception of the world. In essence, he argues that humanity depends on the integrity of the natural world, that human beings belong to a larger system of biological differentiation and that we are in fact interdependent upon the planetary environment and with forests (Pogue Harrison, R., 1992).

The author maintains that there are two conflicting doctrines. The first is a form of super-humanism that sees itself as superior, autonomous, and self-sufficient and which sees cities as the culmination of this doctrine. The second is the ecological doctrine which if on the one hand tends to question the assumption of humanism, on the other attempts to protect and manage and therefore, to a certain degree it too becomes an administrator of nature. In both cases, the author states, there is confusion about the true meaning of human life on Earth which has always been conceived as “self-expropriation”. In short, he maintains that we do not live in nature but in a relationship with it and that the history of forests, if only in the Western imagination, is in fact the history of our self-expropriation from the natural world (Pogue Harrison, R., 1992).

What is proposed here is perhaps an attempt to make our existence less consistent with the idea of self-expropriation, by reshaping our way of living and the meaning we give to the plant world.



Stefano Graziani  
*Taxonomies*

This series has been published on Lampoon Magazine, *The Commitment Issue*, November issue 2020

“It took me three years to photograph what I was looking for. *Taxonomies*, the entire portfolio consists of more than 120 pictures. The project revolves around Swedish naturalist Carl Linnaeus, whom I imagined as a scholar of the visible. I studied his works and his utopian enterprise of Swedish autonomy by cultivating economically strategic plants; the project failed due to the Scandinavian climate. Still, it generated insightful studies on the planet’s flora. I saw the greenhouses I encountered as utopic in his effort to acclimatize non-local plants. After several exhibitions, for a long time considered *Taxonomies* a completed project, I am now thinking of recovering some aspects of it through new works that are direct echoes of it.”





Today, however, scientific knowledge allows us to evaluate another aspect that was previously not possible to take into consideration, namely the benefits brought by trees in terms of support within the terrestrial ecosystem, guaranteeing that dynamic equilibrium is so decisive for the survival of ours and many other species living on our planet. This allows trees and forest entities to be observed from a perspective not only of benefit to public health but also as a real economic benefit, becoming an enhancer for national governments, stakeholders, and private individuals to undertake concrete actions with a positive impact on the urban fabric and the environment. It is essential that this transition is made in parallel with a cultural transition, which effectively represents the keystone in this global paradigm shift. Trees and forests are some of the most powerful weapons we have.

The following projects have a strict connection with the symbology linked with the tree, as a structural element of our life. From Cancun Smart Forest City, where the trees, following the concept of “Axis Mundi”, become the epicenter of a new urban development where the green and blue infrastructure assume a primary role on defining the city’ characteristics -from housing to mobility; to Radura della Memoria, where trees help a community affected by a loss to re-appropriate the “aggregation rituals” (van Gennep A., 1910) allowing a healthy separation process. Scientific studies demonstrate that nature has the ability to help heal grief and suffering, and trees are a universal archetype that can be found with slightly different means in all cultures; thus trees become the point of encounter of diversity. Trees help in this way to create a positive response to the drama of bereavement not only in the biological sense, but also symbolically. Giving life in the name of the loved one, to a new birth which is that of a plant or a tree. In the staging of the theatrical piece “Le Troiane”, the Trojan Women, by Euripides, there were used trees fallen from the Vaia storm (Adrian storm) to represent the destruction of the city of Troy, this time giving a second life to the trees. The trunks taken from the Triveneto region are staged to raise awareness on the risk of another natural disaster, the risk for those fallen trees to be attacked by the European spruce bark beetle (*Ips typographus*), a beetle that would destroy the wood making it impossible to reuse for other purposes, or to reforest the area.

## Cancun Smart Forest City

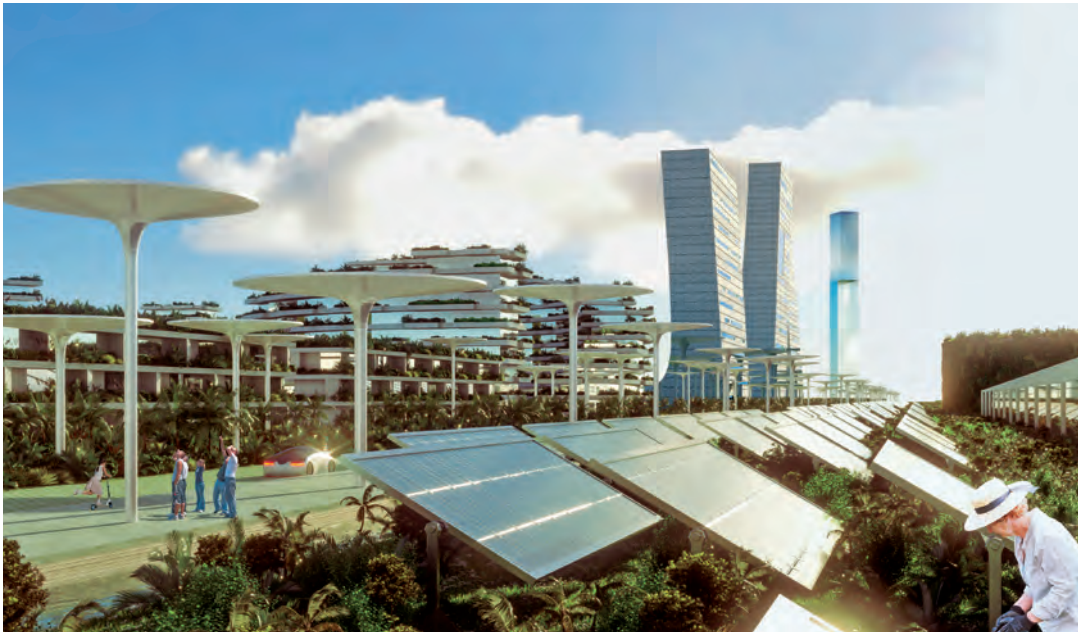
Cancún, Mexico / 2018-2019

Stefano Boeri Architetti

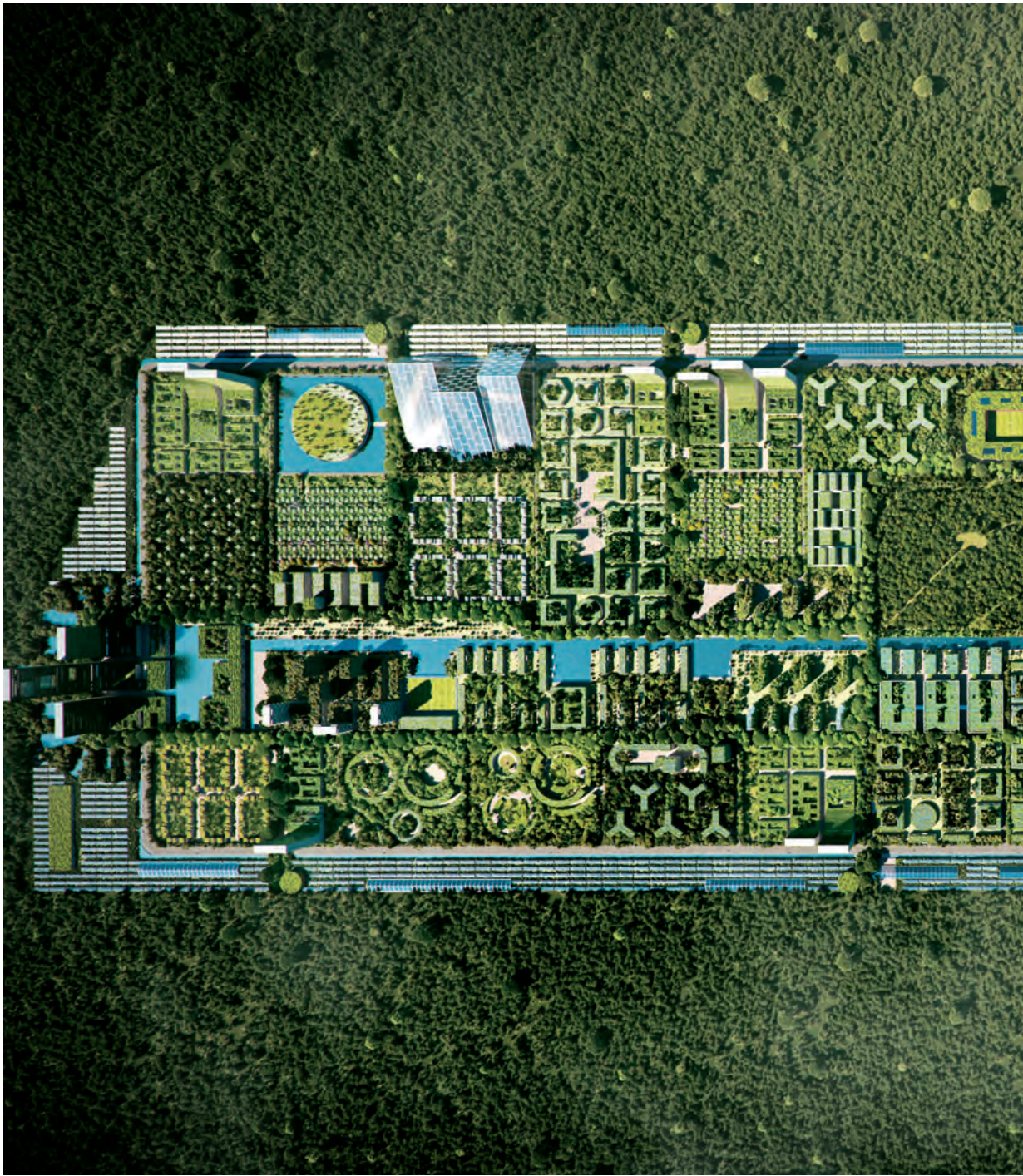
In 2018, Stefano Boeri Architetti was asked to prepare the vision for 557 ha of land at the borders of Cancun, Mexico. The metropolitan area will be home to 362 hectares of planted surfaces and 120,000 plants from 350 different species, based on the design concept of an open and international city inspired by the values of technological innovation and environmental quality. The design of the new Forest City includes a high-tech innovation campus where university departments, organizations, laboratories, and companies will work on a global level to solve the major issues of environmental sustainability and the future of the planet. Within this campus, there will also be research and development centres intended to host students and researchers not just from Mexican universities, but from leading top-flight institutions worldwide.

The Smart Forest City has been designed as a settlement that is self-sufficient in energy production through a perimeter ring of photovoltaic panels and a water channel connected to the sea via an underground system that allows the city to be irrigated in a sustainable manner. This choice encourages the development of a circular economy around the theme of the use of water, (one of the project's key elements) which is collected at the entrance to the city in a large dock and a desalination tower and then subsequently distributed via a system of navigable canals allowing its distribution throughout the inhabited areas and the irrigation of the surrounding agricultural fields. The new Forest City is also at the cutting edge in terms of mobility thanks to a highly developed transport system that requires both residents and visitors to leave every internal-combustion-powered vehicle at the city limits since mobility within the city is solely electric and semi-automatic.

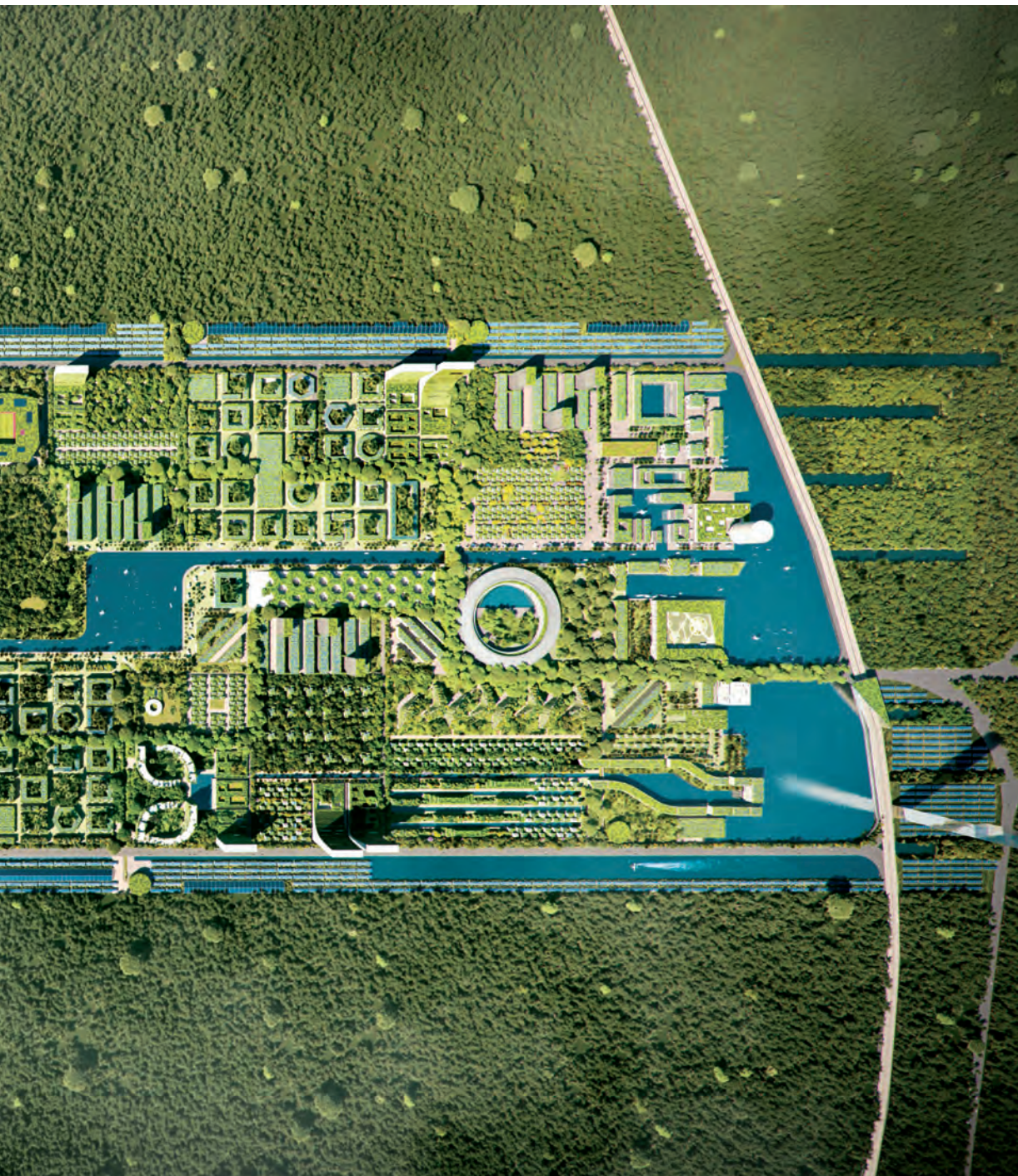
The project has been designed according to the principles of Non-Deterministic Urban planning. Once the definition of the large scale in-variables of the urban framework relating to energy infrastructures have



*Smart Forest City*, Cancún, Mexico. Stefano Boeri Architetti, 2019. Visualization by The Big Picture



*Smart Forest City*, Cancún, Mexico. Stefano Boeri Architetti, 2019. Visualization by The Big Picture





*Smart Forest City*, Cancún, Mexico. Stefano Boeri Architetti, 2019. Visualization by The Big Picture

been established along with mobility, greenery, the presence of the most important research and development centers and the right of each inhabitant to have every service available at a suitable walking and/or cycling distance, the city will provide tremendous flexibility in the distribution of the various building and architectural types.

Cancun's Smart Forest City is therefore a botanical garden within a contemporary city, based on traditional local heritage and its relationships with both the natural and the sacred world. It is an urban ecosystem in which nature and the city intertwine and act as a single organism, leaving room for untended vegetation planted on land used by the public and which is considered a fundamental element of the design. The human need to find solutions that involve a changing perspective on the way in which activities are carried out, from the way we produce to the way we consume, is however still dominant. The path leading to dematerialized and detoxified goods and services can be summarized by the four Rs: reduction, repair, reuse and recycling. The Smart Forest City addresses these development needs, allowing and encouraging education and economic empowerment – especially that of women – by developing radically more eco-efficient solutions, lifestyles and forms of behaviour that start with reducing overall demand for energy and a decrease in waste production.

The Cancun Smart Forest City adopts the philosophy espoused by E. Glissant with regard to the concept of *Mondialité*, making it one of its foundation keystones in order to encourage research and exchange between countries. *Mondialité* means not belonging to exclusive homelands or nations but to Places – made up of linguistic interchanges, free divinities, unspecified native lands, languages and geographies chosen and interwoven between lands and visions – of which the Forest City becomes part, embracing Creolization as a form of driving force for social and economic development, allowing accessibility and intermingling to coexist in the same space. Water treatment plants, food production, winter gardens, innovation paths, navigable canals, mobility hubs, desalination and capillary systems for public and private gardens are interlinked as elements of innovation and tradition.

## Syracuse – The Dead Wood of the Trojan Women

Syracuse, Italy / 2019

Stefano Boeri

This text is a transcription of a lecture by Stefano Boeri filmed during the first lockdown between March and April 2020 as part of the “Tempo Ritrovato” series of readings.

I picked up Matvejević’s book a few months ago while I was working on the staging of Euripides’ *Le Troiane* - The Trojan Women - for the Greek Theatre in Syracuse. The INDA Superintendent Antonio Calbi had asked me to create the stage setting in this ancient theatre, built in the fifth century BC using limestone and which has remained practically intact since then despite its more than 2000 years of history.

I got more interested in Euripides and his tragedy thanks to the famous adaptation that Sartre wrote at a time when the echoes of the Algerian war, which began in 1954 and ended with the African state declaring independence, were still very strong. It was an extremely violent conflict, during which France paid the consequences of a long and aggressive colonial policy. Clearly at that time a political philosopher like Sartre could not help but deal with what was an authentic civil war which left a million dead on the ground and had been a shameful experience for French nationalist politics.

While respecting the text however, Sartre decided to offer an implicit and subtle updating of Euripides’ tragedy. It was no different from that which Euripides himself had completed twenty-four centuries earlier, when, with *The Trojans* in Athens in 415 BC, he implicitly staged the war in progress in the Peloponnese, the aggression by the Athenians and the extermination of the population.

As is well known, in *Le Troiane*, Euripides overturns the Homeric (and epic) perspective of the war, by narrating a story through the voices of the women who survived the sack of Troy that - it will be discovered - has neither winners nor losers. With the city destroyed by fire, the mothers, daughters and sisters of the men killed in the war approach the coast where the ships of the Achaeans await them to kidnap them and take them away by force from Troy. The men are dead; one of the few surviving male children, Astyanax, son of Andromache and Hector, is snatched

from his mother's arms and thrown from the smoking walls of Troy by the Achaean soldiers so that he cannot perform any act of revenge against the enemies who killed his father. Those speaking are the women who have been deprived of a future and who have lost everything.

Together with Anastasia Kucherova, who helped me in designing and creating this scenography, we thought for a long time about the extraordinary space of the Greek Theatre, contemporary with the writing of Euripides; and on what was the best way to enhance the direction of the French playwright Muriel Mayette Holtz who essentially focused on the power of the word, the voices and the bodies of the women chosen by Euripides as the undisputed leading characters.

Other architects, including Rem Koolhaas and Massimiliano Fuksas had been called in the past to work in the Greek theatre at Syracuse; I am not a scenographer and my intent, rather than creating a set of canvas and screens, was to create a landscape, or rather, to intensify certain components of the setting of the Syracuse Theatre in which the theatre itself would be the leading character. This would be a stage device able to make the voices of the actresses led by Muriel resound between the sixty-seven tiers of the auditorium and the holm oak trees and pines behind the stage; and which would best accommodate the movement of the cast, placing themselves in the centre between the audience of humans sitting to watch the tragedy and the audience of the trees behind.

And so, while I was reading the text of the tragedy and thinking about the scenography, it occurred to me that the main features of the theatrical setting should be the trees destroyed by the Vaia storm a few months earlier, which at the end of October 2018, had flattened about 14 million white and red fir trees over in an area of 41,000 hectares between the Trentino, Friuli and Veneto mountains. It was a sudden and extremely powerful storm, with winds of up to 200 km/h that combined with an unexpected meteorological disturbance, completed with continuous pouring rain. The planting of the forest, consisting solely of fir trees placed too close together, along with an excess of water on the ground, had probably weakened the tightness of the roots and created a ripple effect in which nature seemed to have uprooted, flattened, broken up and destroyed everything in seconds. It was a very powerful and disturbing image, especially if we think of forests as witnesses to hundreds of years of history.

In just a few weeks, thanks to the collaboration of the mayor of Sappada in Friuli and the municipal authorities of other small villages among



The travel of *A dead Wood for the Trojan Women*, 2019. Photo courtesy of The Blink Fish





The stage of *The Trojan Women* by Euripides, directed by Muriel Mayette-Holtz, at the Greek Theatre of Syracuse in 2019. Scenography, *A dead Wood for The Trojan Women*, by Stefano Boeri Architetti. Photo credit: Franca Centaro



those most affected by the Vaia storm - and thanks to the support of INDA and the Mayor of Syracuse - we were able to bring 400 fir tree trunks from 4 to 8 metres in length from the Carnia mountains to Syracuse. A short film directed by Stefano Santamato and Paolo Soravia (*The Blink Fish*), tells the story of the journey taken by this dead wood, first on a truck and then on a ship to the port of Syracuse and then the theatre workshops where the staging was created.

The dead trees were erected on the stage as if they were wooden columns that had survived the destruction of a temple. Demonstrating a certain dignity, the trees stood between the audience of humans and the audience of living trees in the woods behind them. A temple of worn trunks, destroyed by storm and death, which in its simplicity was home to the movement of the bodies of Trojan women and the screams of Hecuba, queen of Troy, Polyxena and Andromache. This desperation was no different to that of Syrian or Libyan or Ethiopian women, forced to flee ongoing civil wars or droughts, to risk their lives and those of their children in crossing the Mediterranean to land on the Sicilian coasts, sometimes only a few kilometres away from the Greek theatre where we had staged Euripides' tragedy.

Natural vegetation, uprooted by an environmental catastrophe largely exacerbated by human action and the effects of global warming thus became the setting for a tragedy that lives out of time, narrating a drama that has human nature as its subject and which has been broken and destroyed by war.

## Radura della Memoria, Polcevera Park and the Red Circle

Genoa, Italy / 2019 – ongoing (Radura della Memoria, 2020)

Fiamma Colette Invernizzi

The installation of Radura della Memoria is a project conceived by Stefano Boeri Architetti, Inside Outside / Petra Blaisse, the Artist Luca Vitone, with the participation of Studio Laura Gatti and Metrogramma, dedicated to the 43 victims of the tragedy of the collapsed Morandi Bridge, in August 2018 in Genoa, Italy.

The Radura is the manifesto of the first rebirth gesture in the neighbourhood, thus linking the memory of the victims and their families and the overall vision of the future *Polcevera park and the Red Circle*. The Park has been designed as a system of gardens with different ecologies and infrastructures for sustainable mobility, with the aim of overturning the current image of the valley, through symbolic architectural elements: a cycle-pedestrian system 1,570 metres long, 6 metres wide and with a diameter of 250 metres opens up to embrace the neighbourhood and create new connections between the two sides of the Valley and the different districts; and a 120 meter high wind tower, a linear element in the Valley, for the production of clean and renewable energy.

The intervention of *Radura della Memoria* consists of a circular wooden podium with a diameter of 50 meters, inside which 43 different tree species are placed - a memorial to remember the 43 victims. The variety of trees recalls the typical Mediterranean scrub and the radial composition is made up of a wooden structure obtained from felled trees that were hit by the Vaia storm, also called Adrian storm (Triveneto, in North-East Italy) on 29 October 2018.

The installation – which will remain available to the city until the realization of the Polcevera Park project and then will be dismantled and reused in all its components – shows constant attention to the ecological impact of the choice of materials.

The trees favour the creation of an intimate space suitable for meditation and reading, a place of remembrance. The podium, easily and



*Polcevera Park and the Red Circle, Genoa (Italy). Stefano Boeri Architetti, 2019.*  
Visualization by The Big Picture





*Polcevera Park and the Red Circle, Genoa (Italy). Stefano Boeri Architetti, 2019. Visualization by The Big Picture*



*Radura della Memoria, Legnolandia, 2020*

publicly accessible, invites people to commemorate the victims but it is also meant to be used as a device where to stop by and take a break. The circular wooden podium is 45 cm high and 6.50 m wide and can be accessed through steps distributed both on the external and internal side, inviting the visitors to play with different views and perspectives as well as enjoying the shades of the different trees. Integrated in the podium surface there is a thin steel plate that reports the names of the 43 people who died and which makes the installation also a place of commemoration.

At night, the *Radura della Memoria* turns into a suggestive landmark with luminous spot lights positioned along the circular platform and under the foliage of the trees.

The *Radura della Memoria* – also defined in collaboration with the Committee of the relatives of the victims of Morandi Bridge – anticipates the new system of parks and public spaces that will also host the *Memorial* with the *Mediterranean Biodiversity Greenhouse*, the *Green Factory*, and the *Red Circle* in a symbolic and manifest system of an urban mending between the banks of the Polcevera valley.

The Polcevera Park and the Red Circle created by the temporary group made up of Stefano Boeri Architetti, team leader of the design team, Metrogramma by Andrea Boschetti, Inside Outside by Petra Blaisse, with Mobility in Chain, Transsolar Energietechnik, Studio Laura Gatti, Secondo Antonio Accotto, and the specialist consultancy of H&A Associati, Temporiuso and the artist Luca Vitone, is developing through a participatory process, with the direction of the Municipality of Genoa, the Department of Urban Planning and Urban Lab, involving citizenship and a series of public and private subjects, stakeholders (first of all, the Committee of the victims' family members, the citizens of Via Porro and Via Fillak and of Certosa, the schools and the Town Hall, the Region, RFI, Confindustria, FILSE, Ansaldo Energia, San Giorgio Seigen, IRETI, etc.).

# The Yanomami wisdom

Interview with Davi Kopenawa Yanomami

September 18th, 2018

*Interview translated  
from the Portuguese  
by Alessandro Lucera.  
Interview  
by Simone Marchetti*

Davi Kopenawa Yanomami, is a Yanomami shaman and Portuguese-speaking spokesperson for the Yanomami People in Brazil. He became known for his advocacy regarding tribal issues and Amazon rainforest conservation when the tribal rights organization Survival International invited him to accept the Right Livelihood Award on its behalf in 1989. In 2019, Yanomami and the Hutukara Yanomami Association were also awarded the Right Livelihood Award for their courageous determination to protect the forests and biodiversity of the Amazon, and the lands and culture of its indigenous peoples.

We know how important the tree as an organism and the forest in its entirety still are for many indigenous peoples who live in the Amazon rainforest. These people are increasingly under attack by the continual pressing interference of the white man, together with deforestation, the expropriation of land for agricultural uses and the exploitation of mineral resources. Today, more than ever it is important to give voice to all those who still live and protect the primary forests from the interference of extraction and uncontrolled deforestation. The Yanomami are hunter-gatherers and slash-and-burn farmers with an immense historical culture who live in respect for the environment that surrounds them, and occupy an extensive portion of tropical forest between Brazil and Venezuela. Although the borders of the Yanomami lands have been officially demarcated, their integrity is constantly under threat from illegal expropriation activities for agribusinesses, the extraction of precious metals and more in general by multiple economic interests in the areas. Having never before come into contact with certain diseases that were common to the invaders and due to interference of the white man, from 1940 to 1960 the local populations of these areas were decimated by epidemics.

*Simone Marchetti* Can you explain the meaning of the word Urihi in Yanomami and its symbolism?

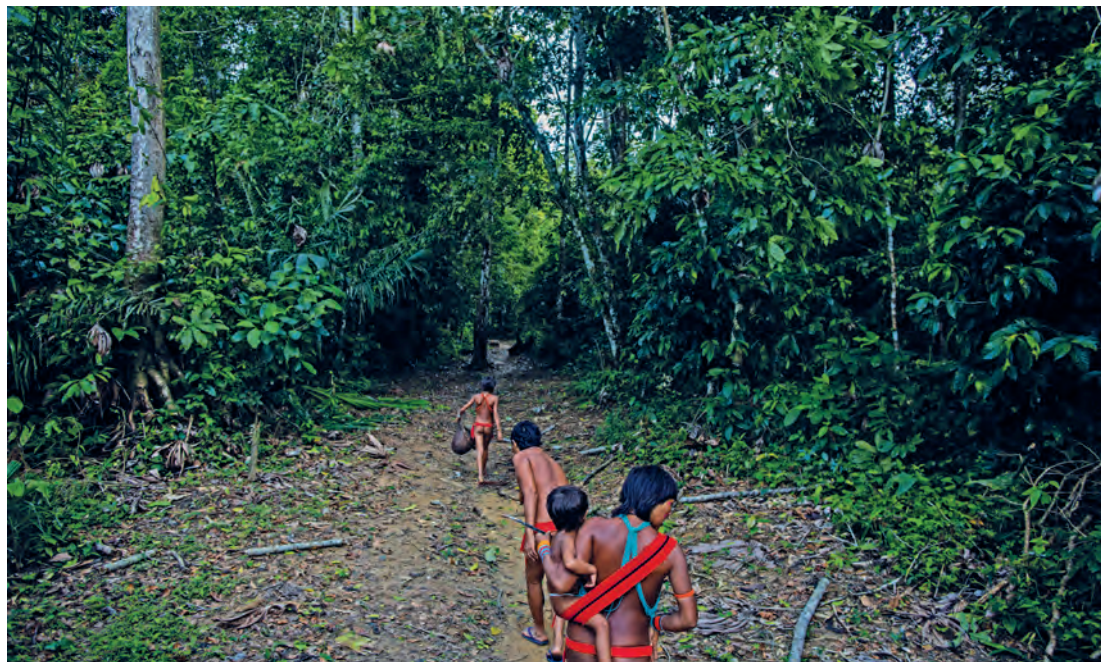
*Davi Kopenawa Yanomami* The forest, which in Yanomami is called Urihi, has a broad meaning that is often associated with the word Mashita or “Urihi - Mashita” which means land-forest, the world we tread on, the land we inhabit. This word takes on a meaning, a broad semantic range of senses together with the word “Utukara”, which means the sky, thereby indicating the whole world, animals, rain, wind, light, the moon, the stars, the sun, darkness and everything

inside the universe. The forest represents the world, the universe, and enormous value is attributed to it. The forest is alive, and that's where all the beauty comes from.

*sm* How does the climate crisis affect the life of the Yanomami?

*dky* In my opinion as a Yanomami, what you call the climate crisis is what we call Shawara, which translated means epidemic. This Shawara is a series of diseases which are one of the multiple consequences of the invasion of the white man, with a series of problems relating to the forests and the lands of the Indians. Shawara also causes those who live in cities to suffer, because it is what makes the whole world suffer: it is carried by the wind, which takes the Shawara with it, and makes it “bang in the sky’s chest”, and then makes it fall on the cities and forests. Shawara, for example, is also the flu, tuberculosis, cancer and HIV. What the white man is talking about, the climate crisis, is just that. It’s everywhere. It starts from the city but then powerfully strikes the forest and all those who live near the sea.

*sm* Like other indigenous peoples of the Amazon rainforest, the Yanomami are great observers of nature. They live in balance with it and have a vast culture related to the forest, plants and trees. We have a lot to learn from indigenous peoples, from conservation to forest ecology, and the enormous knowledge of the properties of individual



The Amazon Forest. Photo credit: Victor Moriyama



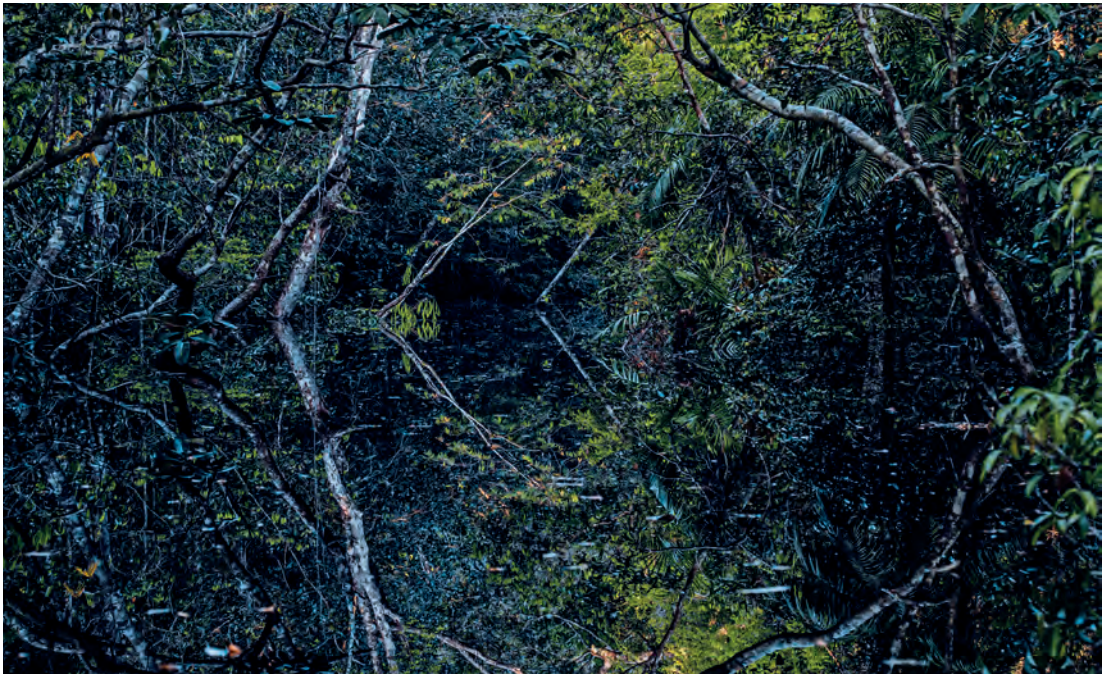
The Amazon Forest. Photo credit: Victor Moriyama

plant species. This also opens the way to the imagination of a future society that is not based on the concept of extraction but of regeneration and reuse, and which ascribes the correct value to the world of plants, trees and forests.

Do you think it is possible to change this model starting from the relationship with the environment in which we live?

*dky* Yes, certainly, starting with what we are doing here today. Making friends, creating big families so as to spend time together, indigenous and non-indigenous. Indigenous peoples together with non-indigenous peoples who struggle to be together with Urihi-Mashita, with the great land-forest. The world needs everyone's support to sustain the health of Mother Earth. What we are trying to save is the soul of the Earth, which is the forest itself. The problem comes from those who live in the capital, those who manage the money, those who have large companies, who use factories to extract, to produce and to consume. The "commodity people" won't let us work together to protect the forest, this is the biggest problem. We do what should be done: the right tasks, the right jobs and above all for everyone, not only for the Yanomami but also for

white men. The forest is the lung of the world and white people do not know the forest, they have never experienced what it means to walk in the forest, they have never been to its mountains, they do not know the reality of the forest, which is our soul. They only know the reality of the city, which is one made of lights, oil, gasoline and minerals extracted from underground, which is really the place where they should stay. They move things that absolutely shouldn't be touched. The Yanomami are a small group, but we are on the side of what is right because we are on the side of the Earth. When I am away from the forest, I am very homesick, because I belong to the forest. The forest doesn't belong to me, it is I who belong to it. The same goes for my people, the same goes for everyone. The forest is health, it allows us to live well because it has everything that allows us to live: there is clean water, there is food. We can all take what the forest offers, but at the same time knowing how to respect it. I always miss the forest when I leave it: it is the place where I was born, where I grew up, where I learned to walk, where I learned to think. The forest has always been at the side of the Yanomami. What I do, in my own small way, is to continue working to defend the forest, to continue to defend the education of the Yanomami people.



The Amazon Forest. Photo credit: Victor Moriyama

# Unfolding Forests

Giorgio Vacchiano

Giorgio Vacchiano. Researcher and lecturer in Forest Management and Planning at Università Statale of Milan, Giorgio Vacchiano studies models in support of sustainable forest management, mitigation and adaptation to climate change and natural disturbances in European temperate forests. He has assets numerous scientific publications; he is a member of the Italian Society of Silviculture and Forest Ecology and of the Ecological Society of America, and a director of the Pro Silva Italia Association. He also deals with communication and scientific dissemination and in 2018 he was nominated by the journal *Nature* among the 11 best emerging scientists in the world.

*It was my first walk in a virgin forest.*

I tried to set my gaze on the two things I always look for when I am in the woods. First, the regeneration – tree seedlings that have just peeked out from the ground, or slender saplings shooting upwards and desperately looking for light. Here, the “forest of the future” was hard to spot. We had been walking for hours since we had left Drinic, crossed the uncharted border between Bosnia and Serbia, and skirted the edge of minefields marked with red skull-and-bones signs. Entering the woods had calmed down my thoughts and anxieties, and I was ready to absorb the tales this forest would tell me. But as I started looking for new trees at ground level, I noticed that it was actually two meters below me, while I was scrambling and balancing over the collapsed stems of gigantic trees. This was the first story the virgin forest was telling: when a tree dies there, it stays where it has fallen, until it is fully decomposed. And since decomposition of spruce and fir wood can take several decades in this cool mountain environment, a spillikin of logs was covering the forest floor, forcing our field survey team to jump from one wooden corpse to the next one, far above ground level. However, I did not need to look for long: to my left, a perfect row of spruce seedlings, twenty to fifty centimeters high, was growing peacefully on top of a large log. I kept looking and scrambling, and more of these processions of young trees came into view. Thus I learned the second lesson of that day: the soil of virgin forests can be so packed with ferns and shrubs, that tree seeds have a hard time germinating there and finding their first light. Much better to grow on a decaying log, where no competitors can reach them, feasting on the endless provision of moisture and nutrients from the decomposing wood. This strategy was so effective that, after a closer look, most adult trees enveloped their base around remnants of ancient stems and stumps, long decayed, but still visible among the arching architecture of the root systems of the newcomers.

Having learned how the forest regenerates in this environment, I tilted my head up to have a look at tree crowns. This is how foresters and forest researchers usually work: looking down at regeneration, and looking up towards the forest canopy, into the thick of the action, where leaves strive to get light and eat carbon. Looking up was hard. I had to bend my neck backwards way harder than what I was used to. In the virgin forest of Lom, trees can reach 60 metres high – twice as much as the highest trees in a “normal” forest of my country, Italy, and higher than all the other native trees in the whole continent. I forced my neck back to the point of aching, and started analyzing how tree crowns “talked” to each other. I mean, not with words or sounds, but with their shape and movements. Foresters learn to read the woods as if they are watching a movie: the thickness, height, spatial pattern, and vertical arrangement of trees tell the story of forest development through time. Trees filled every space from ground level to the top of the tallest fir, a sign that reproduction was a continuous and ongoing process. However, they were arranged in groups of different size and species – thickets of small pole-sized *Fagus* basking in sunlight, larger groups of mature *Picea* with intertwined crowns, and tall *Abies* towering above everything else. The trees were telling us when and where they liked to grow: beech demanded more light, and readily jumped inside canopy “gaps” opened by the natural death of isolated or small groups of dominant trees. Spruce could photosynthesize in shade, growing well under cover and lacing together their crowns from tree to tree to increase their strength and compensate for their shallow roots, which spell danger when strong winds blow. The way the trees behave and related to each other tells of their history and of their future: a forest story unfolding its centennial time span before our eyes, within the few hours of a walk in the woods. Forests grow, change and move – slowly but steadily, for those who can see them.

Many places I have visited while trying to understand global forests bear the signs of movement and change – sometimes happening quite abruptly. California redwoods, among the longest-lived and tallest trees on the planet, are often scarred by the marks of forest fires, which don’t harm the living tissue under the thick bark but which clear the forest floor from competitors, allowing young seeds to germinate and emerge. Bicentennial larch woods, planted in wide open spaces by men of old to improve alpine grazing lands are now encroached by an “understory” of spruce and stone pine growing freely after the demise of the human presence in mountain valleys, and soon taking over the dominance of the forest. Villages connected to valley bottoms only by rough trails now have ash and maple trees as their only inhabitants.

Forests where once Antonio Stradivari came to choose the best spruce wood to give resonance to his violins have now been levelled, the ground zero of the strongest windstorm ever to hit the southern Alps.

Forests are a web of connections: roots are connected to roots; tree crowns mix with their neighbours; fallen logs harbour new arboreal life; seeds hitch-hike via air, water or animals; wind and fire reset hundreds of years of forest growth and open up new niches for regeneration. Connections may extend over unfathomable distances and times, but every time one of the components changes, the whole system is inevitably set into motion.

On planetary scales, forests have danced an especially tight tango with climate and its variability. In February 2017, scientists discovered fossil remnants of a temperate rainforest below the ocean floor in the Amundsen Sea, only 900 kilometres from the South Pole. During the 90-million-years ago Cretaceous era, modern-day Antarctica enjoyed a mild average temperature of 12 degrees, and no significant ice sheets covered the continent, as carbon dioxide concentrations in the atmosphere were much higher than even in present day. Fast-forward 25 million years, and watch as the Chicxculub meteor hit the Yucatan peninsula, spelling the end for the mighty dinosaurs but contributing to the birth of a new type of ecosystems – tropical rainforests, whose species quickly took over and filled the place of the sparse, sun-dappled open conifer woods that became extinct in the aftermath of the impact. Or time-travel to a mere six thousand years ago, when the belt of tropical and rainy climate reached so far north of the Equator that the whole Sahara basin was covered in lush grasslands, lakes and forests, and was roamed by elephants and giraffes that are still portrayed in cave paintings in the middle of the scorching desert. Here, change has been so fast that scientists wonder whether humans were involved in the transition, speeding up the ecosystem response to natural climate change by letting domesticated animals overgraze the northern African landscape. But even desertification was able to help a forest: today, the Amazon basin receives a constant input of nutrients thanks to trans-oceanic transport of Saharan dust, which is blown off dried phosphorus-rich lakebeds and carried by trade winds across the Atlantic. Connections at a distance, or “teleconnections” also combine to create temperate climates with natural climate fluctuations such as El-Niño or the Northern Atlantic Oscillation driving periodic peaks of storm and wildfire activity in American, Australian and European forests. Random genetic mutations occurring under a predictable disturbance regime have led to surprising forms of adaptation by plants, such as fruits that release their seed only when heated by the flame of a forest fire, or species able to precisely synchronize their

reproduction with the occurrence of a large disturbance, which clears the ground from competitors and puts the seeds in the best conditions to germinate and survive. Modern humans unknowingly imitate this effect when they cut a patch of forest with the intent not only of using its wood, but also of inducing a fast replacement of felled trees with a new arboreal generation, born from the seeds buried in the soil or incoming from neighbouring standing trees.

Indeed, humans are an integral part of connections with and between forests. On one hand, thriving forest ecosystems are necessary for human survival on Earth in developing and developed nations alike. Global forests and their soils purify water for one billion people on the planet; they produce food and game for more than eight hundred million people; they protect communities from meteorological and hydrogeological hazards such as landslides, rock-fall, avalanches and even tsunamis; they host parts of the life cycle of pollinators that allow the reproduction of numerous cultivated crops and they absorb atmospheric carbon dioxide, particulate matter and excess nitrogen, helping to curb these ever growing threats to human well-being. On the other hand, every human action rebounds on forests, whether knowingly or not. The question is: how does human activity affect the benefits that forests give us? How fast can change be for trees to still adapt and respond with their resilience? Are we cutting the thread that keeps us alive?

Since the agricultural revolution, one third of global forest cover has disappeared. Deforestation has occurred at alarming speed in all parts of the world, from Neolithic oak forests that covered today's Po Plain, to the heath lands of Scotland and Iceland – remnants of deforestation by overgrazing and subsequent wind erosion – to contemporary deforestation fronts in the Amazon, Congo, and Indonesian rainforests.

And even where we don't actively replace forests with agricultural or pastoral land, or where woods are growing back and reclaiming long lost rural spaces (such as in Europe), all forest ecosystems are exposed to the double threat of the climate and biodiversity crises.

Throughout the planet, trees are functioning as sentries of human-induced climate change and biodiversity loss – as witnessed by the blooming of Japanese cherry trees, which in 2021 was early by over a month in comparison to the average date of the last 800 years. Greenhouse gas concentrations are increasing faster than ever since several million years, pushed by daily combustion of fossil fuels all over the planet. Global temperature has increased by almost 1.5 °C in 150 years, after having stayed within one-third of such variability for the last ten thousand years – the whole Holocene epoch. Heat-





waves, drought, and forest fires are fuelled by atmospheric warming, and are increasing both in frequency and in intensity, putting forests from the arctic to the tropics under pressure. Water scarcity weakens trees, shutting down photosynthesis and opening the way for outbreaks of opportunistic insects and parasites. Oceans trap most of the greenhouse excess heat, increasing the rate of evaporation and overloading storms with water vapour, which then falls back on Earth during storms and hurricanes of increasing power. For the first time in ecological history, seeds have to endure climate conditions different from those in which their progenitors grew, and may not be able to germinate at the edge of the distribution area of wide-ranging species. Forests “migrate” northwards and upwards, broadleaves replace conifers at low and medium mountain elevations, and subsequent fire and drought events may completely eradicate tree regeneration, turning former forests into scrublands in one out of ten cases globally. In fragile areas, direct human impacts and indirect climate hits compound each other, contributing to the demise of vast areas of forest – a decline that might not be only temporary if ecosystems are pushed beyond their current equilibrium and into “tipping points”. In the beginning of 2021, several independent studies showed that the Amazon basin has already lost its ability to absorb atmospheric carbon, as tree death induced by deforestation and heat waves make more carbon flow from forest to atmosphere than that which can be captured by tree photosynthesis.

Change is the rule in forests, but if change is too fast, the beneficial relationship between forests and humans is put into danger.

But faster land use change, accelerating species loss, or unprecedented forest fires are not the only news that we hear today. A new global awareness of the role of forests for our wellbeing is emerging. Fuelled by the frustration of young generations towards climate inaction by governments and companies, and supported by recent scientific discoveries on the functioning and resilience of forest ecosystems, global attention is now focused on what we have failed to notice so far – how healthy forests benefit our livelihoods, our sustainable economy and our wellbeing.

Global strategies and local forest management as well now need to focus on three keywords: Protect. Restore. Manage. Protect forests from deforestation and degradation, both in tropical biodiversity hotspots and in temperate and boreal old-growth and virgin forests, such as in remnants across Bosnia, the Balkans and all of Eastern Europe. Deforestation is a grossly ineffective way to manage land, also from an economic point of view and often is the result of economic and social inequality, lack of democracy and transparency and the supremacy of private interest over the common good. But it doesn't

all have to do with developing countries. Stopping deforestation also means that countries that have already crossed their “forest transition”, that is, where forest cover is increasing together with GDP, must recognize the “deforestation footprint” hidden in their imported products, and strive to stop what is effectively a delocalization of negative ecosystem impacts.

Restore degraded forests and ecosystems, which means so much more than just planting trees. True, one billion hectares worldwide have been classified as available for new tree plantation and could eventually host one trillion new trees. But planting is just the beginning of the life of a forest ecosystem: the right trees must be placed in the right place to ensure their good health and development; resources must be channelled for post-planting care, irrigation and protection of the young trees from disturbances; and ecosystems should be designed in such a way that they can then grow and reproduce on their own, often taking advantage of the natural regeneration ability of existing plants and seeds until they can again sustain the ecosystem services that are the real target of restoration actions.

Manage existing forest land, which is the largest portion of global forests, in a climate-smart and biodiversity-friendly way: put forest management into action that can help forests adapt and resist increasing climate threats and extreme events; reduce the negative impact of economic logging on soils and animal communities; plan sustainable management over large spatial and temporal scales, taking into consideration the time needed for tree growth and adaptation and the spatial arrangement of ecological corridors over the landscape scale; improve wood use by giving preference to long-term products which can serve as added carbon sinks, and promoting substitution effects whereby sustainably sourced wood can replace materials and fuels with a higher carbon footprint.

Forests are the clothes of our planet: ever-changing, mega-diverse, hyper-connected systems. They are linked to the atmosphere and the hydrosphere, with soil and fire, with urban and agricultural land, and with the biosphere – including humans. They are nature’s great connectors, through which our lives are intertwined with those of other humans, throughout the planet and across future generations. They are resistant and resilient to change, but their benefits may falter and stop. We have a responsibility to understand how to protect, restore, and manage them – for the good of us all.

# The relationship between public health and greenery

Architects and engineers focus on designing efficient buildings in terms of energy consumption. But the influence of greenery on domestic comfort must be considered.

## A Dialogue between Professor Pier Mannuccio Mannucci and Professor and Agronomist Laura Gatti

*Interview by Riccardo Badano for L'Espresso Magazine. The interview was published in L'Espresso The Grafted (Stefano Boeri editor in chief), in L'Espresso The Commitment issue (n.22), November 2020*

*Pier Mannuccio Mannucci* The belief that green areas can prevent and cure diseases goes back to the Medieval period, but it was mainly in the United Kingdom during the Victorian and Edwardian ages that this relationship was empirically recognized. The cultural context of the time – for instance, the activity of the Common Preservation Society – toward the preservation and accessibility of public parks, addressed already as the lungs of the city, fostered the debate. The first studies to assess the relationship between people's health and green spaces were based on the observation of psychiatric patients treated in asylums – structures surrounded by lush gardens.

It was when the belief that greenery could help the treatment of mental disorders spread that this approach was extended to general hospitals as well. This is the historical background of the debate, although the scientific evidence is relatively recent.

Recent pieces of evidence were obtained through a meta-analysis of the available datasets – most of them coming from Japan, where practices of Forest Bathing (Shinrin-yoku) have a long tradition. They demonstrate that the ratio between green and grey areas has numerous direct and indirect effects on human health. We can observe that subjects with access to green spaces benefit from a decrease of heart rate frequency and diastolic pressure, as well as an increase of the so-called good cholesterol at the expense of the bad one. Studies registered a lower incidence of premature birth, diabetes and cardiovascular events. Furthermore, the reduction in stress levels, linked with anxiety and depression, has been scientifically proven. This is not only because green areas are most suited to physical activities, but also because vegetation contributes to reducing noise levels – an important risk factor for several stress-induced diseases. Why does greenery have such a positive impact on our health? Well, it is due to the fact that vegetation absorbs, or at least reduces, the concentra-

tion of pollutants and heat in the atmosphere. In a way, we can consider trees and plants a sort of green liver for our cities. The uptake capacity of green areas is not only related to their extension; it is not only a matter of quantity but also a qualitative one. In this regard, there are rigorous studies – for instance the ones conducted at the C.N.R. (National Research Council) by Dr. Baraldi – that show how some trees, such as elms and ash trees, are more effective than others in absorbing pollutants.

*Laura Gatti* Green systems have to be maintained in the best condition to be effective in absorbing pollutants, and this depends not only on the correct selection of species but also on the planting techniques deployed and the proper maintenance of green spaces: if trees are not appropriately tended, they become a source of pollution themselves.

*Riccardo Badano* How does the selection criteria differ from urban parks to high-rise buildings?

*lg* The selection of trees and other components of the vegetative system does not differ from the contemporary landscape design criteria. We have to take into account the eco-physiology of every species, their origins and provenience and then assemble them accordingly. It is only after this that the aesthetic value comes into play. We had to adapt the selection to the architectural typology. In doing this, as a Milanese, I could learn from the many roof-gardens scattered across the city. Talking about high-rise green buildings, like the Bosco Verticale (Vertical Forest) in Milan, the challenges are many, in mitigating the effects of wind on the system – I am not only referring to the increased impact that wind has on the vegetation, but also to the forces trees transmit to the building itself. We ran several wind tests, and the findings were quite impressive: today, we can demonstrate that foliage, instead of being a source of structural stress as we thought, contributes to dissipating wind force up to 15 percent. We are also setting up an experimental monitoring plan to collect data on the distribution of pollutants across the façade using remote sensing techniques. These data will influence the selection of plants in the projects we are currently developing. In a way, we are learning in the making.

Other aspects to be mentioned: the different ways in which the residents interact with their gardens daily and the positive impact plants

Pier Mannuccio Mannucci is emeritus professor of Internal Medicine at the Università Statale of Milan, where he directed the Medical Clinic at the IRCCS Ospedale Maggiore in Milan, of which he was Scientific Director from 2010 to 2015. He has been awarded international scientific prizes and has been Editor in Chief of the European Journal of Internal Medicine. In recent years he has been dealing with air pollution and the effects of this phenomenon on the human body.

Laura Gatti. Landscape designer with agronomic training, she has been working for over twenty years in the design and management of public and private green areas. After graduating in Agricultural Sciences, obtained at Università degli Studi of Milan, in 1999 she obtained with the maximum grades and mention the Postgraduate Diploma in Parks and Gardens at the University of Turin. She is co-designer of Stefano Boeri's Vertical Forest and she is following the construction phases of all the other Vertical Forests that are growing around the world.

have on their lives. Sometimes architects and engineers focus on designing efficient buildings in terms of energy consumption while they underestimate the influence of greenery on domestic comfort.

*rb* Since you mentioned the other projects you are currently working on, what are the arrangements in place to sustainably replicate the approach of the Vertical Forest in different geographical contexts?

*lg* The first approach to a new project is to identify the characteristics of the site we are working in – the microclimate or peculiar geographical features. With the preliminary stage of design, we make an early calculation of the eco-physiological needs of each species, so that, together with Stefano Boeri and his team, we make sure that the trees and plants are at the centre of a design process from the very beginning. We collaborate with local botanists and nurseries to set up a supply chain through which we select the plants most suited to the different conditions. Sometimes, local practitioners use other selection criteria, or they tend to privilege ornamental features over the overall efficiency of the system. In some cases, the native species we choose are considered too wild or too challenging to be grown. In Egypt, we visited twenty-five nurseries to source the best material for the project. We also organized a school for young people keen to learn how to work with local species. I am proud of this project: it feels like the closure of a circle. While on the one hand, this is without any doubt the best way to improve biodiversity, on the other it is essential not to be dogmatic about it, especially now that the climate is changing rapidly and non-native species can be more resistant to the emerging climatic conditions. It's about finding the right balance, keeping in mind that we are working within a timeframe that spans thirty to fifty years. In this sense, we have a responsibility towards the next generations because we know that today we are shaping the future of our cities for decades to come. As I like to say, the best moment to plant a tree was twenty years ago.

*rb* What you say about gardeners considering endemic species too 'wild' is interesting. I guess the definition of 'ornamental plant' has shifted in time as well?

*lg* The seventeenth century was a crucial turning point. For example, the history of gardening in the British Isles: it seems incredible but they only

have forty-seven species of flowering plants and thirty between trees and shrubs that are endemic to that region. It was a homogeneous landscape. During the seventeenth century, they started systematically adapting non-native plants to their climate. They were sourcing plants from all around the world: from the US – the East Coast – and from their colonies. This phenomenon has been going on for centuries and not only in the United Kingdom so, in a way, you can find the same species in gardens all around the globe to the point that there are places today where it is difficult to find native species in nurseries.

*rb* To conclude, let me go back to the consideration about Covid-19. Dr. Mannucci – what about the role that our physical environment plays in relation to the diffusion of pulmonary diseases?

*pmm* Air pollution and Covid-19 both have detrimental effects on human respiratory and the cardiovascular systems. Even though it has been demonstrated that pollutants are not transporting the virus, evidence shows that people that are exposed for an extended period to degraded air quality are more susceptible to the disease. The fact is that the spillover from animals to humans has been facilitated by a set of environmental factors that are a direct consequence of urbanization processes and deforestation. It is not by chance that, both in China and in Europe, Coronavirus has affected urban areas more severely than rural ones. We have only indirect evidence, but it is biologically plausible.



*The Policlinico di Milano - Polyclinic of Milan, Milan (Italy). Boeri Studio, 2008*



*Shenzhen Rehabilitation Center*, Shenzhen, China. Stefano Boeri Architetti China, 2020. The rooftop is conceived as an outdoor area with trees and shrubs. Several studies show the healing power of trees and plants for patients.



# Humans and wild animals live in the same cities. Is it alliance or rivalry?

Interview with Enrico Alleva and Fredi Devas

*Interview with Enrico Alleva and Fredi Devas by Alessandro Mariani for L'Espresso Magazine. The interview was published in L'Espresso The Grafted (Stefano Boeri editor in chief), in L'Espresso The Commitment issue (n.22), November 2020*

Green corridors to host animals and protected cavities in places where migratory birds can nest. The complications of urban ecosystems – from the foxes of Rome, the crows of Tokyo and the lizards of Mexico City

Dining companions is the term used by ethologists to refer to animals that live on food waste from other species. In the Old Stone Age, the mouse and the house sparrow lived on rafts that carried the flint found in the villages of their place of habitat. As consumption exploded over the last century, waste has increased — an attraction for animals that have evolved over the centuries in the food-procuring system. There are many wild animals in the city, but few species — mainly birds and mice. This leads to an imbalance in the city's ecosystem.

*«Bats, foxes, wild boars cyclically visit the city. This depends on the changing of the conditions of the ecosystems where they live» explains Enrico Alleva, an ethologist at Rome's La Sapienza University. «The less 'neophobic' species, that is, who are less afraid of novelty, go in and explore urban spaces. Mammals do so at certain hours of the night when the city is empty, and stealthily manage to enter. The wild boar is an exemplary case. For hunting purposes, hunters have imported prolific species from Eastern Europe. In some years, mothers with many young children look for food and go into the city in search of waste». With globalization, people and goods have brought with them many weeds. Many insects arrived with the food. The red awl, a beetle native to Asia, is a dangerous parasite. «There is a risk that alien species will change the natural system, and it is complex to provide control systems to stop them».*

The animals regained their place during Covid-19's lockdowns. Can you imagine keeping the cohabitation alive even after the blockade?

*«On the one hand, people in the windows noticed animal species they had not seen before, such as the blackbird or the finch. On the other hand, animal species have not found any more food in parks or on the sides of the streets.*

*Green corridors must be provided in cities, where nature is pre-eminent, and these species can find a place to stay. There is an open debate, even in the community of ethologists and zoologists. There are some who have a more conservative position and want to maintain the current state, while others promote interventions such as laying nest boxes to help some species of birds of prey or bats or systems to make wasps and bees nests. There are no absolute rules, there is a danger of creating artificial situations, where without the intervention of the human species animals cannot feed themselves».*

According to Enrico Alleva, *«the botanist has his own preferences, more ornamental, the entomologist and the ornithologist prefer shrub species or flowers that promote the nesting of some birds. You must keep in mind the natural history of the area, consulting the scientific literature or even paintings and photos, to understand what the typical animal and plant species over the centuries have been. Put back what was there, without being too conservative. Palm trees, linked to European colonialism, are species that do not reproduce in Italy».* The city is made up of buildings: *«An element must be considered in the design of our buildings: protected cavities are needed where migratory birds can nest. Flowers and plants useful to bees are also needed, such as the tulip, the mauve, the sunflower, or the marigold».*

Design the city with the eyes of other animal species. A revolution that from anthropocentrism moves towards biocentrism. The urban planning of the future should not focus on forms that deny the presence of homo sapiens but will have to deal with implementing the necessary conditions for coexistence between different animals and plant species. This is the concept behind the Milan Animal City research run by the Polytechnic University of Milan. The studio looks at the Lombardy city from the point of view of the animals that inhabit it. Nesting Milan aims to build a modular structure along the railway lines to accommodate species of birds and plants — a nest infrastructure, which becomes a connective tissue between Milan's city center and the developing neighborhoods, which the railway tends to separate. The project Bombing Park Sempione focuses on the paradox: whatever man does to make room for nature is still a human act. The result is a cynical project that imagines bombing Sempione Park, an example of an artificial nature, deprived of that unpredictability that makes it different from the city of man; bombing domesticated nature to artificially introduce a wilderness.

Italian cities have been home to species of wild animals for centuries. Villa Pamphilj in Rome welcomes specimens of the fox, an omnivorous mammal, although classified as carnivorous. Its diet is based on a variety

Enrico Alleva is an Italian ethologist, member of the scientific councils of ANPA, WWF, Legambiente, Anton Dohrn Zoological Station of Naples, Institute of the Italian Encyclopedia "Giovanni Treccani", Italian Space Agency, CNR Department "Life Sciences", Antarctic Commission. He was president of the Anton Dohrn Zoological Station from 2011 to 2013. From September 2014 he has been President of the Technical Scientific Committee of ASI. He is a corresponding member of the National Academy of the Lincei for the Zoology Section and since 1990 he has headed the Department of Behavioral Neuroscience at the Istituto Superiore di Sanità in Rome.

Fredi Devas is a wildlife filmmaker who cares deeply about the natural world and the challenges it faces. After completing a PhD on Chacma baboons in Namibia, Fredi did research on the bushmeat trade in Equatorial Guinea and then spent time living with the San bushmen in Southern Africa. Having worked on Meerkat Manor and Nick Baker's *Weird Creatures*, he joined the BBC to work on *Frozen Planet* and then *Wild Arabia*. On *Planet Earth II* he decided to leave the wilderness behind to produce and direct the *Cities* episode.

of species: invertebrates, eggs, reptiles, small mammals, and amphibians. Among the vegetables it feeds on are berries and other types of berries. It can also feed on carcasses. For this reason, it finds its ideal habitat in the park of the villa: the urban green spaces close to the dwellings have always been populated by them, inserting themselves into the food chain and the waste chain. Most of Villa Pamphilj's foxes do not show up. Only two showed themselves with daily constancy to the visitors of the villa, seeking the collaboration of man to feed and survive. In Milan, at least eight pairs of the Gheppio falcon have been found to feed on rodents, insects, reptiles, and small birds. The known nests are located in the vault of the Central Station, on the roof of the hospital in San Paolo, and on a tower of San Siro.

The horned lizard chose Mexico City as the city to live in. It is recognized by the rows of thorns that run on the sides of its body, up to the hips and top of the head. It has a body that does not exceed nine centimeters in length, inhabits forests and bushes. To defend itself, it uses pulmonary swelling — it sucks air and swells: the spines rise, and the predator cannot swallow it. Another form of defense: a jet of blood squirts from the eyelids and hits the predator in the eye. Sightings in Mexico City occur mostly on the mountainside of the city's southern border, around the neighborhoods of San Miguel Ajusco and Pedregal. In these areas, lizards find an environment where their predators, including the coyote, do not live. In Manaus, a Brazilian metropolis in the rainforest, monkeys are the largest group. Tamarins appear, almost every day, on the streets of the city, along with squirrel monkeys, hunting for food in restaurants and bars. Citizens have organized veterinary clinics to rescue distressed animals. The city of Tokyo receives about six hundred calls a year from residents who have been attacked by crows. It happens in the spring, at the time when the birds hatch their eggs and raise the young. In the mid-1980s there were more than 7,000 in the city's parks. They are now at 30,000. The administration has installed traps to catch some of them.

Fredi Devas, documentary filmmaker and producer of the BBC documentary series *Planet Earth II*, spent four years learning about animals living in many of the world's most urbanized areas. «*It's hard to tell whether wild animals and metropolises are competing or co-existing*», explains Devas. «*The question is what value we give to the animals that live in our cities. When I heard about the hyenas living on the streets of Harar, Ethiopia, I could not believe it. According to legend, when the city walls were built, the 'doors of hyenas' were created, not large enough to allow the entry of opposing*

soldiers, but big enough to let a hyena in. Two herds of hyenas entered the city through these doors every night, looking for bones left outside the butchers. As I walked down a small street in the old town, I saw hyenas passing by me, touching my leg. I was meat for them: animals of ninety kilos could have jumped on me in seconds, but they did not. A few darkened nights later I filmed the two herds of hyenas fighting for access to the city. Over a hundred hyenas were fighting around my feet and somehow my fear had disappeared. The peaceful pact between humans and hyenas in this city was obvious, I did not feel in danger. I was told by the inhabitants that within the walls hyenas never attack people or livestock. But why are they welcomed here, when in other parts of the planet they are hunted? The people of Harar believe that every time a hyena laughs, it devours a bad spirit».

The trip to India of Devas. In Jaipur, he met a family who fed monkeys every morning for more than forty years. «When the oldest woman in the family died, the family gathered around her. In Jaipur, it almost never rains, on the ceiling of the house there is a hole from where the light comes in. At two o'clock in the morning, the alpha male of the herd entered the hut and touched the woman's hand and ran away. Looking up there were other monkeys watching. I wondered how it was possible. The family told me that there was a spiritual connection between the monkeys and the woman. He fed them for years and that created a bond. Hindus associate these primates with the ape god Hanuman and worship them. The experience in India was how generous Indians are to the wildlife that lives in their cities. The reward for them is to be surrounded by animals».

Fredi Devas has a clear idea of how to give space to animals in our cities: we need to take a step back. Go back to nature, avoid the use of cars, favoring alternative mobility. In the UK, foxes have the same chance of survival in both the city and the countryside. «The main cause of their death in the city is cars », explains Devas. «It would be enough to limit their use to make their lives easier». You cannot just think about air or water pollution: artificial light confuses animals and plants. The invention of the incandescence light bulb 140 years ago changed our night skies forever, especially in metropolises. For many animals, artificial light creates confusion. In New York, a bright screen confuses the migratory birds that cross Manhattan every year; they are confused by its light and crash into it. Every morning the garbage collectors have to clean the dead birds that have fallen at its base.

Moths have evolved to fly to a distant light source: the moon. That is why they often find themselves circling the streetlights. Fredi Devas says:

*«There is one animal that can exploit the confusion of these insects: the Gecko Tokay, found mainly in Southeast Asia. Hong Kong has one of the brightest night skies in the world. Since the Tokay gecko is a lizard that lives after dark, it is hard to imagine that its eyes can cope with such intense light, but from their vertical slit pupils, only a small amount of light is let in when it is under a light bulb and opens in the dark. The other feature that makes Tokay geckos so well adaptable to the urban environment is their phenomenal grip. Each paw is coated with half a million microscopic hairs, so small that it forms a molecular bond with the surface on which they walk, almost like an atomic-scale Velcro. After evolving to walk on wet leaves in the rainforest, their feet adapted well to walking on metal and glass, making Hong Kong streetlights an ideal place to eat».*

## The role of design. Urban Forestry as a practice

Simone Marchetti

The term “Urban Forestry” began to appear more frequently from 1960 onwards following a renewed interest in the role played by trees and their potential within the urban context (FAO, 2014). “Urban Forestry” is also connected to the by-no-means new concept of the Garden City, dating back to the end of the 19th century. We should consider both its multi-dimensional aspects, its capacity to benefit from different aspects of our society, from the psychophysical to the sociological and economic, as well as its ability to be multi-purpose, in other words, capable of recognizing and balancing needs of various types, such as productive, recreational and conservation activities (Gibbons J., 2019). Urban Forestry is defined by the FAO as “networks or systems comprising all woodlands, groups of trees, and individual trees located in urban and peri-urban areas; they therefore include forests, street trees, trees in parks and gardens, and trees in derelict corners. Urban forests are the backbone of the green infrastructure, bridging rural and urban areas and ameliorating a city’s environmental footprint.” (FAO, 2016).

Those populations of trees that today live within our cities in fact play a fundamental role not only in strengthening the identity of certain places but above all in providing genuine ecosystem services that municipal administrations are increasingly adopting for the mitigation of problems related to the climate crisis. From a historical point of view, acceptance of the presence of the tree, or of a group of trees, within the urban fabric has undergone several changes over time. Even Leon Battista Alberti himself, in the far-off sixteenth century, mentions the presence of trees outside the city and their use and distribution along the sides of roads, but always and only with a decorative purpose and without truly recognizing its value in the construction of the urban environment. From being initially accepted as a mere aesthetic component to gradually becoming an element of urban construction exploited for political, social and not



Elman Clémance  
*La Fin des Voyages*,  
2020

*La Fin des Voyages* (End of Travels) is a series that questions the notions of exoticism and travel in which I build a narrative whose decor is the defined and familiar territory of her parents' garden where she grew up, in the South-West of France. This work led me to feed a reflection on the jungle's figure as a plural forest, real or fantasized, knowing that relationships that humans have with nature often have political and societal repercussions, and vice versa. In the form of a documentary-fiction, the photos question the complex representations of an exotic Elsewhere, in which the issues of cultural re-appropriation and domination are underlying, notably through the accessories, patterns, colors and poses used.



just decorative purposes. The urban tree has therefore become a strategic component used as a response to the needs of an emerging social class: if at first gardens and parks were used mainly by the aristocracy, with the passing of the centuries the need arose to give a green urban space for recreation to the middle and working classes.

Today trees transcend class divisions and their beneficial presence is considered regardless of their location on private or public land. They have the potential to become the connecting tissue between once very distinct areas, such as urban fabric and agricultural land. Furthermore, modern satellite technologies using remote sensing or LIDAR and together with new mapping software allow us today to evaluate the overall impact of a city's "Tree Canopy Cover" (by which we mean the percentage of coverage provided by trees canopies present in the city in relation to the urban surface area) as an indicator of understanding the size and quality of a city's green infrastructure almost on real time.

It also goes without saying that trees have the unique ability to create a very well-defined identity in certain areas of a city. Clear examples that we are all aware of are Central Park in New York, Hyde Park in London and the boulevards in Paris. Lining streets, intertwining in parks, and unravelling like great green threads around our cities, trees form patterns that create a sense of belonging and attachment.

Recently, especially in urban planning, increasing attention has been given to the wide range of ecosystem services provided by trees such as the removal of pollutants, support for the mitigation of hydrogeological effects and the maintenance of biodiversity (since an elevated presence of trees usually corresponds to a high number of biotopes for animals and plants). There is increasing recognition of the role of urban and peri-urban forests within the green and blue infrastructures of cities as an instrument for protection against atmospheric agents such as gales or floods, or even as prevention against extraordinary events. Trees can even reduce temperatures in neighbouring areas by at least 2°C (Colaninno N., Morello E., 2019) and the enormous beneficial contribution in terms of reducing wasted energy can be seen from the careful selection and positioning of trees in front of buildings (Palmer L., 2017). Green infrastructures certainly have the potential to make landscapes multifunctional: it has been demonstrated that they can simultaneously perform both ecological functions while responding to social needs and allowing economic optimization (Mell I., 2016)

It is for these reasons that trees are considered a real weapon to be used in improving the resilience of cities: the more the diversity of tree species

is guaranteed, the greater the resistance to diseases and parasitic attacks, as well as in mitigating adverse climatic conditions.

Once the role of plants and trees within the urban scenario has been rehabilitated by understanding not only their cultural significance but also their objective beneficial contribution, it is essential that efforts are made to understand how vital the role of urban design and management plans are in the creation of genuine resilient and healthy green and blue infrastructures. As an example, knowing a tree's root system and its bearing can be crucial in creating the correct design of its location or container, as well as the future management and maintenance of adjacent paved road soils. The same selection of places for planting trees within the urban fabric has important social consequences and indeed one of the great challenges for cities is precisely the elimination of potential inequalities due to an unbalanced distribution of urban and peri-urban forests throughout the territory, thus making green spaces more accessible for all.

The way in which we design spaces can change the face of future cities: among the challenges to be dealt with are the concepts of multi-sectoriality, multi-functionality, multi-scalarity and flexibility, all of which are necessary for the success of a project. All these elements are already part of the intrinsic nature of green infrastructure planning and allow us to respond simultaneously to different scenarios of development, regeneration and urban and peri-urban resilience. In the end, the answers that we have to give to cities at an urban level should be quick and effective in order to be able to insert them intelligently into a logic of overall vision for the city, its spaces and its potential green connections, limiting the pressures from uncontrolled expansion which is often hasty and therefore potentially harmful to the environment. On the other hand, a project needs to be developed in a flexible way so as to easily adapt to different scenarios and challenges. This is possible through the help of various relevant professionals - landscape architects, urban planners, scientists, foresters and agronomists etc - thanks to whom a project could be considered successfully addressed. As Donna Haraway said "Nature is the space in which to reconstruct the public space" and this is a real cultural challenge which in order to be universally shared, requires the knowledge, respect and application of common values and not least, the tenacity of planning, creativity and imagination.

# About Designing with Nature

World Forum on Urban Forests Mantova 2018

## Interview with Thomas Randrup

Thomas B. Randrup is professor in Urban Open Space Management and Head of Subject for Landscape Governance and Management. For almost 25 years he has studied and promoted urban nature and has a special interest in the concept of Nature-based Solutions or Nature-based Cities. Today he works with the processes, roles and use of urban open spaces that keep them relevant and valued. In doing so, he has a special interest in the concepts of Strategic Urban Open Space Management and Nature-based Solutions.

*Interview by Simone Marchetti, November 2018*

We had the chance to meet Thomas B. Randrup during the World Forum on Urban Forest, an international event held in Mantua in 2018, organized by Stefano Boeri's Team, FAO - Food and Agricultural Organization of the United Nations, the Municipality of Mantua, Politecnico di Milano, and Sisef - the Italian Society of Silviculture and Forest Ecology.

*Simone Marchetti* Starting from the fragility of the planet and thinking about design innovation rather than conventional solutions, is it possible to imagine a new approach to urbanism that is other than the status quo?

*Thomas Randrup* Yes – although being both optimistic and possibly naïve – I am promoting that we are inspired by nature when we organize ourselves in relation to nature projects. Nature projects could be an urban forestry intervention, a new landscape design etc. We organize ourselves – and distinguish ourselves in relation to ‘design’, ‘construction’ and ‘maintenance’. In our professional life we create a number of silos, which is unhealthy and unproductive for the nature projects / interventions we want to create. We need to get rid of the silos, and start creating nature related projects inspired by the flow and long-sighted thinking which nature inherently stands for. Therefore, I have proposed that we see new landscape projects in at least a 10 year framework. No designs are definitive, but meant as a vision, which should be functional from the beginning, but will develop over time. Designers, constructors and landscapers will work together as a team over this 10-year period, and develop the design / landscape / forest based on the needs, the vision –nature's indications to the suggested design, and the skills of all involved. This would also make it possible to engage with locals to incorporate a social aspect to the projects.

- sm* Urban forestry, as other urban strategies, have their economic value. One of the ways conservationists found to scale biodiversity conservation up, for instance, is turning these strategies to economics and markets. In other words that means biodiversity conservation and forestry conservation must become economically rational policy trajectories. Is this the only way possible, considering our capitalistic economy or could you imagine another way to embrace the environmental cause?
- tr* We have to admit that embracing global warming, social inequality etc. we must see nature in a different manner than today. Sustainability was introduced as a way of thinking in the late 1980'es. Ecosystem services have been introduced as a systematic organization of nature's values for humans. Now it is time to act, and we have several concepts (or political strategies as you say) to do so. Urban Forestry is one, Nature-based Solutions is another. In order to promote these, we need to admit and acknowledge that nature is part of the solution, but also that these solutions come with a cost which cannot be estimated in traditional market and growth-related economics. Thus, we need a new way of thinking about economics. Tim Jackson has recently published 'Prosperity without Growth' (Routledge 2017), and this may be an indication of a new way of thinking in economic terms, without being driven by the traditional growth regime. I think this is needed.

## Tirana Riverside

Tirana, Albania / 2020 - ongoing

Stefano Boeri Architetti

The Tirana Riverside project by Stefano Boeri Architetti has been designed for a publicly owned area located along the northern edge of the Albanian capital close to the Tirana river. It is intended to function as a large-scale urban regeneration project promoting a functional and social mix embracing different cultures and origins in a neighbourhood intended to be accessible and self-sufficient in terms of clean energy, water, food and all urban public services. Expected to accommodate 12,000 people, the Masterplan is a 29-hectare district, it will provide all the technologies of a Smart City and be capable of guaranteeing the safeguards and health safety requirements necessary to deal with seismic conditions. Tirana Riverside offers new housing solutions to residents and it develops along an innovative green central spine dedicated to soft mobility, which allow access to commercial ground floors, residential, sports and work spaces and numerous other outdoor facilities, emphasizing the total accessibility to all areas of the neighbourhood.

The distribution of the primary public services around three centres arranged at walking distance from each other makes Tirana Riverside a zero-emission polycentric neighbourhood, containing all the essential services for residents. There are public and administrative functions on an urban scale, numerous services to the city, a school and a university centre in order to make the entire area a reference point for the Albanian capital.

In addition to the Masterplan, the drafting of guidelines for the design of individual buildings is envisaged with the aim of working in close contact with the area and reactivating the economy via small and medium-sized Albanian businesses. The Tirana Riverside project makes it possible to collaborate with local manufacturing and professional organisations in a valuable process of sharing know-how and establishing new urban quality and design standards.

Public and domestic green spaces are a fundamental component of the project. These are distributed throughout communal areas, on vertical surfac-

es and on roofs considered as living spaces capable of hosting numerous plant species. In addition there are areas dedicated to coworking and the delivery of goods, sports and leisure facilities, hanging gardens and pedestrian bridges. The presence of solar panels on the roofs thus makes each building a source of production and conservation of clean energy so that there is the possibility of establishing a local energy network available to all residents.

The Tirana Riverside overlooks a river park dedicated to the community and is designed to preserve an ecosystem capable of increasing biodiversity in the urban environment. In doing so, it will become a refuge and biological habitat for non-domestic species, promoting the development of microclimates beneficial to the surrounding sense of physical well-being.

The services distributed along the entire Masterplan are divided into three sections. Primarily there are public squares, play areas dedicated to children, private gardens, urban gardens, retail spaces, cafes, restaurants, offices and emergency medical centres. Then there are neighbourhood services which include religious spaces for different faiths - located around a single square - and those intended for primary and secondary education, together with areas for sports and entertainment. Finally there are urban scale facilities including the university centres, the river park, a number of public ministries, fablabs and larger offices. Tirana Riverside is a project designed to host trees and inhabitants in equal numbers, with a total of 12,000 plants from more than one hundred different native species. The fifteen hectares of green areas are divided into communal gardens, agricultural areas and areas dedicated to horticulture with more than five kilometres of cycle paths. Taking the roofs into consideration as a fifth facade featuring trees, the Masterplan proposes up to eighteen hectares of green areas. The central spine, designed for use by soft and electrically powered mobility, crosses 90 thousand square metres of open public spaces, alternating between terraced buildings, some with courtyards, skyscrapers and L-shaped buildings which offer a combination of residential, working and service facilities. The use of prefabricated structures including wood, allows for rapid construction and makes it possible to generate a virtuous circle of monitoring deforestation and reforestation, sustainable production and a reduction in waste material.

The economic and social advantages of the massive presence of trees intended as an Urban Forest - which in addition to reducing the “heat island” effect, also increase the real estate value of the buildings - make Tirana Riverside a contemporary landscape that combines nature and technology all designed to promote the welfare of citizens living there whether temporarily or permanently.



*Tirana Riverside*, Stefano Boeri Architetti, 2020



## Stefano Boeri Architetti's Green Obsession

An interview with Francesca Cesa Bianchi and Marco Giorgio

Francesca Cesa Bianchi (1980) graduated in 2005 in architecture at Milan Politecnico. In 2008, she attended the MCH 08, a first level master on collective housing at the Escuela Politecnica de Madrid. Since 2006, within her collaboration with different architectural firms in Milan and Madrid, she manages complex multi-purpose projects from competition phase, through concept, preliminary and detail design, to construction documentation.

Marco Giorgio (1970) is an architect who lives and works in Milan. After years of studies and training at the Federico II Faculty in Naples, Marco Giorgio started working with various architectural firms as well as a freelance professional. Since 2001 he has been working with Stefano Boeri on the design and creation of different styles of buildings – residential, commercial and administrative – and also on the coordination of complex projects on different scales, from urban and planning design, to interior architecture and layouts. He is Project Director at Stefano Boeri Architetti for Italian and Francophone projects and has been a Partner at SBA since 2019. His experience in the architectural field ranges from the preliminary stages of concept development up to executive design and construction supervision. As coordinator of the working group and in charge of construction supervision, he has followed numerous projects to their conclusion.

*Interview*  
by Simone Marchetti

### *Simone Marchetti*

Francesca Cesa Bianchi, you have been following multiscale projects in Tirana for a long time now: what are the challenges you have faced and what are the new green opportunities for a city like Tirana?

### *Francesca Cesa Bianchi*

Most of the strategic projects that have been carried out as part of the Tirana 2030 Masterplan are linked to green systems, together with the two other major themes of urban development and regeneration. One example of an important challenge is the Tirana orbital forest. This system was designed to contain soil consumption through the planting of 2 million trees as a genuine green belt, which at the same time needs to be integrated with the needs of the municipality, so as to build a holistic vision of the city. Another challenge is represented by the three rivers that cross the city of Tirana which have the potential to become green corridors of biodiversity.

Finally, we have to look closely at the city's urban structure: Tirana was built following concentric rings, so we have created a fourth green ring that can be linked to sustainable mobility and forestation. This is a highly attractive idea designed to improve the quality of life of the citizens and allow them to enjoy it completely. The whole Tirana Plan was designed to focus heavily on urban regeneration and urban development correlated with the development of a landscape plan on an urban scale. What has allowed the development of projects of this type in Tirana is partly a certain political stability - this is the second mandate given to the same political entity - and partly the fact that it is a very young and pragmatic municipality which has tended to fully embrace the vision that Stefano Boeri Architetti, through the masterplan, provided for the city.

Obviously, the introduction of certain strategies has not always followed a linear path: often, and not only in Tirana, regulatory plans clash with public and private interests, the diversity of land use and the mentality of owners, and it is precisely here that a series of objective difficulties emerge that do not always allow the creation of an ambitious unitary project. Even in the case of Tirana, one of the biggest challenges turned out to be precisely this. Despite this, I believe that the Municipality has done a great deal to reinterpret the ideas expressed in the Tirana 2030 Masterplan. One example is the initiative designed to raise awareness among the population of the issue of sustainability, the importance of trees in cities and the care of the common good and the plant world, starting with young children and in schools. The Municipality has also worked to promote a forestation campaign through an online platform that would allow the donation of trees, both as individual citizens and as companies, and the involvement of all citizens in the planting campaigns, through a detailed forestation plan for certain areas. The first campaign resulted in the planting of about 300,000/400,000 trees which was a major initiative and part of the larger orbital forest project conceived by the studio. In terms of commitment and relations with the municipality, we have always found a great deal of interest.

As these are large-scale urban projects, this commitment is obviously more onerous and difficult to manage, and this remains the greatest challenge for the Municipality of Tirana to date. If in the rest of Europe the theme of sustainability, and the one of trees and their beneficial properties are highly appreciated, and the developers themselves well understand how a project that approaches these issues can make a difference on the market, Albania is still a young and growing market where these issues are not always deeply assimilated. As an example, the actual economic benefits, as well as all those benefits related to ecosystem services associated with the presence of plants and trees in a project are not always clear. The municipality is investing a lot in this, focusing on raising awareness among younger generations and involving older ones in the activities of young people. In Tirana, as everywhere else, the long term contribution made by education and the spread of information is enormous and an excellent investment for the future, because it will provide a form of ownership to new generations who are more open to change and future transformations of the city.

The city of Tirana has seen its urban fabric grow considerably since the 1980s. When we first found ourselves working in this city we understood how dense its urban fabric was, with an almost total absence of public spaces, playgrounds for children. So the Municipality of Tirana must be applauded for having made a huge effort to improve accessibility to public spaces in every district of the city and also for having really improved existing public spaces. Regarding the already privatized spaces, the Municipality has pushed private developers to respect and follow certain urban planning and quality of living standards. A good example is *Tirana Riverside*: this is an extremely ambitious project for the city which, if carried out respecting its high quality standards, will bring enormous benefits to the city as a whole as well as to the individual district itself because it is designed to be a resilient district with a tremendous amount of flexibility in both architecture and landscape.

Tirana is a city on the move that will grow enormously in the future, so it is important that new buildings either adapt or change over the years without becoming obsolete even before they are built. The concept of flexibility is fundamental when designing: buildings must necessarily respond to diversified needs and uses over time and the same applies to the surrounding landscape: the green and blue infrastructural apparatus of a city have enormous potential if designed to mitigate the effects of the climate crisis we are experiencing and that the city will experience in the years to come. For this reason, it is extremely important to make investors understand how much good planning has to be done regarding the surrounding environment, especially if it is part of an ambitious urban and landscape plan.

*sm* Marco Giorgio, what are the challenges of contemporary living and what is the role of the plant kingdom in design?

*Marco Giorgio* In the *Bosconavigli* project in San Cristoforo District in Milan,\* some considerations and changes were made subsequently to the pandemic, including aspects related to the health emergency that we have experienced in recent months. This has considerably changed the layout of the spaces. Having been devised before the pandemic, the project was based on a certain approach and a certain conformation, and while always falling within the category of green

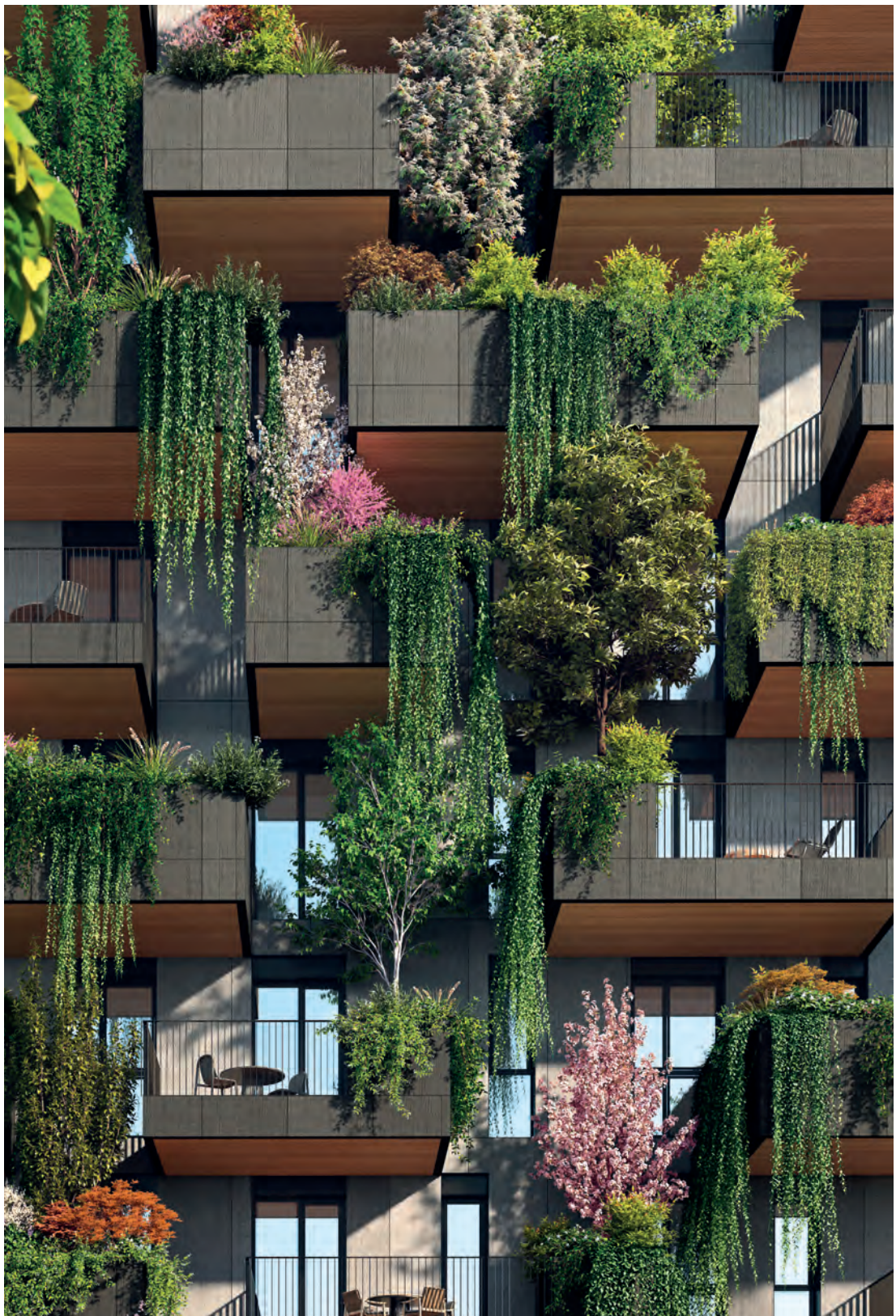
\* The intervention of *Bosconavigli* appears as a traditional courtyard house perfectly inserted within the Lombard tradition and designed to stimulate the dynamic use of public and private spaces. Developing around an open courtyard with an ascending spiral form, it extends towards the south in the direction of a large garden. High energy performance photovoltaic panels completely cover the building's roof, thereby becoming a highly striking expressive and chromatic theme. The three main façades are notable for an alternating system of balconies designed to accommodate plants and trees, and are characterized by numerous entrances and views out onto Via San Cristoforo which visually expand the connection between the internal spaces of the courtyard and the new green spaces of the surrounding public park.



*Bosconavigli*, Milan (Italy). Stefano Boeri Architetti, 2020. Visualization by Level Creative Studio

buildings, it did not give too much attention to open spaces. Following the events of 2020, there was a complete rethinking both among the designers and those who wanted to make the investment, with a view to trying to adapt the project to the new health needs and offer more open spaces. This also included expressing and satisfying them in different ways, from the closed loggia to the open terraces, from the hanging balconies to the rooftops with multiple levels of usable green space.

As well as the rethinking of shared spaces for sport and various other activities, there was a rethinking of workspaces that were not within the walls of the houses, while keeping the provisions on safety regarding spaces of this type very clear during the design phase. In this case, it was therefore high quality housing, where an effort has been made to adapt to new and urgent needs and where a focus was paid to guaranteeing access to communal and open spaces. *Bosconavigli* also establishes a particular relationship with the context. This starts first of all from its architectural development which fits well into the historic centre of the town and which still has some particular historical characteristics, and secondly because the intervention redevelops an area of the city that today is rather run down.



*Bosconavigli*, detail of the façade. Stefano Boeri Architetti, 2020. Visualization by Level Creative Studio

*sm* In recent years you both have witnessed and actively and personally participated in the evolution of the studio's projects: what meaning do you give to the green evolution that Stefano Boeri Architetti has followed in its projects?

*fb* Starting with the Vertical Forest and its inception, over the last 8-10 years, there has been considerable development of highly important themes such as sustainability, green systems, forestation and the Studio has consciously chosen to develop these concepts at different scales. From a master plan for an existing city to the design of a new city, from new buildings to its interiors and up to the retrofitting of existing buildings, the studio works on different project scales, trying to apply the principles of resilience and sustainability and attempting to give an answer to the various criticalities found on each scale. The Vertical Forest, for example, was the seed for a prototype of an ideal city, the Forest City, in which each single building is part of a system with a real green and blue city infrastructure, and as a prototype it is not perfect but the result of an ongoing process. The projects subsequently carried out by the studio tended and always tend to improve on what has previously been done, trying to capitalize on what has been achieved and learned, and trying to take an extra step, for example, towards the design of carbon-neutral buildings that are truly 100% sustainable. The beauty lies in this challenge: trying each time to add an extra percentage. Let me give you an example: if with the Botanica project (manifesto Botanica, page 168) we are talking about the use of electricity from 70% renewable energy, the next step will be to reach 80%, 90%, even maybe 100% renewable energy. This is a continuous search for innovative and sustainable solutions that give an increasingly solid answer to a number of critical issues that today's architecture and urban planning have to face. We must be aware that even individual design choices have and will have an important impact on future generations.

*mg* As Francesca said already, the evolution of the studio's projects, from the Vertical Forest to today, has been remarkable. There has been evolution both from a technical point of view but also in terms of programmes. The goal of the studio is not to carry out "*maquillage*", make-up operations, but rather to investigate and define the peculiarities, the characteristics that a project should have within it so that

it consumes less and is less impactful from the environmental point of view. The projects we are following, although unfortunately in some cases still built according to traditional techniques, always have some characteristics that tend to achieve objectives that fall within the logic of a sustainable programme. The ideal, of course, and this is what we are trying to do more and more, is to exploit the enormous potential of wood as a building material instead of making use of traditional concrete and steel.

Therefore, the evolution of the studio's projects is part of an ecological transition towards which the world of architecture and urban planning should also move and towards which we are slowly making progress. In practice, as a studio we have tried to research and develop new languages to give to our projects in recent years, to give a different shape to architecture. Often those who criticize the architectural language used do not consider the plant world component which is of fundamental importance: there is an attempt, in this type of design, to make the two worlds absolutely interdependent, in which the "green" is not just an aesthetic component but part of a different way of conceiving the urban environment and one in which the plant world is integrated and already conceived of as being within the architecture of the city.

Starting to think in this way, as well as communicating it externally by sending these types of messages is essential. Through this sort of obsession, these arguments become more and more part of the way of thinking, of conceiving the city, of designing one's architecture and slowly changing our modus operandi as well. This revolution obviously starts with each of us, but talking about it and sharing one's vision helps speed up the process of informing and raising awareness and, over time, it can lead to radical transformations. If it is not already too late, this means that in the future we will no longer use fossil fuels, we will have buildings with very low or no consumption, and we will have a world in which the plant kingdom is finally considered an important ally.



The rooftop of *Palazzo Verde*, Antwerp, Belgium. Stefano Boeri Architetti, 2021. Photo Credit: Bart Gosselin

## Prato Urban Jungle

UIA- Urban innovative actions  
Prato, Italy, 2019-ongoing

Stefano Boeri Architetti

Prato Urban Jungle (PUJ) is a project funded by the European Urban Innovative Actions (U.I.A.) program and led by the Municipality of Prato. Stefano Boeri Architetti participates in the partnership together with Pnat, CNR-IBE, Estra Spa, Legambiente Toscana, GreenApes, Treedom Srl.

The Prato Urban Jungle Project is following the guidelines of the Urban Forestry Action Plan for the city of Prato - developed by Stefano Boeri Architetti in 2018-, with a series of urban forestry and plant integration initiatives in spaces established at different scales in order to radically improve the social and environmental quality of the city. Through the implementation of Nature Based Solutions and the definition of new quality, spatial and residential standards, Prato is becoming a focal point of high-level experimentation into sustainable and innovative design solutions.

Prato Urban Jungle aims to operate on Prato's neighbourhoods in a sustainable and socially inclusive way by developing the Urban Jungles - areas with a high density of vegetation nestled in the urban environment, able to multiply the natural capacity of the plants to reduce pollutants, ameliorate microclimatic conditions, increase biodiversity, increase the aesthetic and economic value of the areas, while regenerating common spaces for the communities and transforming outskirt areas into active green vital hubs within the city.

The aim of the Prato Urban Jungle project is to design and implement three main pilot areas within the city. Through an innovative co-design path, PUJ provides a new strategic approach to urban planning by involving stakeholders and citizens, respectively through a digital platform and a cutting-edge governance model and participatory co-design workshops. Thanks to this methodology, a more inclusive development of urban greening is supported. Stefano Boeri Architetti is developing two of the three planned pilot projects: the social housing buildings in Via Turchia and the Consiag-Estra office building.

A specific requirement by the European U.I.A., is to design the PUJ interventions as easily applicable, scalable, and replicable to other similar cases worldwide, acting consequently as a first step of a new urban regeneration model.

Through the implementation of Nature-based Solutions and green retrofitting interventions, the identified environmental and social goals of Prato Urban Jungle projects are:

- To ameliorate the energy performance of the buildings;
- To increase the comfort within buildings and minimize the urban heat-is land effects (UHIE);
- To improve indoor and outdoor air quality;
- To boost physical and mental well-being of citizens living and working in and around the new urban green spaces;
- To provide new biodiversity hotspots;
- To multiply permeable surfaces and implement sustainable water management;
- To create green horizontal and vertical surfaces.

The implementation of the pilot projects will be monitored and evaluated ex-ante and ex-post with a specifically designed sensor system, developed by the partner CNR-IBE.



*San Giusto district, social housing buildings in Turchia str., Prato Urban Jungle, Prato (Italy). Stefano Boeri Architetti, 2020*



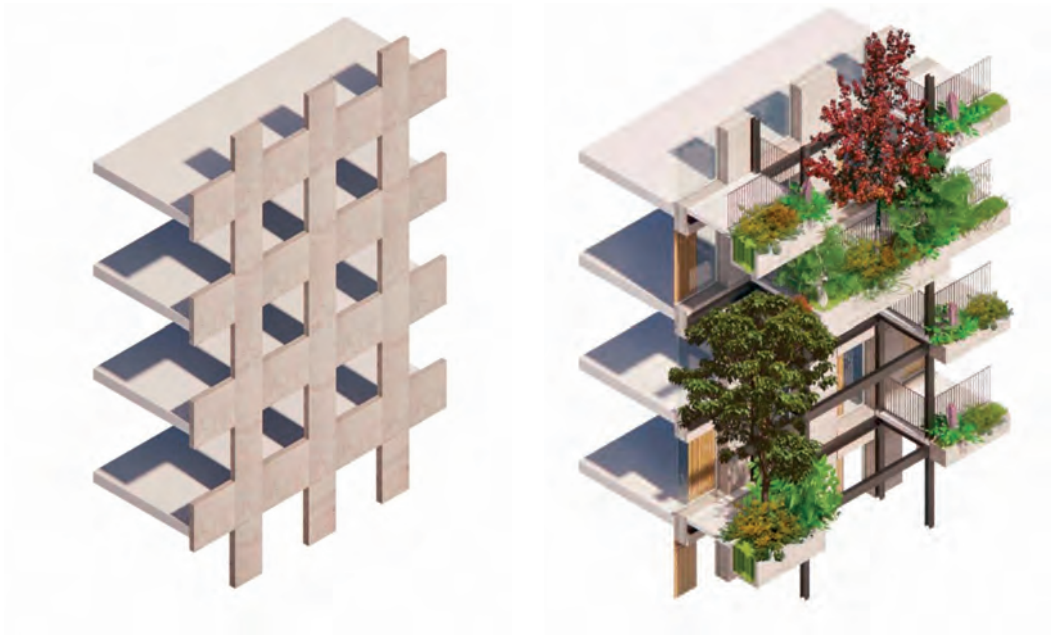
*Consiag-Estra Building, the existing building will be renovated with a retrofitting intervention of its facades and roof. Prato Urban Jungle, Prato (Italy). Stefano Boeri Architetti, 2020*

Consiag – Estra building is a private office building located in a complex urban area overlooking one of the busiest highways of Prato, with a daily passage of 50,000 vehicles. Two different green facades solutions were designed by Stefano Boeri Architetti for the retrofitting of the office building: one light-structured façade, made of steel cables for climbing plants able to shield the southern façade, frequently subject to intense sun exposure; and the other one with a steel structure and pots, able to host trees and shrubs. The intervention also includes the transformation of the unused roof into a green roof, making it an island of biodiversity, usable by employees as a place for socializing, for small-scale events or physical activities. Consiag – Estra implements corporate welfare through Urban Forestry interventions, helping to strengthen cohesion between the city of Prato and its employees, placing them on the front line between the surrounding area and the city.

The project developed by SBA for the social housing buildings in Via Turchia, includes the retrofitting intervention on the facades, the depaving of the parking lot, the realization of a large green entrance pergola, and the creation of social spaces within the garden. On the facades, the project foresees the installation of different structures composed of thin steel cables that allow the growth of climbing plants, capable of improving the local microclimate, of mitigating the temperature, and cooling the surfaces

of the buildings. The climbing species selection has been made to limit the maintenance of the green facades. A new pergola measuring about 100 sqm, covered with vines and furnished with wooden benches is designed to mark the entrance of the common garden. The project proposes the creation of common spaces for socializing, dedicated to collective and recreational activities. The parking lot will be completely depaved: 1600 sqm of asphalt will become a permeable surface. One of the major goals for this project is to minimize the water consumption, using leading-edge irrigation and rainwater collection systems.

The new green surfaces will provide multiple socio-environmental benefits and ecosystem services (ESS) to inhabitants and citizens. In this way, the city of Prato will obtain a renewed environmental and urban quality, with an attractive capacity for innovative companies working in the sustainability sector, as well as with better living quality standards for disadvantaged communities.



Stefano Boeri Architetti, *Facade abacus of Retrofitting intervention*, 2021

## Wonderwoods

Utrecht, The Netherlands / 2017 - ongoing

Stefano Boeri Architetti

Drawn up by Stefano Boeri Architetti and MVSA Architects, the Wonderwoods project aims to create an advanced cohabitation experience between city and nature in the centre of Utrecht, the Netherlands, as part of the new Healthy Urban Quarter. The intervention is a new prototype of the Vertical Forest, 90 metres high, able to offer about 200 apartments of various types for different users: mainly young professionals, workers and families. The tower's facades will host about 10,000 plants from 30 different species, equivalent to one hectare of forest vegetation and resulting in a genuine urban ecosystem capable of producing tons of oxygen each year. The ground floor will host the Vertical Forest Hub which will be connected to a garden on the sixth floor. This will be a centre for documentation and research into urban forestry worldwide. The complex communicates with the urban environment both through a ground floor open to the outside and through a vertical expansion in harmony with the proportions of the surrounding urban block. Also offering office areas, spaces for fitness and yoga, bicycle parking and public and recreational spaces, the Wonderwoods Vertical Forest is designed to be Utrecht's new wellness hub.

The building therefore reveals a complex and multifaceted nature and something genuinely new on the landscape of contemporary European architecture. On the one hand it is not merely a simple skyscraper, indifferent to the context in which it has been created: rather it is an urban tower which physically elevates the utopia of an unprecedented cohabitation between city and nature while respecting and enhancing the characteristics of the neighbourhood between Croeselaan Street and Jaarbeursboulevard. On the other hand, it is architecture that changes as it ascends, measuring itself both against the Utrecht sky and the historical urban context in which it is set. In vertical terms the building is divided into four superimposed "orders" which define a rotation of the building's body around the vertical axis. This movement gradually detaches it from its alignment with the route taken by Croe-



*Wonderwoods*, Utrecht, The Netherlands. Stefano Boeri Architetti, 2017. Visualization by Vero Digital and A2Studio

selaan Street, allowing it to follow an East/West orientation. If on the north corner the tower forms the “prow” of a system of blocks arranged on the axis of Croeselaan Street, on the south side it is laid out so as to be able to create a connection at altitude with the neighbouring building designed by MVSA.

However, the presence of 360 trees and 9,640 shrubs and flowers also expresses the reality of a highly sustainable tall building, capable of absorbing CO<sub>2</sub> in addition to a significant amount of particulate matter. Thanks to the filter action carried out by the leaves, it is also calculated that the microclimate produced on the terraces will enable a significant reduction in the temperature variation between the outside and the inside of the apartments with a proportional reduction in air conditioning energy costs.

As a form of protection for and safeguarding the biodiversity of living species and in particular the birds that inhabit the Dutch skies, the Wonderwood Vertical Forest has also been developed to promote the importance of the relation with nature. The apartments and interior spaces allow residents to take maximum benefit from the plant organisms hosted on the terraces and balconies which also guarantee optimal sunlight and an open view of the surrounding urban landscape. Small niches built into the facades will host nests for different species of birds. As a form of living architecture, the Wonderwood Vertical Forest has facades which will change both in colour and the denseness of the vegetation which will vary according to the seasons as well as depending on the amount of sunlight, growth and maintenance of the plants. The latter will be carried out through a centralized condominium station which thanks to a series of sensors will be able to check and control the irrigation system and also programme the pruning and maintenance of the greenery. The building is not only a model of biodiversity for living species, but also a combination of activities and functions. The base of the building is intended to host a carefully laid out system of duplex residences able to combine residential spaces and ateliers which will occupy the south-western sides up to the fifth floor, to which a number of hospitality, catering and commercial spaces on Croeselaan, Jaarbeursboulevard and Veemarktple Streets will be added. The idea of inserting the Vertical Forest Hub space into the tower came about precisely as an answer to the need to establish contact with similar situations and allow the complex to become an epicentre for future urban Urban Forestry policies. The Hub therefore exists as an open laboratory in which to further expand knowledge of the technical and botanical solutions adopted for the Utrecht intervention but also as a place in which to receive information and news on the progress of the other Vertical Forests under construction elsewhere in the world.

## The Wood cycle

Sofia Paoli

### *Forests and their Wood as a MegaStore of carbon*

Trees absorb CO<sub>2</sub> from the atmosphere through photosynthesis, fixing it as carbon in their organic matter and releasing the remaining oxygen back into the atmosphere.

When we try to understand how much carbon can be stored in forests we must take into consideration many aspects: carbon can be found in trees and in the soil, and carbon is not only present in living biomass but also in dead biomass, or rather wood. If a forest is managed properly, the harvested timber will be used to create added-value timber products which will continue to store carbon. Meanwhile, more trees are planted and the carbon sink effect of the forest is maintained. The role of forests in climate change mitigation is generally well perceived, while the contribution of wood products to mitigation is much less known and understood.

Wood and consequently harvested wood products (HWPs) store carbon in their fibers for as long as we can keep them in use. Stocked carbon continues to be stored through their whole lifecycle: use, re-use, recycling and recovering while by burning or decay in landfills, the stored CO<sub>2</sub> returns to the atmosphere. The longer the life of these products, the greater the benefits to the environment. The consideration of harvested wood products as carbon-storage mechanism is relatively new: the Intergovernmental Panel on Climate Change (IPCC) recognized HWPs in their Revised 1996 IPCC *Guidelines for National Greenhouse Gas Inventories* (IPCC, 1997), but only in the 2013 *Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol* (IPCC, 2014), IPCC added HWPs as a mandatory pool to be reported within land use, land use change, and forestry activities.

### *Substitution effect of wood*

While the carbon storage effect of HWPs helps to keep CO<sub>2</sub> out of the atmosphere, even greater carbon gain comes from the substitution effects of

using wood instead of greenhouse gas intensive-materials. Considerable CO<sub>2</sub> savings can be made by using wood where appropriate: wood can be used in place of fossil fuels for energy for example, but the most effective way is to use wood for construction materials, as steel and concrete have a very large carbon footprint. Wood can be used as a substitutive material both for structural and non-structural construction products, such as beams, wood frames, walls, windows, doors, ceilings, etc.

The construction sector is one of the largest users of natural resources and energy. Data on the market share of wood construction is scattered, but it can be assumed to be below 10% globally, although with significant regional variation (Hildebrandt J., et al., 2017). The market share of wood has been increasing in the last years, in particular, cross-laminated timber (CLT) and laminated veneer lumber have grown rapidly (Espinoza O., et al., 2015).

The fact that buildings account for nearly 40% of global greenhouse gas (GHG) emissions is amply evidenced and well-known (UNEP, IEA, 2018). Global concrete industry alone is responsible for 5% of the world's carbon dioxide emissions (Leskinen P., et al., 2018) : because of the great amount of energy required, the heat generated and the chemical processes needed, 1 tonne of CO<sub>2</sub> is released for every tonne of manufactured cement (concrete's main component). Cement production has increased more than thirtyfold since 1950 and almost fourfold since 1990 (Andrew R., 2018): second only to water, it is the most widely used substance on Earth (Gagg C., 2014).

Replacing construction materials like concrete and steel with wood is nowadays possible thanks to new technologies like cross-laminated timber. On average if we replace 1m<sup>3</sup> of concrete with 1m<sup>3</sup> of timber we are saving 1T of CO<sub>2</sub> (average substitution effect of 1.2 kg C / kg C, which means that for each kilogram of carbon in wood products that substitute non-wood products, there occurs an average emission reduction of approximately 1.2 kg carbon) (Leskinen P., et al., 2018).

Timber structures would allow us to draw carbon from the atmosphere and store it in the demand for new buildings. Timber construction embodies less grey energy and generates fewer greenhouse gases than conventional construction techniques. If trees are transformed into sustainable wood products like houses or interior fittings, the carbon of CO<sub>2</sub> is fixed for decades or centuries. Not only does wood remove more CO<sub>2</sub> from the atmosphere than it adds through manufacturing, but by replacing carbon-intensive materials such as concrete or steel, it doubles its contribution to lowering CO<sub>2</sub>.

Moreover, modern wood processing industries commonly use sawmill residues as an energy source, which contributes – through avoiding fossil

emissions – to the production of substitution benefits of wood products.

Another main comparative advantage of using wooden materials is that they tend to be quicker and easier to build, therefore reducing labour costs, transport fuel, on-site energy use, and the health risks related to dust generation by cast-in-place concrete (HSE). Furthermore, since a timber building weighs 20% of a concrete building (Smedley, T., 2019), it allows efficient industrial prefabrication and consequent productivity benefits.

The use of wood for construction would provide the best and the largest mitigation option that we currently have.

In a study from 2019 (Craig M. T. J., et al., 2019), it has been estimated that the potential of wood to mitigate emissions, and the substitution effect is much greater for the industrial sector (construction, material, replacing plastic) than in the energy sector. What we should really invest in and put efforts into, is the material use of wood while managing the forests in a sustainable way, basically assuring that more trees will replace the ones that have been harvested.

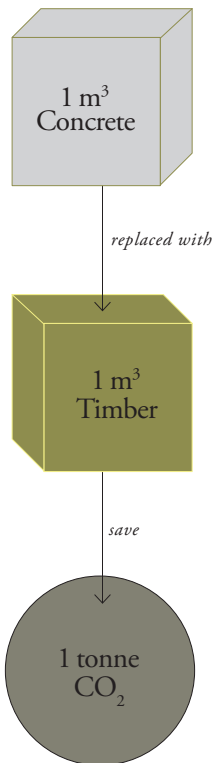
#### *Innovative wood construction*

The use of structural wood in tall buildings has been growing, as many improvements have been made in its structural capability and improved properties. Innovative engineered wood building products include a wide variety of possibilities, such as cross-laminated timber, glue laminated timber, nail laminated timber, laminated veneer lumber and dowel laminated timber. All these mass timber solutions are designed to replace traditional concrete and steel structures in multistorey buildings.

Among these products CLT has been studied the most and the first registered patent dates back to 1920 in the USA. It is a solid structural wood panel made of 3, 5, 7 or 9 layers of solid-sawn lumber or structural composite lumber glued together and oriented at right angles to one another (ANSI, 2012). Glued Laminated Timber, commonly abbreviated as glulam, is a very versatile structural product and is the structural solution used in the world's tallest timber building: the Mjøstårnet tower in Brumundal, Norvegia by Voll Arkitekter, opened in 2019. The building is 85.5-meter tall and it is built using local resources: the 2600 m<sup>3</sup> of wood used comes from local forests. The building was assembled four storeys at a time, in five construction stages and the whole glulam structure was assembled on the ground next to the building.

Another example is represented by HoHo Wien, Austria, by Rudiger Lain-er + Partner Architekten (2020), a 84-metre tall wood hybrid high-rise. The

Replacing concrete with timber



structure is composed of three-quarters timber including CLT walls, CLT or precast concrete floor slabs to part and glulam beams. The assembly of each floor's timber components was completed in four days. Roughly 4,350 m<sup>3</sup> of wood was used in the entire construction. Compared to reinforced concrete construction, the use of wood avoids some 2,800 tonnes of CO<sub>2</sub> equivalents.

### *Circular wood construction economy*

The circular wood construction economy must be supported by a productive forest landscape based on the wood cycle and enabled by the forestation program. This strategy will redirect the construction industry towards wood technologies, and the availability of the raw material will regulate the programmatic growth of world settlements in the long term.

Building stocks and infrastructures constitute the largest stock of materials in industrial economies (Kovacic et al. 2019): in order to minimize the use of primary resources and the dependence on imports, it is necessary to recycle these urban stocks. Life Cycle Assessment, covering the process from cradle to grave, including forestry, harvesting, transportation, processing and manufacturing, to the various end-of-life options, meaning it is necessary to enable higher recycling rates but it is often a challenging task since information about the material composition of buildings and the production process of the materials is lacking.

The construction industry's adoption of Distributed Ledger Technologies (DLT), or Blockchain, could have a lot of potential for enhancing resource management in the built environment. The Material Passport, a design-centric tool assigned to each building component, could be used by professionals in the construction industry to design buildings and it could enable a circular economy (BAMB 2019). Each building element must have its own Material Passport which contains a Building Information Modeling (BIM) of the component itself that is updated every time that there is a change throughout the life of the element.

The main goal of the Material Passport is the optimization of the building design in terms of resource use and material documentation, using BIM as a knowledge base for the elements and the material properties and coupled with other databases to assess the ecological footprint and recycling potential.

Coupling Material Passport and BIM will make it possible to create a material inventory and establish an understanding regarding the material assets of buildings and building stock.

Through this inventory, which we can imagine could be accessed through a digital archive, it would be possible to see real-time data about the current or future availability of building material resources.

The systematization of a network of Material deposits in each area could also be a key issue in improving circularity: deconstructed wooden building components can be temporarily stored in between different phases, until they are needed again. A timber log can be transformed into a new structural element, then recycled into furniture, and eventually chopped and processed into particleboard in a Circular Construction Economy system. When the timber can't be reused anymore, it goes through composting and anaerobic digestion processes, producing biogas on the one side that can be used for manufacturing operations, and compost on the other side that can be safely returned to the forestry soil. In this way, everything that was collected from the tree is returned to the Earth and participates in the regeneration of new timber.

The large amount of waste products generated by construction processes and industry is a global problem that has a dramatic negative impact on the environment at large (of all global waste in 2016, a massive 67.6% came from stocks: largely demolished buildings and infrastructure), and new resources are increasingly difficult or costly to find or extract (PACE 2021). Therefore, efficient management of waste products has become essential. Blockchain technology could be used to develop a unified waste management system in which waste products are monitored throughout their life cycle, creating a residue archive.

Thanks to the use of Material Passport, Blockchain and BIM a virtuous cycle is created that drastically reduces carbon emissions while increasing forest cover and creating new economic opportunities. As the wood goes through this closed-loop, new jobs and business opportunities are created.

In the future, every city should provide a material inventory developed with an integrated set of methods and tools - Material Passport, BIM, Geographic Information Systems (GIS) - as well as modelling and predicting future resource flows.



*Tree Room*, Arte Sella, Trento (Italy). Stefano Boeri Interiors, 2020. Photo courtesy of Giacomo Bianchi and Arte Sella



## Grand Genève Constellation Métropolitaine

A polycentric metropolitan vision for the Genève metropolitan area based on forestry strategies, timber production, supply chain, construction and cycles.

Genève, Switzerland / 2018-2020

Stefano Boeri Architetti

On the occasion of the Consultation Grand Genève, Stefano Boeri Architetti and seven other teams of interdisciplinary professionals were asked to propose strategies and solutions for the ecological transition of the transnational area of Geneva, in which 350.000 new residents are expected to be living by 2050. They will need new houses, new schools, new public spaces, new infrastructures and yet this growth should not waste agricultural soils, nor should it compromise the environment, or increase emissions.

The vision relies on the transformation of a centralized urban territory into a Metropolitan Constellation that stems from the concept of a metropolitan archipelago. Eleven different urban nuclei comprise Geneva and Annecy, leaving Mt. Salève at their core as a place where biodiversity can flourish. This new Metropolitan Constellation will therefore have at its heart not a city but a natural formation, the quintessential habitat for both non-domestic (chamois, wolves, etc.) and domestic species (cattle and sheep). The kaleidoscopic metropolis of Geneva extends around Salève, alternating urban and natural areas strengthened by urban forestry, afforestation, and agroforestry. It will thus become the first planetary manifestation of a co-existence no longer based on authoritarian and aggressive anthropocentrism.

SBA has developed a project with the professional advice of a team of experts, among them Professor Eugenio Morello and Professor Fabio Salbitano who have contributed to the development of a strategy using the circular wood economy and a productive forest landscape based on the wood cycle enabled by the forestation program that will redirect the construction industry to wood technologies. The availability of raw material will regulate the programmatic growth of new settlements in the long term while the cycle and logistics of construction waste are proposed to be re-organized locally: collection, sorting,



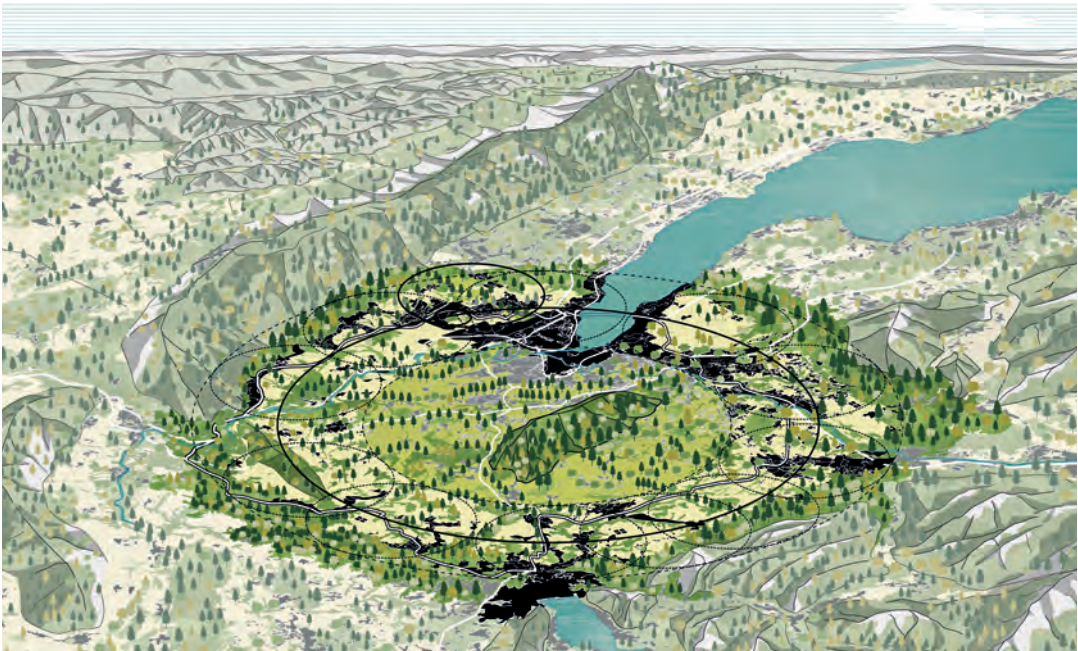
*Grand Genève Constellation Métropolitaine, Geneva, Switzerland. Stefano Boeri Architetti, 2019*

reusing, recycling, upcycling and regenerating (3D printing, fab-labs).

In order to meet the housing demand of +350.000 new residents, Grand Genève will need a great amount of construction timber. At a transnational level Gran Genève will define agreements with the Swiss and French forestry companies in order to secure the possibility of acquiring all the timber necessary for the creation of the interventions during the early years of the project. The woodworking will be centralized at a regional level; new sawmills will be placed at the edges of the metropolitan area in order to establish a short chain between harvesting activities, manufacturing sites and utilization spaces. Therefore, also the time and energy needed for transportation will be reduced.

The products of this process will be used for the construction of buildings within the region or for the energy retrofitting and volumetric expansion of the existing construction stock. At the end of the lifespan of the timber buildings, the deconstructed wooden components will find new reuse and recycling possibilities within Greater Genève which will be allowed thanks to the implementation of digital and physical solutions.

The geographical constellation of the new Greater Geneva could well become the model for a new form of a metropolis, ready to face the challenges of the near future on Planet Earth.



*Grand Genève Constellation Métropolitaine, Geneva, Switzerland. Stefano Boeri Architetti, 2019*

## Amatrice / Polo del gusto

Amatrice, Italy / 2016 - 2017

Stefano Boeri Architetti

Following the 2016 earthquake which devastated the city of Amatrice and the surrounding villages of Central Italy, there was a urgent need for a temporary meeting place in which leisure and restaurant activities could find a dedicated space. Within twelve weeks, the first new structure, the Canteen, welcomed the citizens of Amatrice. This building was made with timber from Friuli, a Region in Northern Italy. Wood came to be the perfect material to rebuild this new center of the city, thanks to its lightweight, its flexibility, its anti-seismic properties, and to a shortening in construction time.

The new Amatrice square, namely “*Piazza del Gusto, Tradizione e Solidarietà*”, was created as part of a project by Stefano Boeri Architetti thanks to funds raised by the Corriere della Sera newspaper and the Tg La7 Italian TV news channel through a fundraising campaign which raised €8 million, €5 million of which were earmarked for construction of the new Amatrice center.

The new square was designed to give back the dignity of work to local citizens - especially for those who lost their job and their activities due to the earthquake - and relaunching Amatrice, starting from its traditions and its food culture. The concept is based on the model of a multi-functional public square, capable of becoming a place for meeting and social exchange, and at the same time providing several services. The new square hosts a school, a canteen and eight restaurants, and occupies an area of 9,000 square metres.

The main structure, the canteen, was especially dedicated for students who were unable to use their school, following the damage by the earthquake. The building occupies an area of about 490 square metres with 150 seats, and offers a view of the Laga mountains.

The buildings located in the perimeter were designed to accommodate eight restaurants. It has been calculated that around 100 jobs



*Amatrice Polo del Gusto*, Amatrice (Italy). Stefano Boeri Architetti, 2016 – 2017. Photo Credit: Giovanni Nardi



have been restored with these new structures, keeping alive one of the most important economic activities in the area and attempting to reactivate the tourist flow in the area, which has always represented a great source to sustain the local economy.

The entire project was carried out in eight months of work, an extraordinary experience that shows that a high-quality architecture can be achieved in an emergency and dramatic situation, while also applying innovative technical solutions in places affected by natural disasters.



*Amatrice Polo del Gusto*, Amatrice (Italy). Stefano Boeri Architetti, 2016 – 2017. Photo Credit: Paolo Rosselli

## Let's talk about forests and Urban Forestry to redesign the world we live in

Stefano Boeri, Maria Chiara Pastore

### 1. *Urbanisation and climate change*

Entering the Anthropocene geological era<sup>1</sup> (in which human beings and their activities are mainly responsible for terrestrial territorial, structural and climatic changes) is often associated with deforestation, the first element of imbalance in the process of absorption of carbon dioxide. (Turney C. S., 2018) The trees themselves, through the study of the alterations of their growth rings, describe the variations in the amount of carbon-14 present in the atmosphere, an indicator of wider changes in the environment.

Urbanisation is certainly one of the first causes of this change. 54% of the world's population lives in cities nowadays; this trend is expected to grow, so much so that researchers foresee 70% of human beings will live in cities in 2050, especially in China and Africa. (UN, 2014)

The sudden expansion of urban areas is structurally changing the entire relationship between city and nature. Cities consume food, energy and water, produce pollution, waste and waste water. The balance between urbanisation and nature is often determined by the latter and "land consumption," "deforestation," "loss of biodiversity" are only some of the words we associate with urbanisation. Cities, while occupying only 3% of the Earth's surface, leave a huge footprint in terms of climate impact; they consume 75% of natural resources and produce over 70% of global CO<sub>2</sub> emissions. (C40, 2018)

The concept of "urban metabolism," introduced for the first time in 1965 by Abel Wolman, (Wolman A., 1965) following studies on the broader changes associated with the post-war "Great Acceleration" in terms of industrial capacity and consumption, tells us that "the Earth is a closed ecological system and (...) the planet can not assimilate without limit the untreated waste of civilization."

While cities have contributed for centuries to the promotion of some of humanity's greatest ideas, we must now urgently bring cities, among

The text is extracted by  
*Il capitale naturale in Italia.*  
*Aria, suolo, acqua, foreste.*  
*Un patrimonio da difendere*  
*e arricchire.* Ed. Ambiente,  
October 2018

1. Jenkyn T. W., "Lessons in Geology XLVI. Chapter IV. On the effects of organic agents on the Earth's crust," *Popular Educator*, 4, 139-141, 1854; Crutzen P. J., E. F. Stoermer, "The 'Anthropocene'," *IGBP Newsletter*, 41, 12, 2000; Lewis S. L., M. A. Maslin, "Defining the Anthropocene," *Nature*, 519, 171-180, 2015; Waters C. N., et al., "The Anthropocene is functionally and stratigraphically distinct from the Holocene," *Science*, 351, 137, 2016; Van der Pluijm B., "Hello Anthropocene, goodbye Holocene," *Earth's Future*, 2, 566-568, 2014; Waters C. N., et al., "Global Boundary Stratotype Section and Point (GSSP) for the Anthropocene Series: Where and how to look for potential candidates," *Earth-Science Reviews*, 2017.

the principal actors of the environmental debate, to the forefront of any policy tackling and countering – possibly reversing – climate change.

## 2. *From coal to wood*

20th century Europe may very well have been born of steel, but we can surely imagine a new Europe and a new Italy brought out of the forests, out of wood and the extraordinary economy it can fuel, triggering a universe of inspirations and economic and cultural activities of great potential.

As specified in the *Secondo Rapporto sullo Stato del Capitale Naturale in Italia* (*Second Report on the state of Italy's Natural Capital*), “Forests in Italy cover a territory of about 11 million hectares (according to the National Inventory of Forests and Carbon Tanks of 2005, with a 2015 update), more 30% of the national surface.” (Comitato Capitale Naturale, 2018)

The waterproof surfaces in Italy are instead no more than 10%, having undergone a great acceleration in the last 50 years, representing “a fabric that – compared to the same amount of urbanized surface – originates from the growth over time of extremely widespread cities, almost pulverized, with very low densities and covering a very large territory, where urban limits clearly defined and the city fades into the matrix of different degrees of suburbs.” (Ibidem)

On the other hand, due to the abandonment of the countryside and small rural centers, woods and forests have been growing back spontaneously. Contrary to what has happened elsewhere, the urbanisation in Italy grew alongside an increase in woodland areas: in this, Italy is unique in the world, despite “wood culture” still being very weak and fragmented in our culture. One fact, for example, is not commonly known: forestry does not mean uncontrolled growth. Naturalistic silviculture, aims at guaranteeing the quality of the woods and their biodiversity through respect of a plant's life cycles, while being a necessary condition to keep forests productive.

## 3. *Forestry*

Adopting wood as a possible answer to the Italian dilemma: a fragile territory, under crisis due to delicate seismic and hydro-geographical conditions.

Forestry means fighting against the progressive erosion of the forests and, in countries such as Italy, it also means reusing wood resource for new development processes. It means trying to strengthen the hold that

forests have on our territory. It means networking those companies that work with wood, especially in the furniture sector and, those, albeit so very few, in the field of building prefabrication. It means imagining a wood supply chain on a national scale capable of managing the entire production cycle, from silviculture to cutting, from the selection of woods to processing, from design to modular prefabrication, up to the last stages of disposal and recycling.

Wood can adapt to a huge variety of solutions, it is a material which does not in itself have a stylistic feature and can replace elements and components of building production without interfering and conditioning its language: from wood bricks to the experiments being conducted in Canada and Europe, aiming at building vertical wooden buildings. Associating wood to the terms “cottage” or “chalet” is now an anachronistic bias. In addition, wood, with its elasticity, lightness and flexibility, is the perfect material for such environments subject to high seismic risk, that are abundant in Italy.

Forestry means above all working in the cities, repopulating them with vegetal surfaces, carrying the trees on our roofs, in the squares, on the sidewalks and in the avenues, creating new parks and gardens, transforming urban courtyards and voids into green oases, promoting urban gardens everywhere, enhancing urban agriculture and using the roots of trees to clean up urban and peri-urban polluted soils.

Forestry will allow us to re-establish a balance, locally and globally, in the relationship between city and nature, thus becoming a structural element of regeneration.







# Kaleidoscopic Futures

# Four Futures. Environment and politics

Stefano Boeri

Peter Frase is a sociologist and activist in the American democratic socialist movement and has written a book entitled “Four Futures – Life after capitalism”. (Frase P., 2016)

It is a concise and highly schematic book that provides plenty of food for thought because it tries to create four scenarios starting from certain fundamental constants in our present situation.

The idea of the future that Frase presents comes from an intensification of this present situation; the future is not science fiction, it is not a totally dystopian deviation from current reality, but rather an essential intensification of those processes, energies and desires that are already around us.

The great energy that Frase talks about is linked to artificial intelligence and the incredible development of technologies and processes that according to Frase are effectively and irreversibly leading towards progressive automation, most notably within the labour market.

Such automation will therefore necessarily affect the lives of millions of inhabitants of the planet, replacing most tasks and most of the traditional forms of work as we know them today. Just think of mobility, the field in which the future is perhaps most evident, to see how the introduction of drones or automation in private mobility is already partially able to replace manual labour and the physical presence of man in terms of functions necessary for the life of a community. Peter Frase’s book tries to build four models of

This text is a transcription of a lecture by Stefano Boeri filmed during the first lockdown between March and April 2020 as part of the “Tempo Ritrovato” series of readings.

a possible future, starting from the combination of energies that are already present around us in the contemporary world.

Automation, according to Frase, is an irreversible process, a force that generates possibilities and potentials and which alone does not define the future: there are other variable components that interact with the drive towards automation.

If the drive for increasing automation is a constant, the variables that Frase cites are two: the great ecological question - which we would call climate crisis - and a political question, that is, the ability of individual nations to know how to go in a direction of greater democracy and egalitarianism, rather than towards sovereigns or authoritarianism.

There are four futures, according to the combination of the constant push for artificial intelligence and the variables related to geopolitics and climate change.

The first future is in some ways “idyllic” and in which a great abundance of resources drives automation forward in a liberating way. In this vision, technology frees us from the slavery of work, in a sort of return to a society in which one of the conceptual origins of Marxist thought is ironically replicated - “from each according to his ability, to each according to his needs”. This is a form of communism, linked to the abundance of resources, which could be created thanks to the fact that automation allows the individual to be released from the most difficult and tiring working patterns and from the slavery of months of production, freeing resources and energy. This is a possible hypothesis, Frase tells us, but we need to realise that - even in the case of a society that functions in such a virtuous way - there will always be those who own not so much the means of production as the means of programming. In a society governed by technology and algorithms there will still be those who own the copyrights and software rights, thereby guaranteeing an income.

This is a very important issue, because it introduces a second scenario, in which a very strong division by classes

remains: a society which is anything but egalitarian and determined on the basis of the ownership of the programming means.

A third possible scenario is instead linked to a necessary rebalancing, a re-distribution that could be defined as socialist or social democratic and which is all the more important if instead of abundance we arrive at a situation of scarcity of goods, scarcity of resources and scarcity of space. This is a situation, unlike the previous cases, in which climate change acts forcibly, drastically reducing the amount of energy resources available on the planet and leading to interventions to support the weakest sections of the population.

There is however a fourth scenario, the most dystopian and dramatic, which leads to seeing in the scarcity of resources and advanced automation the risk that a large quantity of the human species is simply considered superfluous. In this model of the future, a small elitist world, a small sphere of wealth that possesses the means of programming and controlling automation, will be able to live by protecting itself from the effects of climate change without having to resort to sharing with a gigantic share of the population which then becomes superfluous. This vision, which to use Frase's term is close to extermination, is both dystopian and dramatic.

On the one hand, the book presents the future to us as something that inevitably arises from forces that are already present, already in progress in the contemporary world. Frase introduces us to a future that is not monotone; there is not simply a single push towards the future, there is not just a post-atomic or post-catastrophic future. But there is an attempt to intertwine energies already present, to imagine the possible scenarios of the future. The book also looks at futures that are potentially already in sequence: there are phases in which there is a situation of total return to forms of enslavement of large masses of the population by a small elite that possesses the means and therefore the wealth. Such a situation may lead to a struggle and conflict and therefore a social break up leading to a situation featuring a community society.

There is therefore a possible succession of these different futures, due to different forms of conflict.

Frase's book plays on these four scenarios and presents the future as the intensification of forces already in place. But what we actually have ahead of us is not a straightforward future, but rather the intertwining of a series of factors, which are up to us to control today.

From this point of view, and from the lesson we are learning with the Covid-19 pandemic, I believe it is important to realize that the future that awaits us does not emerge solely from the current situation but also from our ability to interpret unexpected phenomena and how we react to them.

# How greening cities can help save the Planet

**Dr. Jane Goodall**

DBE, Founder of the Jane Goodall Institute & UN Messenger of Peace

Dame Jane Morris Goodall DBE is an English Ethologist and Conservationist. In July 1960, Jane Goodall began her landmark study of chimpanzee behavior in what is now Tanzania. Her work at Gombe Stream would become the foundation of future primatological research and redefine the relationship between humans and animals. In 1977, Dr. Goodall established the Jane Goodall Institute, which continues the Gombe research and is a global leader in the effort to protect chimpanzees and their habitats. The Institute is widely recognized for innovative, community-centered conservation and development programs in Africa. In 1991 Dr. Goodall founded Roots & Shoots with a group of Tanzanian students, developing global environmental and humanitarian youth programs. In 2002, Dr. Goodall was appointed to serve as a United Nations Messenger of Peace and in 2003, she was named a Dame of the British Empire.

One of the many problems we are faced with today is the increasing number of people living lives separated from the natural world. Partly this is because so many young people are choosing to spend their time playing video games or communicating with their friends on social media rather than spending time outdoors. And partly it is because, either from choice or necessity, more and more people are leaving rural areas to live in cities where many, especially those in the lower income bracket, are living surrounded by concrete so that they and their children are isolated from contact with nature. Which is unfortunate as there have been studies showing that spending time in nature can have a beneficial effect on mental and physical health and that when trees and flowers are introduced to an area of crime, violence is reduced.

In addition to this, of course, trees help clean the air by filtering out dust particles, muffle the sound of traffic, provide shade, lower the temperature, absorb CO<sub>2</sub> from the atmosphere thus helping to mitigate climate change, and attract birds and other wildlife. Tree roots help to stabilize soil and minimize the harm caused by flooding. And public gardens and parks offer places for exercise and refuge from the bustle of city life. Often, I see artists sketching the scenery and people sitting in the shade reading or even sleeping on the grass. Even time spent in such a sanitized version of nature offers moments for peaceful relaxation.

As the world population grows, so cities grow, and it is desperately important that this growth should be accompanied by new incentives to bring the natural world into existing cities and into the planning of new ones. Of course, the most perfect city structures have been created by Stefano Boeri whose residential apartments are like forests, towering into the sky, incorporating hundreds of trees and shrubs and attracting countless species of birds and insects. Some of these structures are designed to be social housing, such as the Trudo vertical forest currently under con-

struction in Eindhoven, the Netherlands, and will be affordable enough to allow not only the wealthy to live there.

There is a growing understanding that the “greening” of cities is important and we find trees and shrubs growing beside roads and in courtyards, flowers in hanging baskets and window boxes. Living walls are getting more common, as are gardens on rooftops. And while these developments are typically confined to the more affluent parts of town, things are changing as it is increasingly understood that the greening of deprived areas saves money in the long run by reducing crime and improving health. When the city council was asked to plant trees along the sides of the roads in Dar es Salaam, the capital of Tanzania, the effect was soon very noticeable. In the tropics trees grow quickly and soon the atmosphere changed dramatically – for the better. The endless traffic jams were more bearable when leafy branches shielded one from the glare and the heat, people walking beside the roads looked less stressed, vendors sat by their roadside stalls looking relaxed in the shade.

Even a fragment of the natural world in a city can affect one’s attitude. Until I was ‘grounded’ by the COVID-19 pandemic I was travelling some 300 days a year on lecture tours – spending most of my time in cities. And what a difference it made when I could look out of my hotel window and see some kind of nature. When my view was limited to tall buildings, busy highways or – so often – construction sites, I felt trapped, cut off from the world I love best - especially when, as so often the case, I could not even open a window. But just one tree whose green leaves more or less obscured the buildings and the traffic made a real difference and I would rearrange the furniture so that I saw those leaves when I sat to work and woke in the morning.

My last word is a call to action. It is vitally important, for the future of our planet, that along with the greening of our cities there should be a major effort to incorporate environmental education for our children. As things stand it is economically difficult to take children of lower income families into real nature as the cost of insurance on a bus is exorbitant. But city parks are more accessible and provide an affordable alternative. Some are highly manicured, and often planted with non-indigenous vegetation. And while they may be pleased to look at it, they will not be hospitable for many kinds of wildlife. But there are parks that are allowed to run more or less wild with natural trails where school-children can be brought to learn about nature. I have visited with these groups of young people (mostly from the Jane Goodall Institute’s programme for

\* Roots & Shoots, the JGI's environmental and humanitarian movement for young people of all ages from kindergarten through university is now active in 68 countries. Each group chooses and works on projects to make the world a better place for people, animals and the environment and a key component is helping members understand the importance of conserving the natural world.

environmental education, Roots & Shoots\*) in cities around the world. It is wonderful to see the excitement in the eyes of a child who sees, for the first time, a squirrel burying a nut, a spider carrying her egg sac, the golden sacs of pollen on a bumblebee's legs. Some parks are actually small remnants of original forest or woodland, with some ancient trees remaining to remind one of how things were before humans interfered. These areas not only provide the very best classrooms for city children but are attractive to older students who can get engaged in a citizen science project to monitor the plant and animal species of the area, plan out a research project for their biology class and so on. And in Europe miniature woods and forests, some small enough to fit into a schoolyard or abandoned building site, are popping up in and around cities. Inspired by Japan's famous botanist, Dr. Akira Miyawaki, they are marvels of biodiversity.

I have seen for myself that once children experience nature first hand they usually become fascinated and want to conserve what is left and restore at least part of what we have destroyed. It is our disrespect of the natural world – destroying habitats so that animals are forced into closer contact with people – that has led to the conditions that increasingly allow a virus or bacteria to jump from an animal to a human and cause a new human disease – COVID-19 is just the latest example. And that same disrespect of nature has led to something far more terrifying: the climate crisis.

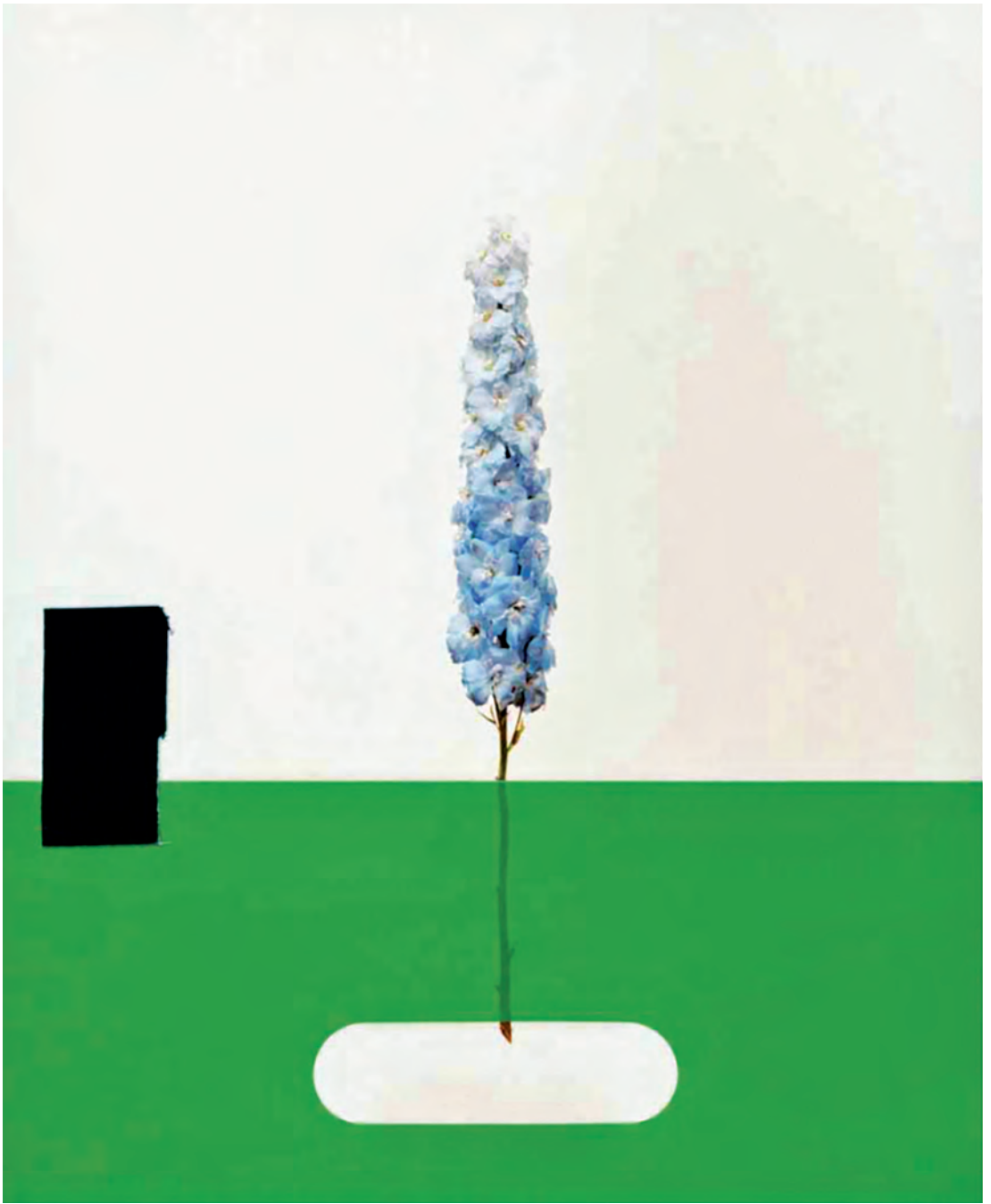
This is why it is so desperately important that we enable our children to reconnect with and learn to respect the natural world and understand that we are part of it and depend on it for our very existence. And why bringing nature into our cities is a crucial part of our fight to save the planet for future generations.



Adrien Dubost  
*Are we willing to use intelligence?*  
*Collages going vertical*

Even more aware of the fragility of our species: we have been fragile in our technocratic ambitions to rule, we have been fragile in our intellectual ability to make predictions





## Trudo Vertical Forest

Eindhoven, The Netherlands / 2017-2021

Fiamma Colette Invernizzi

The Trudo Vertical Forest project is part of the urban renewal plan for “Strijp-S”, a reuse and new development in the area previously belonging to the electronic company Philips, in Eindhoven, The Netherlands. Since 2000, the area has been reused as hubs for creative young companies and re-planned to host housing. One of the key goals of the corporation in charge of the renewal of the area was to maintain the industrial atmosphere of the complex, mixing the creative industry with lively functions. In this context, the Trudo Vertical Forest is an experimental new concept for Social Housing, following the Vertical Forest principles. The Trudo Vertical Forest is intended to mainly accommodate low-income users, in particular young couples, through a system of rent-controlled apartments with high living quality standards on its 19 floors. The rent-controlled system allows, through a series of interviews, to identify the individuals who are willing to be part of a community interested in nature and its maintenance. The maintenance is entrusted by a private company but several courses are held for the Trudo’s inhabitants in order to let them learn how to respectfully take care of plants and trees.

The Trudo Tower applied the Vertical Forest concept to social housing for the first time. It has been designed to follow the Value Engineering principles in order to set new living standards for affordable housing, where the outdoor spaces and the presence of trees and shrubs are finally valued as fundamental assets in the planning regulation system of a contemporary city. The costs of the building have been reduced thanks to the prefabrication and the Value Engineering principles, which means achieving the same aesthetically appealing results with a substantial reduction of costs through a careful material selection, done during the design process. Moreover, the design of the cantilever terraces and the facades have been specifically designed to save costs through the use of modularity in their components. Thanks to the use of prefabrication,



*Trudo Vertical Forest*, Eindhoven, The Netherlands. Stefano Boeri Architetti, 2021.  
Photo Credit: Levi Trommelen and The Blink Fish



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Photo Credit: Levi Trommelen and The Blink Fish





*Trudo Vertical Forest*, Eindhoven, The Netherlands. Stefano Boeri Architetti, 2021.  
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the rationalization of technical solutions for the facade, and the consequent optimization of resources, Trudo is at the forefront to set new living standards in social housing. Trees, shrubs - and the biodiversity that comes with it - for the first time are meant to be fully included as fundamental assets in affordable housing, with a minimum outdoor space of 4 sqm and at least 1 tree for each apartment.

The Trudo Vertical Forest is a 75-meter high skyscraper, whose facades are home to 125 trees, 5,200 shrubs and plants. Trudo improves the urban biodiversity by promoting the coexistence and interdependency of flora, fauna, humans, and architecture. It is helping to set up a new urban ecosystem where different kinds of plant species can create a new hotspot for different birds and pollinating insects to settle, thus becoming a magnet and a symbol of the spontaneous re-colonization of the city by animal life and vegetation. Trees provide many ecosystem services to be used in improving the resilience of cities: once grown-up, the large amount of vegetation that will extend over the building's floors will allow a significant reduction in temperature on its façades, providing considerable overall energy savings. The green facades of the building are providing not only a relief from the monotony of concrete and steel, but they provide an impactful relief from the urban heat island effect. The water system is conceived as circular: rainwater is collected and stored in a tank underneath the building and reused for irrigation.

The goal of the Trudo Vertical Forest is to achieve a tangible psychological impact on urban dwellers thanks to the provisioning of an aesthetically pleasing building. As already said, designing with nature also means creating attractive habitats for insects, birds, and small animals: the presence of other living organisms is considered to be one of the goals of the project. Trudo does not work just on changing the city landscape, but takes into account the need for trees and plants for each apartment, thus including them into the social housing living standards.

## The Tree's right to dwell

Simone Marchetti

With the *Déclaration de droit de l'arbre*, (the Declaration of the Rights of The Tree) for some time in France trees have enjoyed full recognition of their rights, their protection and the safeguarding of historical ones. This document was presented to the National Assembly on 5th April 2019 (the lower house of the bicameral French Parliament) in the attempt and hope of it becoming universal and thereby opening the way to new legislation capable of recognizing the tree as a living being with a right to inhabit the urban landscape. The scientific assumptions of this declaration are that trees are fundamental for ecological balances and the biodiversity associated with them: the world of trees is unique and indispensable and should be recognized, safeguarded and protected even at legislative level, taking into account that a tree has the full right to its over-ground physical integrity (branches, trunk and foliage) but above all its below-ground integrity (its roots), whose well-being is fundamental for its health and for all those species that depend on it (ARBRES, 2019).

This declaration represents the first step in the process of the recognition of trees as individuals with rights, yet its purposes are not new. This is part of a longer process that has been taking place since we, as human beings, started to realize that fundamental human rights are closely linked to the environment in which we live and with the life of other species with which we coexist (Forest Law / Selva Juridica, 2014). Eventually, the goal of this type of declaration is to underline a legislative gap that needs to be filled, a modern constitutionalism that must be overcome, freeing its legal language from the objectification of nature as “property”. Modern law and its language, with its semantic gaps, have played a huge role in enforcing domination and control over people and land. Modern colonialism has also been built and legitimized by the juridical dichotomy of humans considered to be a “Juridical subject”, and Nature (land and the biodiversity that comes with it) considered as an object to be owned,

meaning that it has no juridical rights. From 1960 and 1970 respectively several attempts were made to bring legal cases to court in order to change the status quo and eventually let the landscape, forests and trees be parties to litigation. In 1971 the landmark Manifesto by Christopher Stone, namely *Should Trees Have Standing? Toward Legal Rights for Natural Objects* (Stone D. C., 1972) was a pioneer of this new approach, where a valley - the Mineral King Valley in the U.S.A. - at risk of soil degradation due to a development project plan assumed a juridical entity to stand against its own exploitation. The case became paradigmatic for its assertions, renewing interest in a quest for a new form of language and a new type of legal animism (Forest Law / Selva Juridica, 2014). The indigenous people of the Amazon Forest and Environmentalism as a broad philosophy have contributed greatly to creating awareness and establishing numerous popular movements in the defense of forests and trees, both in South America and all over the rest of the world. As a result of ethical and political discussions concerning justice and the criticisms of the classical notions of environment and nature, several goals have been achieved. One example is the Ecuadorian Constitutional Law, which was the result of an intense exchange of notions and knowledge ranging from environmental sciences to activism and advocacy and which has acknowledged a series of inalienable rights, giving Nature a prominent place in the juridical foundations of the state and recognizing the existence of “different natural worlds” within the Ecuadorian geographical borders in law (Forest Law / Selva Juridica, 2014). This means that from a legislative point of view we are starting to recognize the existence of worlds that we might not know and yet which we can still respect them as entities or individuals with jurisdictional powers.

With the proclamation of a declaration for the rights of trees, every nation and city would assume responsibility for a legacy both to be protected, but above all to be recognized as a physical entity, with a right to life. This is much needed especially in cities, where the presence of grey infrastructures usually overtake the presence of “green infrastructures”. The outcome would be the creation of a law with an intercultural character that would consider the natural world, in which we also belong, as a sort of agro-ecological field of interspecific cultivation (Coccia, E., 2019), and which would acknowledge that all living species are part of the whole Earth-system and each one of them plays a role in its equilibrium. We must also acknowledge the fact that every species tries to intervene - and not necessarily in a bad way - in the biological and genetic destiny of

other species, and that they themselves produce “cities” and “structures” (Coccia, E., 2019). Trees are among those species that plays a huge role in creating such non-human worlds, in the soil between their roots as well as between the foliage of their branches.

Furthermore, it must be recognized that the right of domination and property condemn man to disappear: if the right of domination and property is combined with parasitism, the parasite condemns the host to death by looting it, without realizing that he condemns himself to disappear (Serres M., 1990).

Michel Serres, in his book *The Natural Contract* (Serres M., 1990) proposes a symbiosis contract, where the symbiote admits the right of the host, who as such, comes into contact with the host without damaging it, but establishing a symbiotic relationship, a relationship of mutual support and recognition with it.

Worth mentioning are the powerful statements in the book *The Nation of Plants* by Stefano Mancuso (Mancuso S., 2021), that has been presented on the occasion of the XXII International Exposition - *Broken Nature: Design Takes on Human Survival*, curated by Paola Antonelli\* - at La Triennale Milano in 2019. The book contains the legacy for the progress of future legislation on this matter.

Interiorizing these concepts into our everyday life could radically change the way we interface with the plant kingdom, which thus far has constantly been ostracized by Western culture. Dr. Jane Goodall has also sided with the trees on several occasions, in particular during the launch conference for the *Three Trillion trees Campaign* in Davos as part of the 2020 World Economic Forum. Her proposal was simple but extremely powerful: give a name to each tree, thus giving them an identity and recognizing them as individuals. This idea, which may seem banal, implies a cultural change that is not at all obvious, and which comes from a broader reflection following the same proposal she put forward (and which was strongly opposed by the scientific community) with respect to the use of names, instead of numbers, as given to the chimpanzees she was studying and analyzing, an event that caused a particular stir in the scientific community in the 1960s. Naming trees and recognizing their individual identity is only the tip of the iceberg of a much deeper change that needs to be made, but it is a small step forwards, towards an extremely different vision of the world, where the static nature of plants and of trees is not synonymous with death, but rather the recognition of an evolutionary process different from ours and no less precious for being so.

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## Towards a new alliance between City and Nature

Maria Chiara Pastore

A while ago, thanks to two colleagues from different disciplines, Francesco Ferrini, full professor in Arboriculture at the University of Florence, and Paolo Pileri, full professor in urban and regional planning at the Politecnico di Milano, I came across the book “Ci vuole un Albero per salvare la Città” by Francis Hallé, translated from the original “Du bon usage des arbres. Un plaidoyer à l’attention des élus et des émarques” (Hallé, F., 2018).

I like to use this nice pretext to highlight some aspects that this little book has been able to raise. First, I would like to emphasize the fact that the people who recommended this title work in two different disciplines, but the book in question, a book about trees, is the common ground of the dialogue. Moreover, the text is mainly addressed, by Hallé himself, to politicians and administrators of greenery. This is because trees do not belong to a single or a few sectors, work or research, but permeate all disciplinary sectors. In the research we are working on urban forestry, this common transdisciplinary work is one of the first messages that I would like to emphasize. In the organization of the 1st World Forum of Urban Forests held in Mantua in 2018 and organized by FAO, SISEF, the Comune di Mantova and the Politecnico di Milano where more than 800 people gathered to discuss urban forestry worldwide, this dimension of great interest to different disciplines, from public and private organisations, citizens and associations, was one of the most relevant elements that the topic raised. The plant kingdom brings together the different scientific disciplines, and only the alliance of diverse segments of knowledge can help us understand this complex world and how to relate with it in the best way.

A second element regards one of the messages of the book, concerning the alliance between men and trees. On page 58, Hallé states: “could the tree and man live without each other? Asymmetry is unfavorable to us because the tree does not need us in any way, while it is vital for us” (Hallé F., 2018, page 58). All of us humans, more or less affected by the dimension of relationship, wherev-

er it is friendly or in contrast with nature, often lose sight of this reality. That is, plants, in the absence of human beings, would not only continue to survive, but would proliferate. On the other hand, satellite images of abandoned places, both following an ordinary process of decommissioning, and following sudden or tragic events, such as Chernobyl, show places uninhabited by mankind, and yet highly prolific in terms of green spaces and biodiversity, undoubtedly repopulated and colonized by plants. The man-tree relationship, completely shifted to cover the need for our species to build an alliance which can somehow guarantee our survival (trees populated the Earth well before the appearance of mankind, as the oldest tree-like plant fossil found in Gilboa, New York, USA has been dated as being 385 million years old, and most likely will be able to adapt even after our eventual disappearance as a human species from Earth), seems not to take this imbalance into account. But if we are the ones who need trees, what are the elements that hinder this dimension of integration, and more specifically in the urban environment? I will try and list three elements that possibly affect the relation between nature and the city, in the hope that some of these elements may be overcome.

1) Trees need space;

The space dedicated to trees, and green spaces in general, is one fought over by numerous demands, whether for housing, or commercial, manufacturing or agricultural needs and so on. Furthermore, in the urban environment, trees compete for spaces with infrastructures (certainly those referring to mobility, be they roads, sidewalks, cycle paths, railways, subways, but also secondary services that in some cases prevent them from being planted along with parking lots and spaces dedicated to sports). In terms of this initial element, it is important to observe from an administrative point how complex it is to generate opportunities for increasing the spaces for planting, since this clashes with the responsibilities of different departments or sectors and different organisations. Creating coordination and considering urban forestry as a transdisciplinary sector that necessarily affects other different sectors is a challenge to be faced with and through a medium, namely trees. Trees are therefore no longer to be considered as an element of furniture but as an integral part of any infrastructure. There is also another aspect regarding spaces for the trees, which again comes from the suggestions by Hallé. This regards the physical space that an adult tree needs in order to grow and to be healthy. The tree canopy, but also the roots are elements that need to be calculated when planting a tree, or “to plant the right tree in the right place” (Hallé F., 2018, page 66), to have full grown

trees that can live for a long time and then provide those benefits that we are seeking for.

The second element regards the time, or

2) Trees need time;

Trees grow and their benefits grow and improve over time. The benefits of trees are often indirectly measurable, while numerous other infrastructures are considered “critical” and “indispensable” because they have more immediate effects. In reality, compared to any other urban infrastructure, the costs (even of those older and bigger trees) are enormously lower in terms of initial investments. What still ensures that there are no large allocations of public funds for planting, maintenance, and development of urban forestry is the inability to understand the value of trees. We are living in an era where we need to see, in a short time span, the results of our effort, the money we invest, the time we spend on specific actions. “(...) when it comes to trees, we need to refuse the tyranny of short term span, of urgency, and to accept to live at their (the trees) pacific pace. Leaving it to chance, in this field, to produce ineffective, sometimes ridiculous results. On the contrary, a city that plants young trees in its neighbourhoods, that provides the time for a tree to grow is a city that provides a positive image, and it manifests the trust of the community in its future (Halle, F., 2018, page 69).

This is linked to the third sphere of complexity, namely the fact that:

3) Trees are living beings;

Even if we find space for trees, and the funds necessary to ensure the planting and growth of trees, we still have to consider that there is a certain apprehension when it comes to trees. Trees can fall, their leaves can dirty and clog gutters and pipes, roots can lift pavements and obstruct pedestrians, areas around trees roots that are unpaved can become muddy, trees can block the visibility of commercial establishments. Trees can attract insects and animals, their pollen are potential allergens, and some species have leaves that can be poisonous. We are scared of sharing “our” space with other living species. So what can be done? In some cases, we can work through a careful selection of species; in others, we have to work on in-depth educational campaigns regarding the importance of trees in our cities and in particular on how many and what benefits an individual or a group of trees in different fields can bring to society. Finally, we need to show what happens in those places that have few trees, or none at all. Only through interconnections between the urban and the natural world will cities have the chance to survive.

## V. VI

# (Re)Nature-ing Resilient Cities

The future of Sustainability in urban areas in South East Asia

**Harini Nagendra**

Professor of Sustainability, Azim Premji University, Bangalore, India

Prof. Harini Nagendra is Director of Research Center at the Azim Premji University in Bengaluru, India, and leads the University's Center for Climate Change and Sustainability. She is a co-editor of *Global Environmental Change*. Over the past 25 years, Harini has been at the leading edge of research examining conservation in forests and cities of South Asia from the perspective of both landscape ecology and social justice. For her interdisciplinary research and practice, she has received many international awards. She is the author of *Nature in the City: Bengaluru in the Past, Present and Future*; and *Cities and Canopies: Trees of Indian Cities*.

Cities in the global South are in the thick of a creative phase of rapid expansion. By 2050, models predict that we could see 2.5 billion people added to the world's cities (UNDESA, 2019). Of these, 2.25 billion, i.e. 9 out of every ten people will come from the continents of Asia and Africa. The global south will dominate the urban transformation of the future. This is a time of creative ferment for cities, as well as an urgent call to deal with systemic challenges of pollution, hunger, inequity, and ill health. Over half of the area covered by cities in future decades is yet to be built – this offers tremendous opportunities for the design of built spaces to be more sustainable, equitable and healthy (Elmqvist et al., 2018). At the same time, physical built spaces cannot deliver their promised sustainability benefits without recognition of the fact that cities are coupled social-ecological systems, thus the built architecture and landscape design of any city must be in sync with its ecological and geographical setting, and its cultural and socio-economic context.

It is the lack of sufficient recognition of this basic and fundamental idea of the importance of 'Nature in the City' (Nagendra 2016), a 'nature' that is social, cultural and ecological, that has led to so many of the 'sick' cities we see around us – such as Mumbai, building new airports on the mangrove forests that provide one of the last buffers between itself and sea level rise (Sen and Nagendra 2019), or the increasing intensity of heat waves experienced by many European cities that is exacerbated by the lack of trees and green spaces in low income neighbourhoods.

Research has now demonstrated beyond doubt that urban ecosystems – ranging from large ecosystems such as lakes, grasslands, wetlands and urban forests, to pocket-sized ecosystems, including a collection of pots on an apartment balcony, a roadside tree and a tiny pond – provide numerous benefits for city residents. From cleaning polluted water and air, to providing shade, food, fodder and fish, habitats for birds, butter-

flies and urban wildlife, places for creative communing with nature and mental relief from stress, the importance of ecosystem services provided by urban green spaces and water bodies cannot be over-emphasized.

However, the public awareness of the critical importance of nature to the urban fabric remains limited, with much of this knowledge locked into academic journals. As a good indicator of awareness, most of the good books on cities – and there are many such books, from cities around the world – tend to ignore nature. Remarkable exceptions exist, such as Eric Sanderson’s remarkable ecological history of New York, *Mannahatta: A Natural History of New York City* – but by and large, seminal writings about cities, and what makes them tick, reduce nature to a footnote. The converse is also true, of course. Most excellent writing on ecology and nature continues to focus on the mythical idea of ‘wild places’ – those that are distant from the press of human crowds.

This lack of understanding of how nature and culture are closely intertwined, in a dialectic process, is perhaps the reason why Nature Based Solutions (NBS) for urban sustainability, while increasingly proposed in cities across the world today, have been critiqued for their use of ecological engineering-inspired approaches, a heavy focus on aesthetics and recreation, and their often-seen consequences of gentrification.

For instance, our own recent work in the hot and semi-arid Indian city of Hyderabad found that street vendors were displaced by city development projects such as the construction of the Metro. When street trees were cut down for Metro construction, they lost the ‘right to shade’ that enabled them to conduct outdoor sales during the day in relative comfort – now, many of them suffer from headaches and other challenges



A feeding area for urban pigeons in a mosque in Hyderabad. Photo Credit: Harini Nagendra

that emanate from the loss of access to public trees (Basu and Nagendra, 2020). However, urban design of street trees has rarely, or never, incorporated the nature-specific desires and needs of street vendors – an important cultural and economic component of all cities – into their design.

Foraging for wild plants is, similarly, a widespread but ignored aspect in cities across the world. In Syracuse, New York migrants rely on foraging in nearby vacant plots. In Berlin people harvest plants to use in cooking, tea preparation, medicine and pet food from parks. In Cape Town, low-income residents harvest over 250 species of plants, using them as firewood, medicine and food. But urban foraging is prohibited in most public spaces, implicitly or explicitly. When it is not formally prohibited, a focus on aesthetic and recreational importance of public spaces like parks and lakes shuts down their availability for other uses such as foraging, grazing or the collection of firewood (Shackleton et al., 2017).

Urban design has a major role to play here. How would public spaces look and function if they were explicitly designed not just to allow, but in fact to encourage use for foraging? What kinds of rules could be put in place to limit over-harvesting, and how could architects, planners and local resident associations encourage the process of ‘commoning’, where local residents from varied social, cultural and economic backgrounds can come together to share knowledge and cooperatively work on re-wilding public lands to enable foraging? Some inspiration can be drawn here from the increasing numbers of experiments with urban gardening, in abandoned lots, paving areas, rooftops and other unused city spaces. There are more than 800 community gardens in the city of Rosario, Argentina, which feed 40,000 people. This practice of community gardening was critical during the 2002 economic crisis, helping hungry families feed themselves. Detroit similarly has more than 1300 gardens, including a large number of community gardens and school gardens (Altieri and Nicholls, 2021).

These gardens have high spillover benefits for urban sustainability. They promote the persistence of bees and other pollinators, which are fast depleting in cities. Working in the soil helps children and adults acquire a deeper appreciation for nature, improves mental and physical health, and fosters social capital. Here, too, the possibilities for active landscape design are tremendous. Community gardens have largely grown organically, through the effort and vision of communities. But if urban design was to actively accommodate such spaces, their power could be extended substantially. For instance, small lots could be spatially networked into

a patchwork of plots that are at most at a few hundred meters distance from each other, enabling pollinators to move freely between plots. The overall yield of fruits and vegetables would be improved by such spatial design, at the same time strengthening ecosystem structure and function.

Another co-benefit could be utilised by encouraging rooftop community gardening, especially in tropical environments and cities that are prone to heat waves. This would help in cooling roofs and ameliorating microclimatic impacts, as well as supporting biodiversity and feeding the hungry – a win-win situation. The Indian city of Chennai is attempting to encourage urban horticulture via an emphasis on rooftop gardening by involving resident welfare associations and public schools that cater to low-income communities, as part of efforts to increase the city's resilience to climate change. The initiative is called “Growing Resilience Gardens: The 2030 Vision for Resilient Chennai”. Similarly, the city of Paris has experimented with the idea of setting up vegetable gardens in schools that simultaneously function as cooling islands, helping children to combat heat waves and schools to stay open in summer.

The precise location and placement of a community garden, a tree, a planter, a box drain, a wall with climbers and vines – affects the capacity of such mini-ecosystems to provide regulatory ecosystem services such as reduction of heat, absorption of air pollutants, or access to pollinators. Careful ecosystem and landscape design, coupled with a knowledge of societal requirements in varied local contexts, is essential for the successful maximisation of such co-benefit opportunities.

Such experiments in design need not only come about from municipalities, or landscape architects. Local communities can also work towards social-ecological design innovations that fit their contexts and needs. A community-restored lake in Bangalore provides excellent examples of such innovation. The Kaikondrahalli lake, a once-thriving local lake that was reduced to a drying pool of sewage in 2006, was restored through an innovative partnership between a local community trust, which maintains the lake, and the municipality, which restored the lake in 2007. The lake caters to a wide range of residents. An open area near the lake, which forms part of the land that legally belongs to the lake, becomes the playground for children who go to a low-income school at the side of the lake during weekdays and school times. During non-school times, the playground is used for community events such as watching nature films, or to host an annual lake festival. Grazing, an activity traditionally conducted in the lake for centuries, was banned after restoration

by the city municipality. However, recognising the continued needs of local grazers, the lake trust encourages them to take grass from the lake bed free of charge for their cows. This helps the lake as well, removing the excess grass that grows as a result of the sewage that continues to find its way into the lake despite the restoration, keeping the lake free of excess vegetation while promoting a culturally important local livelihood, and providing the nearby residents with organic milk from grass-fed cows (Nagendra H., 2016).

Such experiments must be collated to understand the facilitating conditions across the world that help to build a sense of community ownership, and to develop a better understanding of the role of design in the restoration of urban nature – as an idea that is central to urban resilience. Yet such ideas are largely ignored in practice, as seen in cities across the world. For instance many of the core financial areas of Mumbai, which represents the commercial and economic hub of India, are likely to be underwater by 2050. Yet rather than disaster-proofing the city, Mumbai is in the process of building a second airport, just 30 miles away from the first, on the coast – destroying protective mangrove floodplains and mudflats that provide a buffer against flooding. Wuhan in China, once called the city of lakes and rivers, now faces flooding due to the disappearance of hundreds of lakes because of urban growth. Hundreds of such examples can be narrated of cities from around the world, indicating a focus on short term economic growth at the expense of long term resilience. Urban planning needs to develop more appropriate frameworks that incorporate the capacity of Nature Based Solutions to improve urban re-



Even small trees provide shade to vegetable vendors and customers in hot Indian cities like Bangalore. Photo Credit: Harini Nagendra

silience to long term impacts of climate change, ranging from fast onset events such as floods and heat waves (which may demand interventions such as planting trees and uplifting buried streams and rivers), to slow onset events such as prolonged droughts and climate migration (which can be helped by interventions such as promoting community gardening and rewilding abandoned spaces that can be used for foraging, providing nutritional resilience for migrants).

Finally, although most of this chapter has discussed the role of urban design for nature-based urban resilience at a micro scale, we also need urban design at a city-level and regional scale. Increasingly, we know that human-engineered urban systems have regional impacts on reshaping climate. Urban heat islands create super-hot regions that change local rainfall patterns, increasing the intensity of storms and the likelihood of flooding. At the same time, for some regions like India, urban air pollution may also prevent or slow the nucleation of rain clouds, reducing rainfall.

Cities thus create their own local effects, contributing to global warming in ways that create classic “wicked” problems, terribly hard to predict or control. The forest fires in Australia in 2019, and California in 2020, are classic examples. Of course, some of these impacts are hard for cities to mitigate, as the likelihood and intensity of fires has increased due to global impacts of climate change. But at the same time many cities in Australia and the US (and elsewhere in the world) have been built in fire-prone areas, and expanded into the forests. This represents risk that could have better avoided by better urban design and planning. Such risks can still be mitigated by creating belts of waterbodies and less flammable vegetation around the cities. Similarly, while coastal cities face increased risks of flooding due to sea level rise, rather than dealing with these through protective walls alone, they should look at recreating mangroves and coastal wetlands in the locations where they were originally present, which could potentially provide far more cost-effective design solutions.

Fortunately, despite the fact that many national governments have begun to pull out of international climate change mitigation efforts and treaties, cities have taken on the challenge, and begun to lead the way to develop pathways for climate resilience. Prominent amongst these is ICLEI (Local Governments for Sustainability), a global network which includes more than 1,750 local and regional governments, many of them city municipalities, which seek to influence low-carbon transitions to sustainability that are nature-based, and address requirements of resilience to climate change as well

as needs of equity. Another important group is the C40 Cities Climate Leadership group, a collection of more than 100 cities from all parts of the world, including the Global South and North, that are experimenting with ways to kickstart the economy after the pandemic-impelled lockdowns in a way that is much more sustainable, for instance moving away from motorised traffic towards a design of cycle-friendly and pedestrian-friendly cities.

Design plays a major role in such initiatives as well. Carefully done, urban design can help create co-benefits by planting trees along sidewalks to provide shade and encourage walking in the heat. Restoring urban creeks, canals and storm water drains by taking out the concrete and planting local vegetation will enable walking and cycling can be done in the midst of nature, even in the middle of high rise buildings. International coalitions have a major role to play in inspiring such best practices, and enabling cross-learning from cities, not just in the usual North-North and North-South directions, but also in south-north directions to enable transfer of knowledge in multiple directions.

# Building with Nature: Towards an Alternative “Green Architecture”

**Xiangning Li**

Professor in History, Theory and Criticism, Deputy Dean, College of Architecture and Urban Planning, Tongji University

For his 2015 performance art project, “Project Dust,” Chinese folk artist Nut-Brother took a vacuum cleaner to many of Beijing’s public spaces and sucked up dust from the hazy skies. 100 days later, he molded this gray mass into a brick and placed it into the walls of a Beijing *hutong*. His project went viral, sparking renewed discussions about the damage wrecked by urban construction on the natural environment.

The ecological issues caused by rapid urbanization have inspired many works of contemporary Chinese architects and artists. In the late 1990s, artist Wang Nanming created a conceptual artwork titled “Sandstorm,” in which he set out a piece of linen with a layer of glue during a sandstorm to capture the particles in the air. When Lake Taihu experienced a massive cyanobacteria bloom in 2007, Wang soaked white silk and gauze in the lake, which slowly contaminated the cloth and turned it green. He called the piece “Water of Taihu”. For his 2009 project, “Drought Monotype,” he turned to the severe drought of Northern China that had dried and cracked the soil, using stone rubbing to preserve the effects of the drought on paper. These works manifested climate change and ecological devastation in tangible, visual ways. Presented as critical art with symbolic significance, they reflect the ecological crises that confront modern-day China.

In his series “Sitting on the Wall,” contemporary artist Wang Fen explores his understanding of the relationship between nature and buildings. In an analogy of the trapped human condition, the young girls at the center of the frame look toward a triumphant and thriving city, their backs turned on a nostalgic, bucolic nature setting. The series invites viewers to ponder the choice of a “absolute” future. In the series “Phantom Landscape,” artist Yang Yongliang creates what looks like a Chinese landscape painting, but closer inspection reveals a steel forest made up of manmade structures. These objects of the industrial era simulate verdant hills and clear waters, with the scenery created by those structures having already become the “nature” of our times.

Dr. Xiangning Li is full professor in architectural history, theory and criticism at Tongji University College of Architecture and Urban Planning, and he is also Dean there. He has published widely on contemporary architecture and urbanism in China and he was a visiting professor at Harvard, teaching a course on the same topic in 2016. He is the editor in chief of the *Architecture China*, and serves as editorial board member of many academic journals such as *Architecture Asia*, *The PLAN* and *Le Visiteur*. Prof. Li Xiangning was the curator of the Pavilion of China at the 16th International Architecture Exhibition La Biennale di Venezia, and the curator for 2015/2017 Shanghai Urban Space Art Season.

<sup>1</sup> In 2012, the Ministry of Finance and the Ministry of Housing and Urban-Rural Development (MOHURD) jointly issued the “Suggestions Regarding the Acceleration of Green Building Development in China,” which laid out their policy of varying financial support based on green building grades. A two-star green building could receive a financial reward of 45 yuan per square meter of building area; a three-star green building could receive 80 yuan per square meter of building area; and a green ecological city could receive

a flat-rate subsidy of 50 million yuan. In 2015, MOHURD issued and implemented a newer version of the Green Standard that evaluated building projects based on six indicators: land saving and outdoor environment, energy conservation and use, water conservation and use, material conservation and use, quality of indoor environment, as well as operation and management. Green buildings are ultimately certified with three, two, or one stars (from highest to lowest).

2 According to the National New Urbanization Plan (2014-2020) passed in 2014, green buildings in cities and towns must account for 50% of all new buildings by 2020, an increase from the 2% set in 2012. In May 2017, MOHURD issued the 13th Five-Year Plan for the Development of the Construction Industry, which required that all new civil architecture in cities and towns meets energy conservation standards; that green buildings account for 50% of all new buildings in towns and cities; that the new construction area of fully renovated and furnished homes accounts for 30%; that green materials account for 40% of the building materials; and that prefab building area accounts for 15% of new building areas. All of these standards must be met by 2020.

3 Take LEED certification, for instance. After the Agenda 21 office building in Beijing received China's first LEED certification in 2005, LEED certification has continued its long-term and rapid growth across China. Between 2005 and 2016, China had a compound annual growth rate of 77% of LEED-certified area. More than 48 million square meters across 54 cities became LEED-certified by August 2017. Since 2010, China has remained the largest LEED market outside of the US, accounting for 9% of the global LEED market and 32% of the international market (excluding the US). (These figures do not include LEED-certified interior design and construction.) See Joseph Crea's "2017 China

This disquiet and the self-criticism arising from the contradictions between buildings and nature represent a kind of consensus among mainstream society.

### *Green Architecture: Policy Directions and Economic Considerations*

The Chinese government has already unveiled a series of public building policies addressing environmental issues, as well as aiming to minimize the negative impact of urban construction on natural and ecological environments as much as possible. Of that, the most directional policy was the issuance and implementation of the Green Building Evaluation Standard (or the Green Standard). As China's first national standard for green buildings, this evaluation system was first proposed in 2006 before undergoing two rounds of revisions in 2014 and 2019. It currently acts as the fundamental technical index that regulates and guides China's green building development. The policy offers a carrot and stick approach. For the carrot, it uses financial support to differentiate between building grades: the higher the grade, the greater the subsidies.<sup>1</sup> For the stick, it mandates a higher proportion of green buildings among new and existing buildings.<sup>2</sup>

Compared to the Green Standard, international green certification still enjoys a considerable market share in China,<sup>3</sup> although this demand arises more often than not from economic calculations. To many building developers, international certifications like LEED and WELL signify a higher level of technical recognition, and promise higher profits. Outside of China, LEED-certified developers or proprietors often receive tax credits, collect premium rent, and boast an eco-friendly image. While China has no such regulations, countless real estate developers still jostle every year for LEED certification, sparing no expenses.<sup>4</sup> One study found that the rent for LEED-certified Grade A offices in China's first-tier cities (Beijing, Shanghai, Guangzhou, Shenzhen, and Chengdu) run 10% to 30% higher than the average rent. Those offices are also better positioned to weather a downward commercial real estate market.<sup>5</sup>

Low carbon and going green will no doubt become mainstream in the future, but an ideological divide still exists between proponents of green building and the architects overseeing building designs. On one hand, the former group often strives to make technical standards a deciding factor in certification systems, but these demands force architects to compromise the freedom they have with the architectural form. On the other hand, as far as investment and profit goes, the majority of green buildings

are still high-investment, long-ROI projects, in spite of financial incentives from the government through the Green Standard.

### *Green Certification: Benefits and Drawbacks*

In their preliminary stage, green buildings often require more incremental costs than ordinary buildings, a one-time investment that gets recompensed through future savings on energy costs. But China's public ownership of land means that the government grants the right to use the land for a specified duration while having the final say on land ownership. Should the land come under demolition, planning changes, or any other major economic or social impact, then that can revise or change the building's usage and even ownership. As a result, that period between the initial investment and the expected long-term profits is rife with uncertainty – or, rather, it weakens and even disrupts the relationship between those two.

In 2010, Frank Gehry criticized the unlikelihood of paying off the necessary incremental costs of green buildings in one's lifetime, which is especially true in a country like China where demolitions are a frequent occurrence.<sup>6</sup> Consequently, some property developers tend to focus more on LEED and other green certification as a way of improving their brand, instead of the energy cost savings that comes from green construction. That way, they can follow up their initial investment with a greater economic premium within a shorter amount of time. As Gehry said, to become LEED-certified is like wearing an American flag pin. Does that then relegate green buildings to nothing more than added weight in property developers' sole pursuit of profits?

Moreover, current assessment standards for green buildings vary across the world, such as the Green Standard in China, LEED in the US, BREEAM in the UK, and DGNB in Germany. When Chinese building projects apply for international certification, they often run into technical and environmental incompatibility; at worst, it can lead to underperforming energy savings. For instance, Europe sets its indoor heating temperature at 21°C -24°C, which uses 15% more energy than Beijing's setting of 18°C. Many regions in northern China also rely on the waste heat from coal-fired power generation, but drawing from a district heating network can offer a way to improve efficiency.

Moreover, the energy consumption of Chinese residential and public buildings falls far short of the standard of developed countries. China's average hot water consumption is only one-fifth of the US' and a quarter of Japan's. However, China is still at one of the processing ends when it comes to the international division of labor within the new energy industry. Because

Green Building Report: From Green to Health" [J/OL]. CBRE. <https://www.usgbc.org/articles/report-reveals-leed-china-accelerating>. 2017-11-11.

4 According to the data provided by a construction consulting firm, a Beijing project applying for LEED-NC (New Construction) certification had to pay the following fees: Upwards of 400,000-600,000 yuan in consulting fees to the consulting firm for reviews of the design proposal and the construction plan; upwards of US\$15,000-45,000 in LEED certification fees; US\$0.04-0.045 per square foot for design review fees; and US\$0.01-0.015 per square foot for construction review fees. See "LEED Certification: An Exorbitant, Eco-friendly Gimmick – The Pursuit of Profits behind China's Green Buildings" [J/OL]. Discovery in Feature. No 25. <http://discover.news.163.com/special/whybuildgreen/>. 2010.

5 See Joseph Creas's "2017 China Green Building Report: From Green to Health" [J/OL]. CBRE. <https://www.usgbc.org/articles/report-reveals-leed-china-accelerating>. 2017-11-11.

6 See Frank Gehry's "On LEED Architecture" [J/OL]. Bloomberg Businessweek. [https://www.bloomberg.com/businessweek/innovate/next/archives/2010/04/gehrys\\_take\\_two\\_on\\_leed\\_architecture.html](https://www.bloomberg.com/businessweek/innovate/next/archives/2010/04/gehrys_take_two_on_leed_architecture.html). 2010-04.

7 “LEED Certification: An Exorbitant, Eco-friendly Gimmick – The Pursuit of Profits behind China’s Green Buildings” [J/OL]. Discovery in Feature No. 25. <http://discover.news.163.com/special/whybuildgreen/>. 2010.

8 Green Property Index by Green Ranking Research Group. “2018 China’s Green Property Index Report” [J/OL]. Xinhuanet, [http://www.xinhuanet.com/globe/2018-07/04/c\\_137300883.htm](http://www.xinhuanet.com/globe/2018-07/04/c_137300883.htm). 2018-07-04.

9 “Carbon neutrality” refers to a balance between emitting carbon dioxide and removing (usually by offsetting carbon) or completely eliminating carbon emissions (a post-carbon economy) in order to achieve net zero emissions and no carbon footprint.

of that, their production of construction materials and logistics continue to emit carbon dioxide and other pollutants, yet the energy and pollution necessitated by that production is excluded from the full life-cycle of a building’s energy conservation and environmental protection. Likewise, in determining the carbon footprint, LEED certification generally fails to account for the energy consumption of transporting building materials in China.<sup>7</sup>

### *Building with Nature: The Other Value Dimension of Green Buildings*

The emergence of technical considerations added to buildings, like green certification, and a renewed awareness of the value relationship between nature and architecture has led to another kind of consensus in China: An ecological strategy and value orientation that strives for lower technological requirements and construction costs. Since ancient times, the traditional Chinese understanding of energy has only been recognized through the murky terms of *Fengshui*, which decides the direction of a building, natural ventilation and more. Looking back, those rules proved helpful in reducing the spread of germs and creating a healthier home environment.

Then there are architectural types that engage with nature, like the *Yaodong* (“cave dwellings”) common to the Loess Plateau in northern China. Although people at the time had no way to accurately measure their energy consumption, they created their own microclimate through their *Yaodong*, which kept cool in the summer and warm in the winter. Such structures are highly consistent with the sustainability ideas we espouse today and offer an example for passive buildings.

During the 4th China Architecture Media Awards in 2015, Wang Shu raised the idea of “building with nature,” which the *Building with Nature: Architecture China Award* pushed further in 2019. It encourages China’s contemporary architects to reconsider and establish a relationship with nature, using that approach to reflect on the malpractices resulting from China’s rapid urbanization over the last two to three decades. “Nature” in this context does not refer to a precise, quantitative analysis of energy consumption. Instead, it’s a philosophical respect for the inevitable guidelines of a fact-based logic, which thus serve as an ethic of construction.

Consequently, the idea of “building with nature” as a rational method of construction strongly questions and criticizes socialized mass production under any kind of state system. Given the popularity of green certification, we may have a way forward if we can integrate traditional knowledge with the advanced technology and ideas of modern society, creating a value system for design that transcends cities, buildings, and landscapes. Perhaps that can

herald new explorations of energy-efficient, sustainable architecture with the natural environment and manmade architecture jointly creating a future of positive interactions.

### *Conclusion*

In June 2015, China submitted its Intended Nationally Determined Contribution (INDC) to the United Nations, pledging to reach peak carbon emissions around 2030 and strive to peak as early as possible.<sup>8</sup> This move offers two indications: First, that China is still going through a period of increasing carbon emissions; second, that China will redouble its efforts at launching a series of policies and regulations in the next decade, pushing for ecological conservation and sustainable development at a national level. During the general debate at the 75th session of the UN General Assembly on September 22, 2020, Chinese President Xi Jinping announced the country's intention to become carbon neutral by 2060.<sup>9</sup> The largest energy producer and consumer in the world, China has an annual carbon emission total of 16 billion tons, of which fossil fuels currently make up an estimated 85% of its primary energy mix. Its ambitions for carbon neutrality opens the door to momentous opportunities and challenges, but it also serves as a significant variable in the fight against climate change and a global focal point.

To realize the objectives bookended by 2030 and 2060, China's future urban construction needs to focus on two issues: Launching and implementing relevant policies and regulations, and putting both construction technologies and emission control technologies into practice. The way China can smoothly transition from its period of increasing carbon emissions to a phased reduction, and actively integrate with global progress for energy conservation and emission reduction carries major implications for sustainable development across the world. We expect that contemporary Chinese architects will be able to find solutions that can sustain both our world and our future.

## Nanjing Vertical Forest

Nanjing, Jiangsu, China / 2016 - 2021

Stefano Boeri Architetti China

The Nanjing Vertical Forest intervention is the first of its kind by Stefano Boeri Architetti in Asia and is located in the Nanjing Pukou District, an area selected to lead the Southern Jiangsu modernization process and the development of the Yangtze River area. The project focuses on the issues of desealing and Urban Forestry, in search of innovative solutions to reduce the critical level of pollution which is affecting the lives of millions of people in China, as in other parts of the world. The two towers are characterized by the alternation of balconies and plant containers modeled on Milan's Vertical Forest, and the façades are home to 600 large trees, 200 medium-sized trees and over 2,500 shrubs and trailing plants which will cover an area of 4,500 square metres. The project has been designed as a vertical forest that through the planting of 27 tree native species will help to regenerate local biodiversity, stock CO<sub>2</sub> and absorb dangerous pollutants. The first tower, 200 metres high, is used for offices from the eighth to the thirty-fifth floor and includes a museum, a green architecture school, and a private rooftop club. The second tower, 108 metres of height, features a hotel managed by the Hyatt chain, with several recreational and educational functions, including multi-brand shops, restaurants, conference halls, a food market and some exhibition spaces. Particular attention was paid to pedestrian access on the ground floor, in direct connection with the urban space and the garden areas on the fifth floor, overlooked by the hotel and the green architecture school.

As with Milan's Vertical Forest, the Chinese intervention represents another example of a symbiotic relationship between architecture and nature through the use of vegetation on its façades, in the hope that architecture itself can function as a connection mechanism between the two and act as a rethinking process for the built environment. In a city unfortunately notable for high pollution and fine particulate matter, the concept of Urban Forestry applied to buildings appears as the one of the solutions at hand to create a sustainable and future oriented city.



*Nanjing Vertical Forest*, Nanjing, China. Stefano Boeri Architetti, 2021. Photo Credit: Rawvision studio





*A view of the tree nursery of Nanjing Vertical Forest, Nanjing, China. Stefano Boeri Architetti China, 2021. Photo Credit: Rawvision studio*

## Easyhome Huanggang Vertical Forest

Huanggang, Hubei province, China / 2017 – 2021

Stefano Boeri Architetti China

Located in the city of Huanggang in Hubei province, the Easyhome Huanggang Vertical Forest City Complex covers an area of 4.5 hectares, and has been designed to create a new green complex capable of integrating buildings for residences, hotels and large commercial spaces. The complex, intended to create a completely innovative green space for the city, meets the daily needs of a number of different individuals, including residents and temporary guests, inhabitants and tourists.

The project comprises five towers, two of which are residential and designed as vertical forests, thus densifying the green surfaces and augmenting the expansion of the city's biodiversity. The floors have cantilevered elements that interrupt the regularity of the building and create a continuous ever-changing movement, accentuated by the presence of trees and shrubs selected from local species. The combination of open and closed balconies provides the best solution for adapting to the life experiences of different groups of inhabitants by generating a transition space between nature and the human living environment.

The intervention, thus designed, allows an excellent view of the tree-lined façades, enhancing the sensorial experience of the greenery and integrating the plant landscape with the architectural dimension. The irregular arrangement of the balconies allows the plants to develop freely in height and the foliage to fit perfectly into the façade design. Thus, the inhabitants of the residential towers have the opportunity to experience the urban space from a different perspective while fully enjoying the comfort of being surrounded by nature.

The project manages to combine the needs of the internal market with traditional residences, as well as to provide advanced technologies and radically change the urban landscape and people's expectations for a future life in sustainable cities.



A view of the tree nursery of *Nanjing Vertical Forest*, Nanjing, China. Stefano Boeri Architetti China, 2021.  
Photo Credit: Rawvision studio



The trees ready to be located in *Easyhome Huanggang Vertical Forest*, Huanggang, China. Stefano Boeri Architetti China, 2021. Photo Credit: Rawvision studio



# The Politics of Parks: Green space and social Inequality in New York City

Parks in New York City promote public health and well-being. Do they also promote gentrification and inequality?

**A dialogue with former New York City Parks Commissioner Mitchell Silver and Stefano Boeri**

Mitchell J. Silver is former Commissioner of the New York City Department of Parks and Recreation in 2014. Silver is also the immediate past president of the American Planning Association. He is an award-winning planner with more than 30 years of experience and he is internationally recognized for his leadership in the planning profession. As former Parks Commissioner, Mitchell Silver has overseen management, planning and operations of nearly 30,000 acres of parkland, which includes parks, playgrounds, beaches, marinas, recreation centers, wilderness areas and other assets.

New York City needs green space. To promote the health and well-being of a growing population — and meet the problems of pollution and climate change head on — America’s largest city has invested heavily in expanding and improving its public parks system. But green space can also present problems of social inequality. Many worry that new parks, playgrounds, and community gardens will spur gentrification, making neighborhoods unaffordable for low-income communities of colour. And high-profile green spaces can become tourist destinations that feel inaccessible to longtime residents.

Since he took office in 2014, former Parks Commissioner Mitchell Silver has been balancing these concerns. A New York City native, Silver has been an urban planner for over 30 years. Today, through a series of new initiatives, he is attempting to rehabilitate parks in the city’s socially disadvantaged neighborhoods, expand the tree canopy into underused areas, and make green spaces more welcoming to the communities they serve. For Lampion (the dialogue is published in Lampion Magazine, n.22), Silver agreed to sit down with architect Stefano Boeri, guest editor of the issue, and discuss the present and future of urban parks and forestry — in New York City and across the globe.

On a drab February afternoon, they met at Silver’s offices in the Arsenal, a turreted brick building on the southeast side of Central Park. Outside the window, the foggy city skyline was visible. Spanning one wall was a pencil-drawn schematic of the park. Rumor has it, Silver told Boeri, that the conference room they sat in had been the office of Robert Moses, New York City’s fabled “master builder” and the parks commission for 26 years during the mid-20th century. Their conversation, condensed and edited here for clarity, imagines new modes for urban forestry that can address climate change and other pressing social demands of the 21st-century city.

*Michael Friedrich* I'd like to start with a bit of background on each of your contributions to parks, gardens, and urban forestry. Commissioner Silver, you took office in 2014.

*Mitchell Silver* First and foremost, over the almost six years, we've been able to complete over 700 capital projects. I believe that's probably the most for several commissioners going back to Robert Moses. We're fortunate to have a large capital budget, and we build as many capital projects as possible. That's everything from playgrounds to park restorations to adding to our urban canopy. Specifically, we've addressed this parks equity proposal. We've transformed 47 of 67 parks we plan to do. We have this new Parks Without Borders proposal that's really opening up parks and making them more accessible to the public. We have our Anchor Parks initiative, making old parks new again. And we've been focusing on our tree canopy. We completed the million trees campaign two years ahead of schedule. And now we're planting well over 20,000 trees a year, both our street trees and trees within parks. We're pushing forward a better approach to making our cities more resilient. From Rockaway to Coney Island to East River Park, we're planning on having a very different park system in the future to address climate change, but also the sea level rise.



John Spyrou, *Upstate New York and Long Island*, 2019

Of that 700, there are a lot of great stories, and I can go into greater detail, but those are some things I'm most proud of.

*mf* Mr. Boeri, you're known in part as a champion of urban forestry and expanding the tree canopy in urban environments — and especially for pioneering Milan's Vertical Forest, which is a method of high-density forestry on a high-rise.

*Stefano Boeri* You are precise in defining vertical Urban Forestry policies as a way to densify plants and trees in very small surface ground. What we have done in Milan is to plant 21,000 plants in 2,000 square meters. It's such a small urban surface in the center of a city with a polluted environment. That explains the advantages of such an approach. If you introduce, as a "graft," this kind of super-dense ecosystem, which has 800 trees from six to nine meters, 4,500 shrubs, basically 15,000 plants and more than 100 different species, it means you have a certain spectrum of advantages, like the capacity to absorb the dust of carbon pollution, absorb CO<sub>2</sub>, and produce oxygen. At the same time, in terms of biodiversity, after six years we have more than 20 different species of birds that are nesting on the skyscraper. The reduction of energy consumption for cooling in the summertime is another advantage. I don't believe vertical forestation is the main or the most important of several tools we have to develop urban forestation, but it's one of them.

*mf* We're ideally situated here, surrounded by skyscrapers, to think about a vertical forest. Is that a realistic vision of forestry for New York City?

*sb* If we're talking about the opportunity to multiply the number of trees in a hyper-dense urban environment like Manhattan, why not? We are seriously working on that, and we are also doing our best to make these buildings affordable for everybody. This prototype in Milan was quite expensive in terms of construction costs, in terms of maintenance costs. But now we are in a condition to do the same with another kind of format entirely. In terms of equity, these kinds of buildings are, nowadays, one of the possible instruments we have to deal with climate change and global warming.

*ms* In New York, we're always open to ideas. Certainly, we want to make sure we execute our horizontal forest, and that is a huge priority for the city.

But we're also a city that believes in market forces, and if there is a private sector developer that wants to initiate a vertical building that has those green elements, and if the economics work, there's no zoning that prohibits that from happening. Now, we have to look at different climates. You have Singapore, where things grow robustly all year long. New York City's climate is a bit different. Right now, we're pushing heavily for green roofs, wherever possible. We understand the value. I'm intrigued by the idea, which is why I'm impressed by Mr. Boeri and the work that he's doing. I can't say it's something that's a vision for New York, but as we become more dense and climate change becomes more real, it's something that's going to be discussed.

*mf* You've talked about a range of benefits that public parks and tree canopy confer on an urban environment. In particular, you've mentioned reducing particle pollution, increasing habitat, and producing microclimates.

*ms* I'll add they benefit physical and mental well-being. We're finding, in study after study, just being in green space reduces stress, reduces anxiety, in some cases even reduces crime. In my opinion, we cannot have a livable city without quality parks and a public space system. You just can't have it. That is why we're pushing green space out into the public ground – streets, plazas, sidewalks – because everyone benefits by having shade, cooling buildings, air quality, water quality, absorbing carbon dioxide, and pushing more oxygen out there, having the biodiversity of all the species that enjoy our plant life. As you look at the research, the way to address climate change is to plant more trees and improve green space. If I can create more green space in New York City, and I have that mandate, I will do it – horizontal, vertical, and all ways.

*mf* You mentioned that studies have found that green space in some cases can reduce crime.

*ms* Improving neglected parks and public space shows the community that local government cares. When you respect the community with quality design, the community respects you back. Based on our inspection records, we are not experiencing vandalism in the newly transformed parks and playgrounds. Parks account for one percent of all crimes in New York City. Activating parks with programs tends to attract more users, which has also been shown to reduce crime. Good uses tend to

displace bad uses. Meanwhile, Parks Without Borders follows the Crime Prevention through Environment Design strategies. Removing or lowering fences and clearing visual obstructions make parks safer. Sightlines are improved, which gives the public a sense of security and reduces the locations where people can hide or commit crime. We are also working with more community groups to partner as stewards of the park. This allows more caring neighbors to reclaim public space as well as become the eyes and ears of parks and playgrounds.

*sb* What Commissioner Silver has done is an important example. In Milan, we are launching a campaign to plant three million trees in the next 10 years, with the same goals.

*mf* I want to turn to some of the social effects, since you brought that up. There can be a lot of disparity in New York and other U.S. cities. Parks in high-income neighborhoods often receive disproportionate funding and attention while parks in disadvantaged neighborhoods go neglected.

*ms* You have to recognize that it's been a problem in the past. We had the luxury of using a data-driven approach. We did this analysis to take a look 20 years back to find out whether we have invested equitably throughout our city. Every city has a capital improvement plan. You're taking these large dollar amounts, and then you come up with a plan. We looked at that to find out: Were we distributing those dollars equitably? And the answer was no. What do you do next? In our case, the answer was that there were at least 200 parks that were not being invested in. If you want to achieve parks equity, you have to take a hard look at where your dollars are going. But beyond that, it's also maintenance. You want to make sure that you have staff that's actually caring for parks in an equitable manner. When I got here, we identified our hot spots — sporting events, picnic areas — and decided to change our entire weekly schedule to send staff out to parks, so they could be cleaned and maintained seven days a week as opposed to five days a week. A lot of this is taking a fresh look.

*mf* Mr. Boeri, what is your approach to maintaining equity in your practice for Urban Forestry in Milan?

*sb* We are now involved in many campaigns for urban forestation in Milan. We have been involved in China in cities like Liuzhou, like Nanjing,

where we are part of this campaign to create the orbital forest all around the city. We are working in completely other climate conditions like Cairo, Egypt, where we have proposed a campaign for the multiplication of the environment in the central city, in other parts of Europe, and in Cancun, Mexico. Every time we start, we are considering the necessity of support for equity. The effect of heating in the urban environment is one of the most evident results of global warming. That the tree canopy can directly reduce heating is part of the purpose in urban environments. It is a mistake to imagine that these improvements to the environment can reach only a part of the city.

*mf* There are certain models of 21st century parks, and I'm thinking of some of the ones that are built on disused infrastructures — those like Domino Park, the High Line, Brooklyn Bridge Park — that can be socially useful to some communities but appear to be alienating to others. I'm thinking particularly of research out of the City University of New York that showed the High Line's users are “overwhelmingly white.”

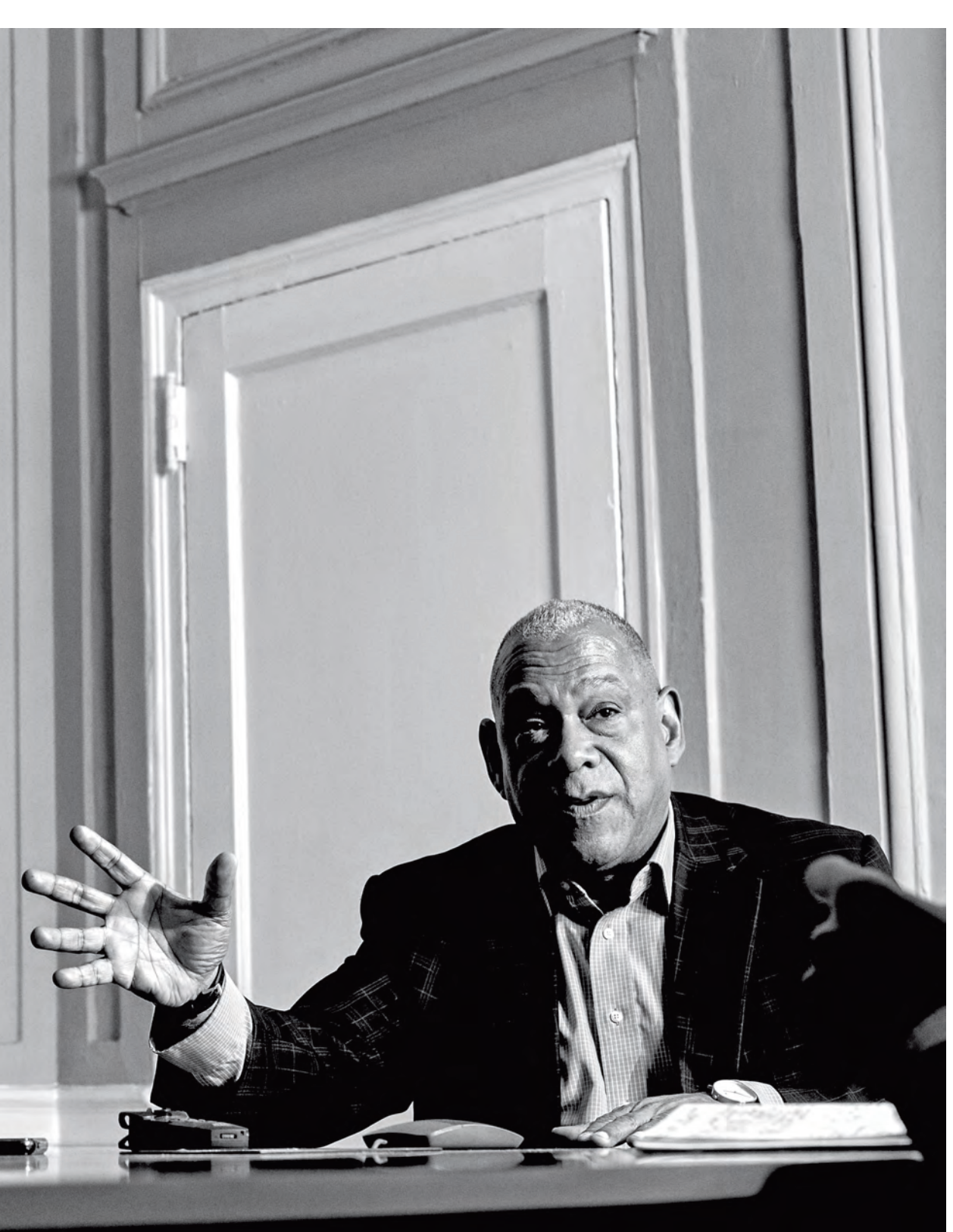
*sb* You mean gentrification.

*mf* Yes, but even before we talk about gentrification, I mean in terms of how a park is used and who's using it. I'm curious what kind of programming, activities, and design are necessary to make sure parks are useful and inviting to everyone.

*ms* Let's take the High Line. The High Line is a linear park. It's not one to go to for sporting events, or for picnicking — although you can eat there. It is basically a traveling 3-D garden that you can experience on an elevated walkway. By that virtue, that park is going to attract certain users. So, from our perspective, programming is important. I applaud the High Line, and others, for example, like Brooklyn Bridge Park, because there the basketball courts are very controversial, but they want to make sure the piers provide a variety of experiences for all users. The High Line now has a lot of cultural programming, from art to food to music to dance. They work well with the community to find out the programming elements that will appeal to everyone who lives nearby. I think they took a lot of heat initially for how that park was designed. I have to say, I serve on that board, and they do a great job with the programming. The “Brick House,” from Simone Leigh, is one of my favorite sculptures



John Spyrou for Lampion Magazine, *The Commitment issue*, November 2020  
A dialogue between Mitchell Silver and Stefano Boeri.



in New York City, designed by an African American artist. It's getting acclaim everywhere and is a destination for people to photograph, have events near it. That's their way of really changing their focus in the future by providing those offerings that appeal to a wider audience. And the High Line is just one example. You're seeing that from park to park.

*mf* Mr. Boeri, you brought up the specter of gentrification. Some of these high-profile green projects end up attracting a lot of real estate money and driving up property values nearby, displacing longtime residents. For example, a report from the New York Economic Development Corporation has shown that the High Line has done that in Chelsea and the Meatpacking District. I read, as well, that the Vertical Forest has presented challenges to affordability for tenants because of maintenance and structural issues. How do you keep housing affordable while expanding green space?

*sb* We are in construction in Holland for a social housing Vertical Forest. That's something that we are very proud of. We are also replicating this kind of model in different parts of the world — in China, for instance. I think it's possible to raise these kinds of green buildings while making them totally affordable for everyone. That's one part of the answer. The other part of the answer goes back to what we were saying about the necessity to have a public vision and public direction on this kind of process. I think it is necessary to fix a certain percentage of such development as social housing, as has been done around the High Line in New York or the central public park in Milan, where we have built the Vertical Forest. That's a political issue. It's not only something that comes from the private market. It has to be policy.

*ms* From our perspective, the High Line is an exception rather than the rule. We have 2,000 parks in New York City, and most that we improve do not lead to gentrification. But that fear is there. I have found that there are some examples where improving a green space — like the downtown waterfront — can lead to redevelopment and gentrification, but with most parks that is not the case. This comes up when I've gone to community meetings. We're saying, Okay, we have two choices. If we do something, it's called gentrification. If we do nothing, we're told we're neglecting the space. I'm looking at a space that has not been invested in well over a quarter of a century. We'd rather improve it and not deny



John Spyrou, *Upstate New York and Long Island*, 2019

another generation of children and families and seniors a quality space. There are other issues the city is dealing with to provide more affordable housing and tenants' rights. We try to separate that and not hold public spaces hostage when improving them for the community. This comes up often and so we now have the numbers to say: please show us where improving this two-acre neighborhood park has led to gentrification. It's more myth than reality.

*mf* One example: In Hunters Point, Queens, I know there's been concern about the waterfront park and I remember as it was being developed, there were community groups that were actively trying to resist it. It was also around then that I started to hear about the "just green enough" movement — the idea is that you build green but not too green or too high-designed in a way that would attract fancy real estate.

*ms* I still believe you want to have the maximum amount of open space possible. We're a city of 8.6 million people. We have 30,000 acres of parkland. Having that absolutely beautiful public gem and giving the best land to the public creates value, but also livability for those that live there. The beauty of the Hunters Point South plan was that a lot of affordable housing was built into the project. You have this nice mix of market rate and affordable housing, and both have access to this world-class public park facing the East River and the view of the East Side of Manhattan. I think all people deserve that view. I don't really support "just green enough." I want to maximize green space and preserve that for both present and future generations.

*mf* Building new public parks and maintaining the existing ones can require not just public tax money but also private investment. Often that comes in the form of public-private partnerships in New York. Meanwhile, Mr. Boeri, the projects you're building require private real estate development. What are the benefits and drawbacks of relying on private funding for these ecologically and socially useful projects?

*ms* There are many experiments all over the world to find the right balance between the necessity of the public to remain the owner of public parks and the necessity of involving private funds to contribute to their maintenance. Today, public-private partnerships are a great option to build a park. I don't think there's any downside. With Brooklyn Bridge Park,

for example, it was a master plan. It was all city-owned land. In order to make the deal work, a portion of it was set aside for development. Another portion was set aside for the park. The lease or sale of development was used long-term to both build and maintain the park. That model worked. One of the untapped resources I see is that 40 percent of New York City is in the public realm. There's 14 percent parks, 26 percent streets and sidewalks, and we keep losing sight of this 26 percent of the public realm we own. Streets and sidewalks to me are a great opportunity to provide more greening, more shade for the public. I certainly support public public-private partnerships — Domino Park is an example, Hudson River Park, Governor's Island — but there are also other ways to build great parks.

*mf* You said there's no downside to involving private funds to contribute to park building and maintenance. But some commentators have noted that private donors and developers tend to invest money in urban parks in areas that are already thriving, contributing to unequal distribution of resources for green space — more for Bryant Park and the High Line, say, and less for Van Cortlandt Park and McDonald Park.

*ms* I was referring to public-private partnerships in the creation of new parks like Brooklyn Bridge, High Line, Domino, et cetera. There is no downside because these parks are open to all and through programming support our equity and diversity values. In addition, we welcome improvements to all of our parks from private and public funds. Our goal is to create an equitable parks system. Funding for maintenance and operations is equitably resourced. The New York City Parks budget has increased from \$320 to \$580 million from fiscal year 2014 to 2020 to improve the parks system and ensure all New Yorkers have access to safe and clean parks. We also completed over 700 capital projects in six years to improve the overall parks system. Moreover, \$318 million was the Community Parks Initiative and \$150 million of Anchor Parks.

*sb* I think without the private contribution it would be impossible to develop and realize such big campaigns. What we are doing in Milan is to gather private funds and try different formats, sometimes as a sponsor, other times it's simply receiving money to invest in green environments. But the other part of this partnership is that we need public direction. We need the municipality to run the entire process of forestation. We

need the vision. Without a vision, all this fragmented contribution will remain isolated.

*mf* What's the ideal way to make parks happen? What are the success stories that are energizing you and pointing to the future of park planning?

*sb* I think we need to imagine the future where we can realize structures that are high-rise, timber and wood, green, and total affordable — those four characteristics together. High-rise because we cannot avoid having density in the future of our cities. The use of timber and wood is something that will become more important in the future in order to cut CO<sub>2</sub>. Green to make buildings more sustainable. And affordable. We have to invest all our energy into this kind of project. It doesn't matter if it's in South America or in North China. We know how to build these typologies in relation to specific climate conditions. We are now designing a new district in Albania after the Earthquake in Tirana, with 15 new high-rises in wood for a Vertical Forest in social housing. That's just to give you one example. But we are also in construction in France and Holland with social housing Vertical Forests. If we use prefabrication the right way, we know how to cut the cost of maintenance.

*ms* What I see as exciting is in categories I'm going to call “underperforming asphalt” and “concrete.” One example is Discovery Green — two dead parking lots in downtown Houston that they requisitioned and asphalted and made into one of the most amazing public spaces that has transformed the district around it. Also in Houston is the Bayou. I love the fact of taking infrastructure and having parks and public space serve two purposes. We want to make sure that resiliency projects also provide a public benefit. The underperforming asphalt one I'm intrigued about here in New York City is right by Madison Square. Janette Sadik-Kahn saw this underperforming asphalt and just had lines painted, put out some benches and flower pots, and now it has become an incredible public space right next to Eataly. The great thing about it is we own it. We don't have to acquire it. To me, across the world, this is one of the greatest opportunities — land that is already publicly owned. We've given far too much to cars, and not enough to people. We just have to think differently, be innovative, and reprogram it to make it more green. That's leading to the transformation here in New York City and other places around the world.

# On Ecosystem Services, Accessible Cities, and Environmental Justice

A new approach for Inclusiveness in Urban planning

A dialogue between Stefano Boeri and Cecil Konijnendijk

*Simone Marchetti*

Ecosystem Services and Landscape Planning. This is a fantastic opportunity for bringing architecture, landscape architecture and design together with ecology, social ecological approaches and biodiversity if we can start merging these fields a little bit better. I think we would be present at a real change in how we conceive and plan our cities. How can we integrate these fields into different urban settlements (high or low density) and what is the role of the Ecosystem Services?

*Cecil Konijnendijk*

During my career I've been working at the interface between urban forestry, ecology and urban planning, but also considering environmental psychology and in general, socio-cultural aspects. I've always tried to bridge between those aspects. The concept of Ecosystem Services is really useful in the sense that it helped to give us a way of packaging the benefits of Nature in the city. We have always talked about the benefit of Nature but it was always rather a fluffy concept and it often came very late in planning or in decision making. So with the Ecosystem Service concept the topic has actually been raised on the political agenda and on the planning agenda, because people could relate to that idea of the services that nature provides to cities, for example. I think it was a really important paradigm shift to start talking about it. When people like Rudolf De Groot<sup>1</sup> and Robert Costanza<sup>2</sup> started talking about that, about valuing ecosystem services there was a lot of resistance but I think also a lot of people realised this was actually a very good idea.

*Stefano Boeri*

We are in a post-pandemic condition right now in Europe, and as architects and urban planners we are considering decentralizing urban

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He has studied, taught and consulted on the subject of Urban Forestry and the relationships between people and nature, all over the world. He is also a great writer and Honorary Editor of Urban Forestry & Urban Greenings, and editor since its founding in 2002. His research has strong emphasis on governance and policy aspects of urban forestry; he is now serving as Program Director of the Master of Urban Forestry Leadership.

*Dialogue moderated by Simone Marchetti, June 2020*

<sup>1</sup> Rudolf De Groot is Associate Professor in Integrated Ecosystem Assessment & Management with the Environmental Systems Analysis Group of Wageningen University, the Netherlands. He is a Landscape Ecologist by training and has worked for more than 35 years on the use of ecosystem services as a tool for sustainable environmental planning, management and decision making.

2 Robert Costanza is an American/Australian ecological economist, Professor and Vice-Chancellor's Chair in Public Policy at the Australian National University. Professor Costanza's transdisciplinary research integrates the study of humans and the rest of nature to address research, policy and management issues at multiple time and space scales, from small watersheds to the global system. He is co-founder and past-president of the International Society for Ecological Economics and was founding chief editor of the society's journal Ecological Economics. (Web Source: <https://www.robertcostanza.com/>)

life in historical villages. France, UK, Germany, Spain, and Italy have a lot of abandoned or semi-abandoned historical villages. I think we could now seriously imagine re-inhabiting these villages and possibly designing a new trend that is actually quite spontaneously growing in Italy, in France and in other parts of Europe. When we talk about natural Ecosystem Services, we have to remember that normally citizens and cities are not considering the objective contribution that historical villages and their surrounding natural areas are day by day offering to our lives: in terms of clean air, in terms of water, in terms of products and food, in terms of the beneficial effects of woods and their connections. I believe that we have now to reconsider the condition of urban life. Not only in the traditional urban settlement – because we have to do a lot to ameliorate the quality of life in our cities – but also considering possible alternatives and scenarios. A lot of families are already dreaming of relocating their lives in villages for instance. We have to consider the possibility of creating a deal between cities and villages, their mountains, their valleys and the terrific natural capital that is still preserved in those areas. Cities should recognize their contribution in terms of Ecosystem Services provided, while villages should guarantee support to new incomers in terms of services with the help of a new kind of circular economy, especially connected with woods and their whole chain. This is closely related to forestry: we have to re-imagine a deal between humans and forests too. We must admit that we are strictly dependent on forests and their ecological value. We also know very well that forests need the presence of humans for their maintenance, in order to avoid massive fires and other ecological disasters that could damage the environment, the biodiversity and ourselves even more.

*ck* Absolutely. I think Stefano you have raised a very important point. There is a kind of fluid concept that urban becomes now, so the countryside is actually more and more drawn in around the whole idea of globalization and people moving. With the current pandemic, at least here in Canada, we see more and more people leaving the city and permanently located in islands or in the countryside, because people can work from home and they can actually have the possibility to live there for a longer time. In China, there is this initiative called Beautiful China Initiative that is based on five main topics: ecological environment, green development, social harmony,

system perfection and cultural heritage, which also might be interesting to investigate. So I really think this might be a real trend going on here, of reimagining the countryside and the historical villages and of those who become new “urban”.

*sb* Yes, we also shouldn't put this trend in a nostalgic perspective. It's not about going back to the agro-pastoral condition, otherwise we are condemning this perspective to a sure failure. In Italy we are working on a Contract model between cities and villages, that was also similarly developed in France, called *Les contrats de réciprocité*, that means contracts of reciprocity.

*sm* Questioning the attitude of humans towards nature. The image of the Earth from outer space marked the start of a changing perspective on nature and on our relationship with nature. For the first time we realized, as a species, that environmental conservation means human self-preservation. In that period, environmental philosophy began to spread. Nevertheless, there is a dilemma for an uncontrolled wilderness that is still raising questions and resistance from most of the population. Which is the solution?

*sb* When we investigate the relationship between forests and humans, wild nature and humans, we enter into a very delicate issue, and I am curious to know what your position on this topic is, Cecil. Forests need human presence for their good health and maintenance, but if we go back to the origin of the pandemic, this is in a way related to biodiversity loss and deforestation, mainly caused by us, the human species. It is for sure a very delicate and controversial topic of discussion.

*ck* This is for me a very important issue. I have always been a big advocate of keeping wild nature in cities as well and I am against overdesign and overplan everywhere, in order to keep certain degrees of unpredictability for plants and trees to grow spontaneously. As long as we have been here, we have had a special relationship with forests. And this relationship has developed, but there is still something in our genes and our evolutionary process that tells us about a love/hate relationship with trees and forests. I think we need to explore this relationship and keep exploring that also in cities. The one way to do it,

3 Ingo Kowarik is Full Professor at the Technical University of Berlin. He is an ecologist, interested in understanding biodiversity patterns and underlying mechanisms, with a particular focus on cities and biological invasions. He is also interested in the people-nature intersection and on approaches on how to integrate biodiversity in urban environments.

is to have wild woods, wild forests in the city. This can be co-shaped by local communities, for instance. I like this concept of bio-cultural diversity. It means that we are not just talking about biodiversity but we are also bringing the cultural dimension. I think Ingo Kowarik<sup>3</sup> in Berlin has done some really interesting work on what he calls “wild nature”. He believes that rethinking the relationship between cities and nature is a pivotal challenge for nature conservation. Nature has a technological issue: we decide as humans to let nature be, but then of course it becomes a mix of natural and maybe “new natural”, where you actually have exotic species that come in and help shape nature. So it is complex, but I think we really need it, not in the least because we know it has strong health benefits, or because it has this transcendental and spiritual dimension, but also in terms of learning, of getting our children exposed to wild natural processes. That is why I am a big fan of keeping some parts of natural areas in cities wild.

*sm* This is very interesting, because it is linked also with the issue of accessibility to green spaces. There is often a substantial environmental inequality in how green areas are distributed in cities, most of the time with lack of accessibility towards already disadvantaged communities. How to better manage and plan the urban forestry in the cities according to this issue?

*ck* This is crucial, but most of the time accessibility comes in many forms. It's not just access to green spaces, it is access to decision making, it is access to management and access to the benefits. As you said already, we unfortunately see a trend of accessibility becoming more directed towards those people that have the means to be involved in decision making, management and that maybe have the skills or the knowledge already set to get involved, and also have the mobility. I think in order to overcome these issues it is important that all of our professions have to focus very much on this environmental justice aspect. We see now today with the Black Lives Matter and other movements that there is more and more emphasis on making sure that everybody has access. During the pandemic in Vancouver, it was very clear that where I am, in the Western part of the city we have really good access to green spaces, on my street there are a lot of trees. But if you go to Eastern Vancouver, people don't have access, there are no green spaces and people have to travel a long way in order to



get there. When a pandemic like this hits, accessibility becomes even more important. I fully agree, accessibility, environmental justice and equality are really important and should be addressed not just by politics but by design.

*sb* And we have to admit that Vancouver is already advanced in this field, for sure a good example of a city which is willing to work on an urban forestry plan. This pandemic is a sudden and unpredictable event but at the same time it is not isolated, it is part of a sequence of crises. It is strictly connected with inequality, with the economy, with the climate crisis. What makes this pandemic so unique is that it is capable of putting together all the profound invisible structures and processes that are running below the surface of the world, and in a way they are all merging together and exacerbating their effects during this unpredictable event. I also agree that accessibility will become the first issue in the future. In order to make sure it really happens we have to work all together, merging different fields of studies and professionals. I think we must stop dividing the world in three: our species, the animal species and the plant world as if they are completely different worlds. A possible positive effect of this pandemic is that we have to re-design the perimeter of the notion of nature. Basically when we talk about wild nature, I think we also need to consider the presence of other wild species, or non-domestic species in our environment and consider them in the design of our cities and in the green and blue infrastructures. Forestry in general is something that connects different worlds: on one side human creativity and on the other side the world of animals. Forestry brings life, biodiversity and this is why it is so special and important to keep working on that.

*sm* Cities and governments are now talking about ecological transition. What are the adaptive strategies that you think need to be implemented in the urban resilience agenda and what is the role that urban forestry might assume in reshaping the urban environment?

*ck* Cities have been built in the same way for so many decades and centuries. We basically have been making very small adaptations, we haven't really revolutionized how we live and work. I agree with Stefano, this has been one of the many crises that we have seen, and it's only been quite recently that we've started to think about doing

things differently. And I hope this helps to finally make that transition, make our living spaces - maybe we don't need to talk about cities but more about human living spaces - more sustainable and Nature-based. I think Urban Forestry is a really good mechanism, as Stefano was saying, because it represents a meeting point for different disciplines, for different interests, for different parts of society. I see it as a great opportunity now if we can get ourselves together to really change things and make sure that we live in a more sustainable, healthy and vital way.

*sb* For sure we have to redefine the protocols of urban planning. We are used to conceiving urban planning as a territorial and deterministic discipline that is normally working on the balance between intentions and codified actions. It is not about making amazing master plans and not taking care about the consequences and the effects produced by the design. I think we really need an ethic of responsibility and not simply an ethic of action. This is such an important step we have to take. We could do that if we simply start conceiving that a master plan is not simply a drawing on a piece of paper, but make sure that we orient - and not govern - in certain directions, such as ecological, sustainable and adaptive living environment. We have to admit that a super deterministic approach is usually a kind of failure. We have to imagine a kind of non-deterministic planning activity that also addresses the issue of participation, how to decentralize decisions, and how we can use the web in order to make decisions more widely shared. What we do together when we talk about these topics, involving people, local associations, and local administrations, is of fundamental importance. We are changing the cities through the planting of trees and this is already a drastic change in the logic of planning.

# Forestami. An introduction

A contribution by Giuseppe Sala, Mayor of the City of Milan

Giuseppe Sala, known as Beppe Sala, is an Italian politician, business executive and public executive, Mayor of Milan and the Metropolitan City since June 2016. He has held positions of chief financial officer and general manager of Pirelli and Tim, as well as consultant for several banks. He held the position of sole commissioner of Expo 2015 from 2013 to 2015 and was director delegate of Expo 2015 SpA from 2010 to 2016.

“*Serit arbores, quae alteri saeculo prosint*”. This was how Cicero saw the role of those who, even in old age, had tomorrow at heart. The tree as a promise of a better future. Planting trees as a sign of the responsibility with which one must live one’s life with respect to future generations.

There is no doubt that trees are taking on an increasingly important meaning in the evolution of our system of values. The tree is a sign of the desire to give meaning to our soil, especially in the city, as a positive generator of life, environment and equity. Planting trees means giving priority to building a more just and progressive city (and society), which combines the themes of environmental sustainability with those of economic equality and social justice.

Few people now cannot see that respect for the environment is the fundamental priority for giving us and the planet a future. It is young people who demand decisive changes in favour of the health of the Earth and it is above all they who no longer tolerate simple slogans, and demand choices and decisions that can no longer be postponed. Answering these questions is the only way to spark interest in politics in them. But concrete and global responses are needed to remedy the climate crisis and the effects it is having on the man-made environment.

We must positively answer our duty to work towards a true, solid and authentic environmental transformation and seek greater social justice. These aspects are solidly interconnected as an environmental revolution cannot be interpreted as a fashion for the few but must be the basic condition on which to build an economically and socially balanced society. For those who needed confirmation of this vision, the Corona Virus crisis has made this abundantly clear. Suspicions about the relationship between pollution and the spread of the virus have not yet been clarified, but in any case this pandemic has taken away the illusion of our “supremacy” over creation. The disease was even stronger than technology,

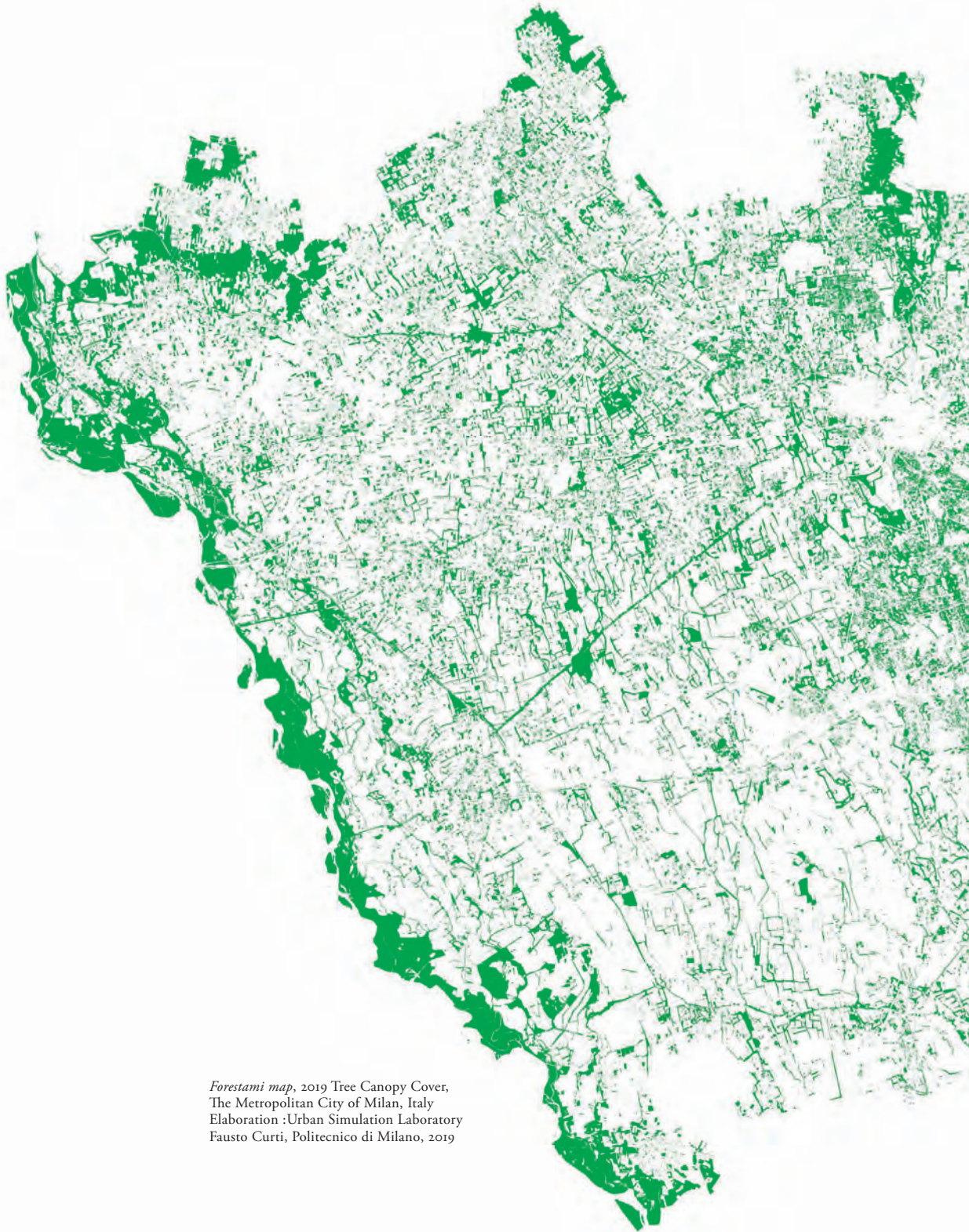
progress or our being “beyond” pain and suffering. Bringing health back to our attention rewrites the order of fundamental priorities governing our political action.

Health, environment and equity are the prerequisites for establishing healthy and sustainable growth in our world in which there is work and justice for all. Implementing this program requires a profound rethinking of our community’s personal lifestyles and investment priorities.

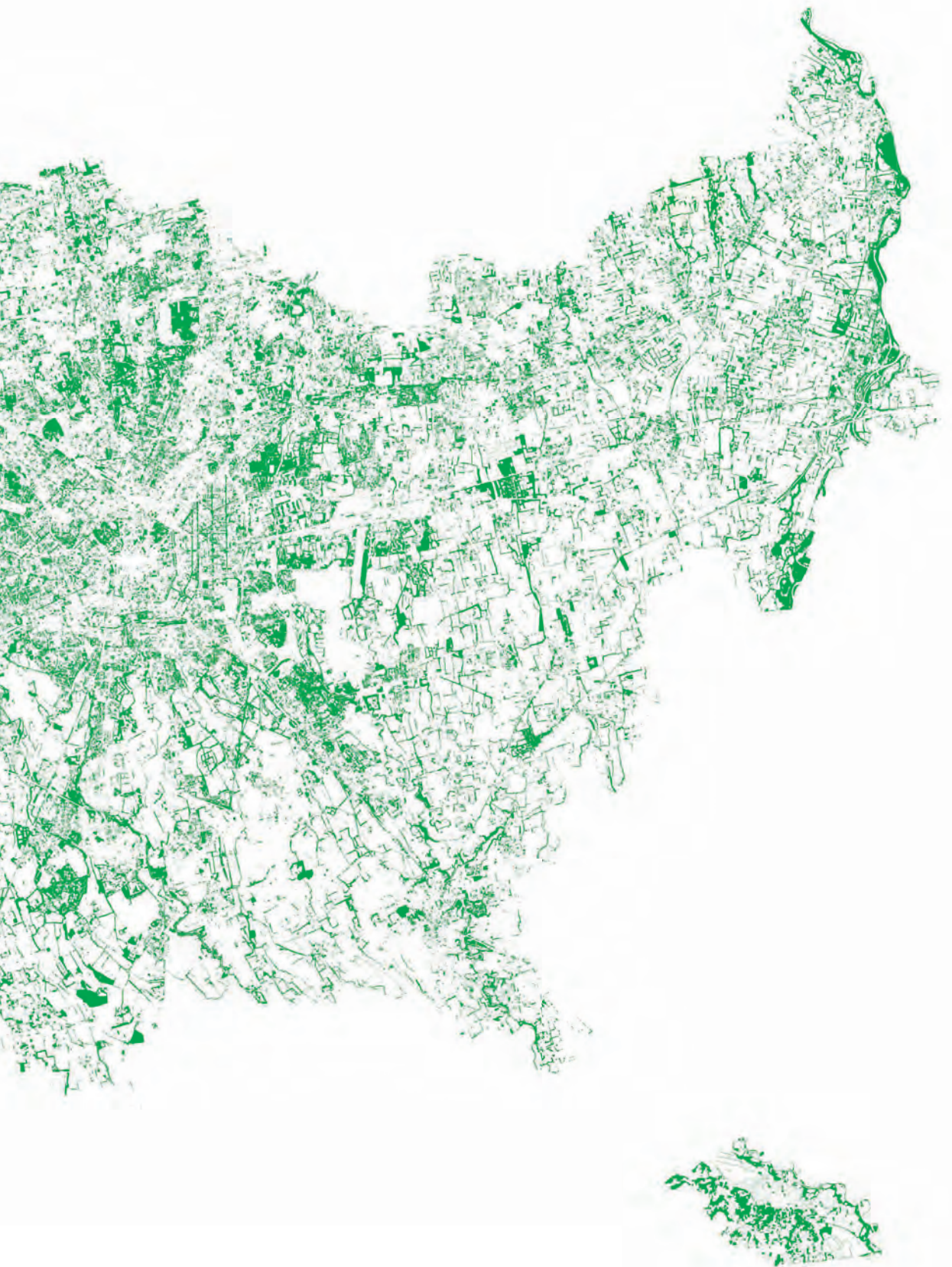
Seen in this light, the Forestami project is neither a whim nor a fashion. It is the concrete desire to build new green and blue infrastructures that harmoniously accompany those equally necessary infrastructures which have to guarantee the healthy movement of data, goods and people.

Forestami must become the style trademark of the city and the Metropolitan City that no longer sees greenery as an element of street furniture but which considers planting (and caring for) trees as a condition of its existence. Overcoming the opposition between greenery and city development does not only mean limiting land use. This is a necessary but insufficient condition. We must have the courage to build new cities and new counties according to plans that allow people and families to grow, work and have fun in a healthy environment, to be enjoyed in a responsible and safe way and we must never forget that the true condition for building this future is the conversion of the consciences of each of us, as Pope Francesco reminded us. This is why we must open a wide debate on these issues in order to convince the reluctant but also to ensure a new awareness of greenery in the city and of its importance from the point of view of physiological, sociological and economic well-being in overcoming the city/nature dichotomy.

We shall not be alone in this commitment. Milan is part of a community of some of the most important cities in the world which are all working on this revolution along with a continuous exchange of experiences, policies and achievements. With the citizens of these communities we Milanese can build a movement of opinion based on attention to health, the environment and social and economic equity that can truly write the pages of a new future.



*Forestami map, 2019 Tree Canopy Cover,  
The Metropolitan City of Milan, Italy  
Elaboration :Urban Simulation Laboratory  
Fausto Curti, Politecnico di Milano, 2019*



## Forestami. The Three Million Trees Campaign for the Metropolitan City of Milan

Milan, Italy / 2018 - ongoing

Maria Chiara Pastore

Planting trees, creating woods, multiplying the number of plants along the streets, squares, courtyards, roofs and facades of our cities is the most effective, economical and engaging way to reduce the effects of the climate crisis, reduce energy consumption and clean the air we breathe from particulate matter.

Urban forestry is today at the top of the agenda of the great metropolises of the planet (from New York to Melbourne, from Shanghai to Paris) and Milan, Italy - with the project for 3 million trees by 2030 - is a candidate to become one of the leading cities involved in a major campaign to support forestry.

The OMD Foundation - Milan Duomo Meteorological Observatory reports that 2018 was the hottest year in the last 122 years, with an average temperature that stood above 16.1 ° C. In recent years there have been 22 days of extreme heat, i.e. with temperatures above 31 degrees, and tropical nights (during which the temperature does not drop below 20° C) have gone from 35 to more than 50.

Strong winds and violent storms have hit with increasing intensity and frequency, causing damage in Milan and the greater Metropolitan Area. Yet contrarily, if we consider the trend of annual rainfall, we find a decrease in the overall quantity.

Each new year has shown us how the climate crisis is changing the health of our cities today. Never before has it been so essential to respond together to this great challenge.

The Forestami project, created by the Politecnico di Milano – Polytechnic University of Milan – , Department of Architecture and Urban Studies, aims to improve air quality, the quality of green spaces, and green infrastructures by planting a tree for each person who lives in the metropolitan area of Milan by 2030, or 3,000,000 new trees.

*The Municipality of Milan, the Metropolitan City of Milan, the Parco*

*Nord Milano*, the *Parco Agricolo Sud Milano* and *ERSAF - Lombardy Region* have signed a Memorandum of Understanding, where the subjects undertake to collaborate in order to promote the construction of a Metropolitan Park along with policies and projects that can promote urban forestry. The Politecnico di Milano is supporting the institutions with research funded by the Fondazione Falck (Falck Foundation) and Sistemi Urbani Ferrovie dello Stato (The Italian National Railway System) with the aim of building a strategic vision regarding the role of green systems in the Milan Metropolitan Area that collects, implements and enhances all main green, permeable and tree-lined systems - and their vital spheres - within the territory of the Metropolitan City.

Planting three million trees and shrubs in the Metropolitan area of Milano is a complex and considerable challenge. There are four strategic objectives in implementing the Forestami project that also introduce the main areas of work:

The first strategic objective concerns knowledge of the territory and the systemization of current projects for the transformation of the built environment, but also for the transformation of green systems, the environmental fragilities and the changes that the Metropolitan city is currently undergoing. Starting from this complex anamnesis, the research tries to imagine urban and peri-urban areas that can host new natural capital.

The Metropolitan Area of Milan is very different. The Northern part is characterized by a dense presence of industrial buildings and is heavily urbanized, while the South, with the presence of Parco Agricolo Sud Milano, is characterized by large agricultural fields to the detriment of biodiversity, where the inclusion of new species must coexist with the productivity of agriculture. Public spaces and private spaces, spaces that can be made available to host new plants, are becoming the new natural capital of the entire Metropolitan City. For this reason, the work of the Politecnico di Milano has focused on seeking potential areas for tree planting. On the one hand, we calculated the tree canopy cover, estimated in 2018 at 16% over the entire territory of the Metropolitan City and then estimated the potential for tree plantation, by observing - always using satellite data, and the various cartographic databases -, where the 3 million trees could find the proper space. On the other hand, we have opened consultation tables with the institutions, first of all with the 133 municipalities of the Metropolitan City, to work on finding potential areas that could be made available for the planting of trees and shrubs.

The second strategic objective concerns the finding of financing: an ambitious project like this, which plans to plant 3 million trees and shrubs throughout the metropolitan territory, both on green and gray surfaces, needs large investments over a long period of time that fundraising alone cannot cover. For this reason, the Forestami fund was set up, constituted by the *Fondazione di Comunità*, which collects donations from individuals, both citizens and companies. Competitive calls, on a national and international scale, constitute another important source of funding, guaranteeing the possibility of continuously working on projects of different natures and sizes.

The third challenge concerns the construction of a new governance model, which can accompany the project along its 10 years of activity and support it in the planting, maintenance and monitoring of all new plants, but also think about how the Forestami model can be sustainable beyond the current period of work and research. For this reason, the project aims to establish an autonomous legal entity, in order to funnel the various projects that arise from time to time.

The last challenge concerns the communication strategy of the project, the dissemination of the benefits provided by urban forests, the participation of the citizens of Greater Milan, and their engagement.

The environmental, social, economic and health benefits that green infrastructure brings, and especially trees, do not have a short-term impact, and although there is a lot of data available, these are not yet clearly related to the territory, and often difficult to communicate. We are in an era where haste, and the need to immediately see the benefits, the results, to be able in a certain sense to reap the fruits of the work done, characterize many choices. The Forestami project in a sense works at a different pace. It works with nature, therefore thinking in terms of agronomic seasons, it works for the most part with forest seedlings (or small plants) that will become forests: it works on maintenance. The story of this process is a fundamental part of the work, with the aim of building a strong relationship between the inhabitants and the natural capital, so as to be able to appreciate direct benefits (being in nature), and indirect ones (a better quality of the environment).

Forestami is therefore a project of care, of storytelling, a project for the well-being of the Metropolitan City of 2030.

With Forestami, the Milanese metropolis anticipates a national project of Urban Forestry, so that the woods around the cities and continuous systems with monumental trees inside them can protect and promote biodiversity, shade public areas avoiding excessive heating, clean the air by absorbing fine particles, reduce CO<sub>2</sub> and improve the quality of life and public health.

## Forest City Manifesto

The non anthropocentric urban phenomenon

Stefano Boeri Architetti China

1. *The prototype of a city created by VFs©*

The Forest City© (FC) is the prototype of a new generation of compact green cities, consisting of dozens of tall and middle-size buildings – the so called Vertical Forests© – all surrounded by the leaves of trees (from 3-9 meters in height), shrubs and flowering plants.

2. *An Urban Ecosystem*

The Forest City© is an urban ecosystem that hosts 500,000 inhabitants and occupies 1,600 hectares of land. It is an urban ecosystem where nature and city are intertwined and act as one organism. Wild vegetation taking its place inside public spaces should be considered as a fundamental element of the landscape design.

3. *An Anti-Sprawl Device*

Every Forest City will be concentrated on a vertical dimension – and within a perimeter of 4 by 4 square kilometers (1,600 hectares) – the urban volumes that are normally found in 10,000 hectares of land.

4. *Eco-sufficiency for self-sufficiency*

Humanity needs to find solutions that involve a changing perspective on the way business is done, from the way we produce to the way we consume. “The path towards dematerialized and detoxified goods and services can be summarized by the four R’s: Reduce, Repair, Reuse, and Recycle.” FCs will address the development needs of 500,000 inhabitants, enabling education and economic empowerment and developing radically more eco-efficient solutions, lifestyles and forms of behaviour, starting from reducing the overall demand of energy and waste which will mean reduced costs.

*From the Exhibition “Trees”,  
presented by Power Station  
of Art and Fondation Cartier  
pour l’art contemporain, in  
Shanghai, China*



*Forest City Manifesto*. Visualization by Stefano Boeri Architetti Shanghai, 2021



5. *A Polycentric City*  
A city characterized by a central nucleus, surrounded by different active districts and neighbourhoods, working together to form a networked city structure, which aims to overcome the strongly hierarchical center-periphery dichotomy and the distribution of land values and which will allow a redistribution of the system of services related to the real needs of the different parts of the city.
  
6. *A Multiplier of the biodiversity of species*  
FCs will be home to hundreds of different species of plant life, including trees, shrubs and perennials. FCs will also host many species of birds and domestic animals.
  
7. *An application of new Green Standards*  
The presence of green areas (both public and private) in cities varies greatly. While there are contradictions in how a city may define green spaces, Prof. Cecil Konijnendijk argues for a new rule of thumb for urban forestry and urban greening - the 3-30-300 rule. “3 trees for every home, 30 percent tree canopy cover in every neighbourhood, and 300 metres from the nearest park or green space.” Forest Cities will apply this rule of green equity that promotes health, wellbeing, and resilience.
  
8. *A new model of urbanization in China*  
The FC is a model of urbanization and the basic element for a large number of settlement combinations. Different FCs could be assembled in a cluster or along a line, creating a major conurbation, but always respecting the maintenance of the standards established for FCs: one per 1,600 hectares of a city in 10,000 hectares of a green (agricultural, natural, sports-purposed) permeable area.

## Final thoughts

Stefano Boeri

The theme of transition is currently unavoidable and this book makes me think that it is important today to have the courage to look at things differently. The idea of transition is not that from one economic condition to another of a country, a continent or a state, it is no longer just the transition of a political system. Today any reference to transition means referring to something much deeper, to the need of substantially rethinking our relationship with nature, with other living species, with the worlds of animals and plants: with those plants, trees and animals that live around us and which we have seen conquering metropolises and cities during the months of lockdown.

I think that transition means having the courage to make important choices for our natural environment.

We need to make some courageous choices regarding the life of cities.

We must think about the fundamental issue of energy and the idea that cities and neighbourhoods must have a substantial level of energy self-sufficiency: in other words, they must be able to produce and stock energy from renewable sources as part of the grid - without being the peripheries of centralized systems - thanks to the possibility of each building becoming a terminal for a clean energy network. This idea, launched by Rifkin with his plan for the Third Industrial Revolution, is of great relevance and significance today.

Moreover, as we said, we must ensure that the phase in which urban mobility was based on fossil fuels ends forever, not in 10-15 years but in 3-4 years at the latest: this is a radical choice but data showing the relationship between air pollution and the spread of the Covid-19 epidemic must make us think.

Even though there is no direct evidence and we must not be led by over-simplifications, this issue - together with the climate crisis and the loss of natural resources - forces us to take action towards a transition that must be collective and must start right from cities.

The perspective towards which we must move, if we really want to save the future of cities from the next failure, should see the metropolises interpenetrate

with the sphere of natural phenomena, articulating themselves in great archipelagos, inclusive with the agricultural sphere and that of natural vegetation and fauna.

The metaphorical image of an archipelago suggests how the functional autonomy of its islands does not prevent emphasizing the importance of a common and identifying sea, constituted in our case, by great corridors of ecological biodiversity.

The vision of a potentially transnational archipelago-metropolis thus emerges, capable of including multiple urban aggregations within itself, without however consuming further land, and of recognizing a crucial and structural role for the system of plant and animal connections.

This concept of the city as a community and as a geographical space brings to mind the pages of a book I read a few years ago in which Carlo Ginzburg explains, in four masterful lessons, why “no island is an island”, but rather a system of vital spheres, each one different from the other - yet each participating in the same universe of relationships.

We have entered a new chapter in the history of the planet.

If it is true that what we are experiencing is an event that has brought the whole world to its knees, it is equally true that as the dominant species, the time has come to assume responsibility and stop running head-long towards collective suicide.

It is a question of understanding whether or not we are aware of it and if we are today able to transform this awareness into immediate and pervasive political action. Like oxygen, we need to understand what the instant future is - to use a term dear to the philosopher Franco Bolelli -, and that our contemporary action is already building today will the instant future will actually be.

We need a transition for a new world: let's all start thinking about it, in our practice, in our daily life, for our long-term perspective and for that of our next generations.



Stati di transizione, in *Urbania* (Stefano Boeri, ed. Laterza, 2021). Photo credit: Elisa Galluzzo

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## IV

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## Listed Projects

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2. *Sustainable Dystopias*, Venice Biennale, Venice, Italy, 2008
3. *The Future above Astana*, Expo2017, Astana, Kazakhstan, 2013
4. *Vertical Forest*, Milan, Italy, 2014
5. *Tower of Cedars*, Lausanne, Switzerland, 2015 – ongoing
6. *10 thousand peaks valley*, Guizhou, China, 2015
7. *Chongqing Hortitecture*, Chongqing, China, 2015
8. *COP21*, Paris, France, 2015
9. *CTBUH*, Chicago, USA, 2015
10. *Forest City*, Shijiazhuang, China, 2015
11. *Guizhou Mountain Forest Hotel*, Xinyi, Guizhou, China, 2015
12. *Tirana2030*, Tirana, Albania, 2015-2017
13. *Nanjing Vertical Forest*, Nanjing, China, 2016 – ongoing
14. *Masterplan for Charlestown*, Canouan, Saint Vincent and the Grenadines, 2016
15. *Liuzhou Forest City*, Liuzhou, China, 2016
16. *Mantua HUB*, Mantua, Italy, 2016
17. *Radura*, Milan, Italy, 2016
18. *Yinma River*, Changchun, China, 2016
19. *The Green River*, Milan, Italy, 2016 - 2017
20. *Balcon sur Paris*, Villiers-sur-Marne, France, 2017
21. *Forêt Blanche*, Villiers-sur-Marne, France, 2017
22. *Bloku West Residences*, Tirana, Albania, 2017
23. *Europacity*, Paris, France, 2017
24. *Huanggang Vertical Forest*, Huanggang, China, 2017
25. *A colony of Vertical Forests on Mars*, Project developed by SBA China, 2017
26. *Trudo Vertical Forest*, Eindhoven, the Netherlands, 2017
27. *A School for Canouan*, Canouan, Saint Vincent and the Grenadines, 2017-18
28. *Wonderwoods*, Utrecht, the Netherlands, 2017 – ongoing
29. *Costa Domiziana*, Campania, Italy, 2017-18
30. *Cà delle Alzaie*, Treviso, Italy, 2016 – ongoing
31. *The Green Cathedral*, Amsterdam, the Netherlands, 2018
32. *Mount Nanming*, Lishui, China, 2018 – ongoing
33. *New Forest City Cairo*, Cairo, Egypt, 2018
34. *Palazzo Verde*, Antwerp, Belgium, 2018-2021
35. *Policlinico di Milano*, Milan, Italy, 2018
36. *Prato Action Plan*, Prato, Italy, 2018
37. *Smart Cities New York*, New York, USA, 2018
38. *Smart Forest City Cancun*, Cancun, Mexico, 2018 – 2019
39. *WFUF - World Forum on Urban Forests*, Mantua, Italy, 2018
40. *The Vertical Forests and the Future of Metropolis*, New York, USA, 2019
41. *Cairo Vertical Forest*, Cairo, Egypt, 2019
42. *Hanging gardens of Valira*, Valira, Andorra, 2019
43. *The Polcevera Park and the Red Circle*, Genoa, Italy, 2019
44. *Oasi*, Milan, Italy, 2018
45. *Prato Urban Jungle*, Prato, Italy, 2019 – ongoing
46. *Framing The Wild*, Paris, France, 2019
47. *Tirana Vertical Forest*, Tirana, Albania, 2019
48. *A Dead Wood for The Trojan Women*, Syracuse, Italy, 2019
49. *Superverde*, 2020
50. *Shenzhen Rehabilitation Center*, Shenzhen, China, 2020
51. *Green Obsession*, Berlin, Germany, 2020
52. *The reconstruction of Castelsantangelo sul Nera*, Castelsantangelo sul Nera, Italy, 2020 – ongoing
53. *Tree-Room*, Arte Sella, Val Di Sella, Borgo Valsugana, Italy 2020
54. *Tirana Riverside*, Tirana, Albania, 2020 – ongoing
55. *Orani Pergola Village*, Orani, Italy, 2021
56. *Pirelli 39*, Milan, Italy, 2021

## Project Credits

### Post-earthquake reconstruction plan for Castelsantangelo sul Nera, 2020

*location:* Castelsantangelo sul Nera (MC), Italy / *client:* Municipality of Castelsantangelo sul Nera / *partners:* Stefano Boeri Architetti (Partner and Scientific Coordinator), MATE soc. cooperativa (Consortium leader), Nhazca (geological aspects), Proge.77 srl (structural aspects), Dream Italia (environmental aspects) / *typology:* Urban planning, reconstruction strategies / *services:* Implementation planning of the earthquake areas, masterplan and technical standards for the reconstruction of public and private buildings

### Parco Italia / Italy Park, 2019 – ongoing

*location:* Italy / *Project by:* Stefano Boeri Architetti / *typology:* Forestry, Urban and Peri-urban Forestry

### A Forest School for San Marino 2030, 2019

*location:* San Marino Republic / *client:* State Secretariat for the Territory - Republic of San Marino / *project by:* Stefano Boeri Architetti / *typology:* Architecture / *sub-contractor:* Andrej Mikuz (cost control) / *service:* Schematic design

### Tirana 2030. A kaleidoscopic metropolis, 2015 – 2017

*location:* Tirana, Albania / *Typology:* Plan / *partners:* Stefano Boeri Architetti (scientific coordinator) with UNLAB (Consortium leader), IND, Municipality of Tirana / *client:* Ministry of Urban Development / *sub-consultants:* Transports and mobility) Mobycon, arch. Edmond Alite; (Landscape and Environmental Strategy) Laura Gatti; (Landscape and Environmental Analysis) EMA Consulting; (Infrastructures and underground utilities) arch. Maria Chiara Pastore, ing. Dritan Bradko, ing. Fatjon Zekaj, ing. Gezim Tola; (Legal Counsel) avv. Florian Xhafa; (Agronomy) DISAA Dipartimento di Scienze Agricarie e Ambientali- Produzione, Territorio, Agroenergia-Università degli Studi di Milano; (Sociology) arch. Vasilika Shtephani; *urban economist:* TU Delft; (Urban planner and expert in GIS cartography) arch. Eri Cobo; (Expert in GIS cartography) Erin Mlloja; (Accessibility) avv. Lisa Noja; (Urban regeneration) arch. Lorenza Baroncelli; (Cultural Heritage) arch. Kreshnik Merxhani; (Culture and events) Tommaso Sacchi

### Green River for Milan, 2016 – 2017

*location:* Milan, Italy / *Project by:* Stefano Boeri Architetti (team leader) / *client:* FS Sistemi Urbani / *services:* Concept design / *Typology:* Masterplan, Urban renovation, Landscape / *Program Mixed use:* Park, Public space, Residential, Culture, Social housing, Services, etc.

### Milano Vertical Forest, 2007 – 2014

*location:* Milano, Italia / *project by:* Boeri Studio (Stefano Boeri, Gianandrea Barreca, Giovanni La Varra) / *Year:* 2007-2014 / *client:* COIMA Sgr (ex HINES Italia s.r.l.) / *typology:* Architettura, Bosco Verticale / *service:* Residential towers

### Torre Botanica, 2019 - ongoing

*location:* Milano, Italia / *project by:* Diller Scofidio + Renfro (DS+R), Stefano Boeri Architetti / *year:* 2021 / *Client:* COIMA SGR

### Expo 2015. Feeding The Planet – Energy For Life, 2009

*location:* Milan, Italy / *typology:* Masterplan, Landscape / *Services:* Conceptual masterplan Guidelines for exhibition contents and program, politics and feasibility study / *program:* World Expo 2015 masterplan / *role:* Stefano Boeri - member of the Architecture Advisory Board with Herzog & de Meuron, Ricky Burdett (London School of Economics), William McDonough + Partners

### Smart Forest City Cancun, 2018 – 2019

*location:* Benito Juárez Municipality, Quintana Roo, Mexico / *project by:* Stefano Boeri Architetti / *typology:* Urban masterplan and Landscape plan / *Client:* Grupo Karim's / *sub-contractors:* Transsolar KlimaEngineering (Sustainability and Smart City); MIC - mobility in chain (Mobility); Studio Laura Gatti (Landscape strategy and agronomist) / *data:* 557 ha, 130.000 inhabitants, 7.500.000 plants, 400 species, 260.000 trees (2.3 trees per inhabitants) 400 ha of green and permeable areas; Conference Center, Hotel and Wellness / *program:* Sport, Education, Exhibition, Garden, Hotel, Industrial, Infrastructure, Park, Leisure, Mixed use, Office, Parking, Public space, Residential, Restaurant/Bar, Retail, Services, Hospital

### A dead Wood for the Trojan Women, 2019

*location:* Syracuse, Italy / *project by:* Stefano Boeri Architetti / *typology:* scenography / *client:* Fondazione INDA (Istituto Nazionale del Dramma Antico) / *services:* Concept design of the scenic project, final and detailed design, construction site supervision

### The Polcevera Park and the Red Circle, 2019 – ongoing

*location:* Genoa, Italy / *typology:* Urban and landscape masterplan, landscape architecture / *client:* Municipality of Genoa / *partners:* Stefano Boeri Architetti (Team leader, urban planning and design), Metrogramma Milano (Architecture), Inside Outside / Petra Blaisse (Landscape design), Mobility in Chain (Mobility), Studio Laura Gatti (Agronomist), Transsolar Energietechnik (Environmental comfort and energy expert), Antonio Secondo Accotto (Geologist) / *sub-consultants:* H&A Associati (cost control & planning), Studio Luca Vitone (artist for the Radura della Memoria), Tempo Riuso (participatory process) / *services:* Il Parco del Ponte. International competition: masterplan for urban regeneration (1<sup>st</sup> prize), Feasibility study, Developed design, Detailed design for the Park / *Program:* Infrastructure, Landscape, Leisure, Office, Parking, Public space, Residential, Retail, Community services, Productive, Sport, Factory

### General Hospital Polyclinic. Redevelopment of Area “Ospedale Maggiore Policlinico, Mangiagalli e Regina Elena”, 2007; 2009 – 2010; 2017 – 2018

*location:* Milan, Italy / *Typology:* Architecture / *Partners:* Stefano Boeri Architetti, Techint S.p.a. (team leader), ABDArchitetti, B.T.C. S.r.l., C+S Associati, Labics, LAND S.r.l., TRT Trasporti e Territorio S.r.l. / *Client:* Fondazione IRCCS Ca' Granda - Ospedale Maggiore Policlinico / *Services:* Competition for concept design and masterplan (first prize), Preliminary and Final design, Building permit, Detailed Design

## Tirana Riverside, 2020

*location:* Tirana, Albania / *Project by:* Stefano Boeri Architetti / *Typology:* Urban masterplan and Landscape plan / *Client:* Municipality / *Services:* Concept Masterplan – Vision and Strategic Plan, Feasibility study / *Sub-consultants:* Mobility in Chain (Mobility), Studio Laura Gatti (Agronomist), Transsolar Energietechnik (Sustainability), SON-Group (Local Partner), SCE Project (Structural Engineering), ESA Engineering (MEP) / *Program:* Public space, River park, Private garden, Industrial/services, Residential (social and student housing, residence, multifunctional domestic space), Industry 4.0, Cultural production & use, Commercial/Food beverage, Co-working, Sport & wellness, Fab-Lab, Education & open school h24

## U.I.A. PUJ Prato Urban Jungle, 2019 – 2022

*location:* Prato, Italy / *Client:* the European regional development funds of the Tuscany Region, U.I.A. (Urban Innovative Actions) of the European Commission / *Typology:* Architectural rehabilitation of built heritage, urban forestry / *Partners:* Stefano Boeri Architetti (Partner for design and coordinator for urban forestry strategy), Prato Municipality (Project leader), Pnat srl, C.N.R. IBIMET Istituto di Biometeorologia del Consiglio Nazionale delle Ricerche, ESTRA S.p.A., Legambiente Tuscany, GreenApes Srl, Treedom Srl / *Sub-consultant:* SCE Project srl (Structural Engineering) / *Services:* Urban Planning guidelines, schematic design, developed design, building permit, detailed design, supervision of construction management, site supervision / *Program:* green roof, facades, roofs, terraces, patios

## Wonderwoods. Healthy Urban Quarter, 2017 – ongoing

*location:* Utrecht, Olanda / *Partners:* Stefano Boeri Architetti (Plot A), with MVSA Architects (plot B) / *Typology:* Vertical forest / *Client:* G&S Vastgoed, Kondor Wessels Projecten (Developers) / *Sub-contractors:* Arcadis (Landscape Concept, MEP and Structural Engineering, Sustainability), Laura Gatti (Agronomy) / *Services:* Restricted Competition (winner), Concept and Final Design, Technical design of the facade, Site Supervision support / *Program:* Residential, Commercial, Education

## Visions Prospectives Pour Le Grand Geneve, Habiter La Ville-Paysage Du 21eme Siecle, 2018 – 2020

*location:* Grand Genève (Suisse, France) / *Typology:* Territorial strategy, masterplan, urban forestry / *Client:* Fondation Braillard Architectes / *Partners:* Stefano Boeri Architetti (team leader, urban planning), Michel Desvigne Paysagiste (landscape planning), Baukuh (architecture), Bollinger + Grohmann (civil engineering), Systematica (mobility) / *Sub-consultants:* Transsolar (energy and environmental engineering), Angelo Giuseppe Landi (heritage conservation), Martin Guinard (curator), Armin Linke (photographer), Guillaume Yersin (local architect), Eugenio Morello (climate change), Richard Sennett (sociologist) / *Services:* restricted consultation for the post-COP21 ecological transition

## Amatrice Food Area, 2016 – 2017

*location:* Amatrice, Italy / *Project by:* Stefano Boeri Architetti / *Typology:* Architecture / *Promotor:* Comitato "Un aiuto subito. Terremoto Centro Italia 6.0" – Corriere della Sera – TgLA7; *Beneficiary:* Municipality of di Amatrice / *Sub-contractors:* Ing. Mirko Degano, Ing. Loris Borean (Structural engineering); Paolo Zuccolo (MEP engineering); Sandro Stefanini (Town planning); GAD srl (Cost control & planning) / *Contractor:* ATI Domusgaia Srl e Legnolandia Srl / *Operational Contributor:* Regione Friuli Venezia Giulia, Innova FVG, Filiera del Legno FVG / *Partners:* Artemide, Gad, Villeroy & Boch, Mareno, Vimar, Tecnogroup, Valdama, Geda, Calligaris, Lualdi, Asso group, Casalgrande Padana, Daikin, Lions / *Services:* Concept, Preliminary and Final Design, Site Supervision

## Trudo Vertical Forest, 2017 – 2021

*location:* Eindhoven, the Netherlands / *Typology:* Architecture, Vertical Forest / *General contractor:* Stam + De Koning / *Partners:* Stefano Boeri Architetti (team leader), Inbo (local architect), Tielemans (Structural engineering), Ten Hooven (MEP design), Dupre (Landscape contractor) / *Client:* Sint Trudo / *Sub-contractors:* Studio Laura Gatti (botanic design), SCE Project (design of the facade) / *Services:* Concept design, Preliminary design, the Façade and Landscape Detailed Design, Supervision of Architecture Detailed Design / *Program:* Residential social housing, Ground floor with Retail/F&B, Office, Storage

## Nanjing Green Towers, 2016 - 2021

*location:* Nanjing, China / *Typology:* Vertical Forest / *Investor:* Nanjing Yang Zi State-owned Investment Group CO.Ltd / *Local Design Institution:* Nanjing Yangzi River Urban Architectural Design, Co. Ltd. / *Services:* Concept Design, Preliminary design, Final design, Supervision of Detailed design / *Program:* Hotel, offices, shopping mall

## Huanggang Vertical Forest City Complex, 2017 - 2021

*location:* Huanggang, China / *Project by:* Stefano Boeri Architetti China / *Client:* Huanggang Easyhome Commercial real estate Co.,Ltd. / *Services:* Masterplan, Concept, Schematic Design, Construction following / *Typology:* Masterplan, Architecture, Vertical forest Program Hotel, Leisure, Office, Parking, Residential, Restaurant / Bar, Retail, Services

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## Stefano Boeri Architetti biographies

### Stefano Boeri Architetti

Based in Milan with offices in Shanghai and Tirana, since 1993 Stefano Boeri Architetti (the Boeri Studio until 2008) has been dedicated to research and practice mainly in architecture and town planning/urbanism, but also in the fields of design, interior design, sustainability, Urban Forestry and culture. Stefano Boeri Architetti (SBA) has developed architectural designs and urban regeneration projects in complex environments on several continents, supporting and enhancing synergies between all the various players involved in the development, whether public or private. SBA has been the recipient of numerous international awards that have confirmed its importance and has been recognized by the architectural community worldwide. Completed in 2014, rapidly becoming the new symbol of Milan and a global icon of biodiversity, in the same year the Vertical Forest was designated the *Best Tall Building in the world* by CTBUH (Chicago) and received the *Best High-rise Award* from DAM (Frankfurt).

After the first Vertical Forest, SBA has carried out the design of similar buildings all around the world and up to 2021 numerous Vertical Forests are built or under construction, including the one of Huanggang, Nanjing, Tirana, Utrecht, Eindhoven and Antwerp. The obsession that SBA has with greenery is not just a stubborn desire to create greener architectures. It is, rather, the stubborn search for a different point of view in architecture. It is the idea of an architecture of biodiversity, which supports a variety of living species and not just the human one. It is the firm belief that biodiversity is not simply a matrix for measuring the density of living species in a place, nor is it only an important resource for strengthening our immune defenses. Counting on a staff of over 50 co-workers, in the design and research process SBA collaborates with a wide network of professionals, from engineering consultants and landscape architects to social scientist specialists, as well as philosophers, anthropologists, professors, intellectuals, activists, researchers, agronomists, botanists, photographers and artists.

### Stefano Boeri Architetti Research

Established in 2017, the Research Team is led by Maria Chiara Pastore, coordinated by Livia Shamir, and composed by Luis Pimentel, Simone Marchetti, Sofia Paoli. The Research Team's main aim is to support Architecture, and strategic Regional and Urban Planning projects by providing scientific background to the Design Teams. The main topics of research are: Urban Forestry, Global natural corridors, Nature-Based Solutions, Green Infrastructure, Adaptive and resilient planning policies, and Ecological transition of cities. The group is part of different networks of International Agencies, Non-governmental Organizations, Academia and Research Institutes, at the national and international level.

### Stefano Boeri

Stefano Boeri (1956) is founder and partner of Stefano Boeri Architetti, based in Milan with offices in Shanghai and Tirana. The focus on the relationship between city and nature led to the creation of the Vertical Forest, the first prototype of a residential building hosting 700 trees and 20,000 plants. He is a professor at the Politecnico di Milano and has been visiting professor at several universities. He is director of the Future City Lab at Tongji University.

In 2018, he was co-chair of the Scientific Committee for the First World Forum on Urban Forests together with the Food and Agriculture Organization (FAO). He presented the Great Green Wall of Cities developed with FAO, C40, UN-Habitat and other organizations at the 2019 UN Climate Action Summit in New York. Author of numerous books and publications, he was councilor for culture in Milan and in February 2018 he was appointed president of the Fondazione Triennale Milano.

### Francesca Cesa Bianchi

Francesca Cesa Bianchi (1980) graduated in 2005 in architecture at Milan Politecnico. In 2008, she attended the MCH 08, a first level master on collective housing at the Escuela Politecnica de Madrid. Since 2006, within her collaboration with different architectural firms in Milan and Madrid, she manages complex multi-purpose projects from competition phase, through concept, preliminary and detail design, to construction documentation. Francesca is currently Partner (since 2019) and Project director of SBA's international works in Mexico, Russia, China, Albania, the Netherlands, France, Belgium, Egypt and Qatar. She is responsible for the masterplans of new cities, Forest Cities and urban waterfronts including: Smart Forest City Cancun, the Waterfront for Charlestown. Masterplan for a touristic area and La Maddalena Waterfront.

### Marco Giorgio

Marco Giorgio (1970) is an architect who lives and works in Milan. After years of studies and training at the Federico II Faculty in Naples, Marco Giorgio started working with various architectural firms as well as a freelance professional. Since 2001 he has been working with Stefano Boeri on the design and creation of different styles of buildings – residential, commercial and administrative – and also on the coordination of complex projects on different scales, from urban and planning design, to interior architecture and layouts. He is Project Director at Stefano Boeri Architetti for Italian and Francophone projects and has been a Partner as SBA since 2019. His experience in the architectural field ranges from the preliminary stages of concept development up to executive design and construction supervision. As coordinator of the working group and in charge of construction supervision, he has followed numerous projects to their conclusion.

### Maria Chiara Pastore

Maria Chiara Pastore (1980) is Head of Research Department at Stefano Boeri Architetti and associate professor at the Politecnico di Milano. Her work includes research into the implementation of an improved green system as part of Greater Milan 2030, Forestami (Milano 2030), the production of the Water Vision for the 2030 Tirana Masterplan (Albania), the "Safer house construction guidelines" for the Malawi Ministry of Housing (GFDRR), the "Master plan for the City of Dar es Salaam" for the Tanzanian Ministry of Lands Housing Human Settlements Development and the master plan for EXPO 2015 in Milan (with Stefano Boeri Architetti). She has been a consultant to the World Bank, a member of the scientific committee of the World Forum on Urban Forests and visiting professor at Technische Universität Graz (TU Graz). In 2018 she published "Reinterpreting the relationship between water and urban planning. The case of Dar es Salaam" (Routledge, 2018).

## Livia Shamir

Livia Shamir (1985) is a Senior Architect and Project Leader at Stefano Boeri Architetti in Milan, where she coordinates the Research Department. She focuses on strategic urban planning projects, specializing in urban sustainability, resilience, and urban forestry strategies.

Since 2014 she has been an assistant professor on the Town Planning Design Workshop course at Politecnico di Milano. Since 2018 she has been a Research Fellow at the Politecnico di Milano for the development of Forestami, an urban forestry project aimed at promoting the construction of a metropolitan park and encouraging urban forestry policies and projects in the Metropolitan City of Milan. Currently, she is a Ph.D. Candidate at Politecnico di Milano, Department of Architecture and Urban Studies. She has collaborated with the FAO, Mantua Municipal Council, the Politecnico di Milano, and the Italian Society of Silviculture and Forest Ecology (SISEF) during the organization of the 1st World Forum on Urban Forests (WFUF) held in 2018 in Mantua and the WFUF Milano Calling 2019 International Forum.

## Simone Marchetti

Simone Marchetti (1990) is an architect currently living and working in Milan. Prior to his architectural studies (Politecnico di Milano, MA), he studied for one year biology where he developed his interest in merging different disciplines. After a working experience in 2014 at London based bureau EcoLogicstudio working on the overlapping areas between biotechnology, architecture and urban design, he now continues his research work in Milan. Since 2017 he has been a collaborator in the research division at Stefano Boeri Architetti where he is involved in projects in the field of urban forestry and urban planning resilience strategies. In 2021 he received a research grant from Politecnico di Milano, he is also assistant professor at the MA Urban Planning course, Politecnico di Milano, since 2020, and invited guest lecturer at Harvard GSD. Some of his other undergraduate experiences include courses on sustainability in architecture & urban planning, and principles of passive-house planning at the Technische Universität Wien and at Universität für Bodenkultur Wien (BOKU) in Vienna in 2016.

## Sofia Paoli

Sofia Paoli (1992) graduated in 2017 in architecture at Politecnico di Milano. Paoli works with Stefano Boeri Architetti in the Research Team, where she is involved in urban planning, focusing on urban forestry, urban sustainability and resilience, urban policies strategies and nature-based solutions. In 2021 she received a grant from the Department of Architecture Urban Studies at the Politecnico di Milano to develop Uforest, a three-year Knowledge Alliance project co-funded by the Erasmus+ Programme of the European Commission. The program will create a cross-sectoral alliance that will connect often non-collaborative disciplines, such as urban planning and architecture, with forestry and urban ecology, in order to provide training and support to students and practitioners working toward innovative Urban Forestry projects. She has been Assistant Professor at the Università degli Studi di Firenze, department of Design and Architecture DIDA, at Politecnico di Milano DASTU and invited guest lecturer at Harvard GSD.

## Luis Pimentel

Luis Pimentel (1988) is originally from Venezuela and is now based in Milan. He works with Stefano Boeri Architetti as part of the research department and has been engaged in large scale projects specializing in territorial analysis. He has curated the 2016, 2017 and 2018 editions of Milano Arch Week for the Triennale di Milano. He has also curated a series of international events in Maracibo from 2009 to 2012 as part of the “Distopia” collective. He has been assisting tutor for the XXIV Vertical Workshop for the Universitat Internacional de Catalunya (UIC) Barcelona School of Architecture and he participated in All the World Futures at the 56th Venice International Art Exhibition as part of The Tomorrow, an editorial project by Stefano Boeri and Pier Paolo Tamburelli. Together with Studio Folder he participated in the Far Away-So Close Architecture Biennale at the Muzej za arhitekturo in oblikovanje (MAO) Ljubljana. His work has been published in the Harvard Design Magazine: HDM 34 Architecture from Latin America.

## Maria Lucrezia De Marco

Maria Lucrezia De Marco (1992), practicing architect and editor, graduated from Politecnico di Milano in 2017. Her academic experience includes studies at the Escuela Técnica Superior de Arquitectura in Seville and at Universidad Politécnica in Madrid. Her editorial and publication projects are mainly focused on architectural and urban planning research exploring the current changes in the contemporary metropolis. She works at Stefano Boeri Architetti's Milan office and has collaborated on urban scale projects aimed at the regeneration of the natural environment in urban contexts. Since 2014 she has collaborated with international institutions and cultural organizations in the management and content production for more than 300 public events, conferences and exhibitions. In 2020-2021 she was an external collaborator for the Urban Planning Design Studio led by Stefano Boeri at Politecnico di Milano, focusing on the relationships between cities and rural villages in Italy.

## Fiamma Colette Invernizzi

Fiamma Colette Invernizzi is currently communication coordinator and creative content creator at Stefano Boeri Architetti. She is also editor of Il Bullone, a national monthly journal where she has been a volunteer since 2015. Fiamma is also assistant professor at Politecnico di Milano, where she graduated with honors in architecture in 2015 and obtained a PhD in Interior Design in 2020. As well as articles in national newspapers, she has written several academic papers about interior design, educative and research experiences and architectural restoration and contributed chapters to books, including “Design of the Unfinished: A New Way of Designing Leftovers Regeneration” and “Cultural, Theoretical, and Innovative Approaches to Contemporary Interior Design” by Luciano Crespi and “Mind and Places: a Multidisciplinary Approach to the Design of Contemporary City” by Anna Anzani. During her academic career she has lived in Cyprus as a visiting PhD student and participated in numerous international conferences in Europe and the Middle East.

## Guido Musante

Guido Musante. Editor, curator and copywriter of design and architecture, also through 1972-2791: concept inversion agency he founded. Former Deputy Editor of the digital bimonthly Babylon and columnist of *Interni* magazine for three years, from 2005 to 2013 and then from 2017 Guido Musante is a journalist specialized in the product sector of Domus magazine as well as Editor of Stefano Boeri Architetti. Lecturer at the Politecnico di Milano, after a similar experience at the Domus Academy, he is a member of the AIS (Association of Italian Design Historians).

## Photographers biographies

### Edward Burtynsky

Edward Burtynsky is regarded as one of the world's most accomplished contemporary photographers. His remarkable photographic depictions of global industrial landscapes represent over 40 years of his dedication to bearing witness to the impact of humans on the planet. Burtynsky's photographs are included in the collections of over 60 major museums around the world, including the National Gallery of Canada, the Museum of Modern Art and the Guggenheim Museum in New York, the Reina Sofia Museum in Madrid, the Tate Modern in London, and the Los Angeles County Museum of Art in California.

### Stefano Graziani

He graduated with a degree in architecture from the University IUAV of Venice and contributes to some of the most important journals in the field, including *Domus*, *A+U* (Japan), *Numero Press* (France), *Log* (USA), *Monopol Magazine* (Germany), *Abitare/Rizzoli* (Maddalena Effect, published by Studio Boeri). The photographs of Stefano Graziani cannot be simply contained in one or more categories because each time, the narratives that emerge from these selected visions lead us toward profound reflections on the human condition, on myth, nature, and the night, on magic, lost languages, and memory. His works are exhibited in Italy and abroad and are part of many private and public collections including the *Maxxi* in Rome, *Osservatorio Fondazione Prada* in Milan, *CCA* in Montreal, *ICCD* in Rome, and the *Fondazione Fotografia* in Modena.

### Lorenzo Zandri

Lorenzo Zandri is an architectural photographer and artist currently based in London. Trained as an architect between Rome and Paris, he started to dedicate himself completely to photography and the process of the image in architecture, deciding to not build things but images. In 2019 his visual research 'On the riverside' has been exhibited for the London Festival of Architecture in London and published in different platforms and books. His work has been also displayed in Praha for 'Behind Camera', an international exhibition curated by Adam Střech with Leonardo Finotti among others. His images have frequently published on architectural and design magazines (DOMUS, AD, Dezeen, designboom, iGNANT etc).

### Adrien Dubost

After graduating from a French business school Adrien Dubost discovered his passion for photography, deciding to pursue it at the London Institute of Photography. After taking part in courses taught by Holger Pooten, founder of the school, Dubost decided to specialise in portraiture and still life photography. He now balances his time between personal projects and editorials. Adrien Dubost is a photographer based in London represented by Picture Club. Between the selected publications: *Port Magazine*, *Esquire Uk*, *THE WEEK Fashion*, *Bound Magazine*, *Lampoon*, *Wallpaper\**, *The British Journal Of Photography*, *Ordinary*, *Dream Magazine*, *À Part*, *Duel*. A selection of exhibitions: *London Affordable Art Fair 2018*, *LloP Show - Free Range Festival 2018*.

### Diana Lelonek

Diana Lelonek (1988) graduated from the department of Photography in the Faculty of Multimedia Communication at the University of Art in Poznan. She has a PhD at Interdisciplinary PhD Studies, University of Art in Poznań. Diana Lelonek explores relationships between humans and other species. Her projects are critical responses to the processes of over-production, unlimited growth, and our approach to the environment. She uses photography, living matter, and found objects, creating work that is interdisciplinary and often appears at the interface of art and science. She participated in several international biennale, festivals and group shows at: Riga International Biennale of Contemporary Art RIBOCA; Edith-Russ-Haus for Media Art, Oldenburg; Center of Contemporary Art, Warsaw; Kunstraum Niederösterreich, Vienna; Temporary Gallery, Cologne; Ballarat Photography Biennale, Australia; Tallin Art Hall; Culturescapes Festival, Basel; Musée de l'Elysee, Lausanne.

### Sebastian Mejia

Born in 1980 in Cali, Colombia. He lives and works in Düsseldorf, Germany and Cali, Colombia. He graduated as Meisterschüler from the Hochschule für Bildende Künste in Dresden. Currently, Mejia is living between Düsseldorf and Colombia. His work has been widely shown in Europe and the United States and is internationally collected by both private and public institutions. Having completed the Artist-in-Residence Programme (Bronner-Residency) in Tel Aviv. Mejia received the Baker Tilly Roelfs Scholarship in 2016. In February 2017, Mejia will present new work at Die Grosse (Kunstaussstellung) NRW in the Kunstpalast Düsseldorf and the Exhibition of the Baker Tilly Roelfs Stipendium in the KIT. Mejia's work taps into the ongoing dialogue between the hybrid culture of Latin America and deeply rooted European cultural traditions.

### Clemence Elman

Born in 1992 in Paris, Clémence Elman spent her childhood in Pau (South west of France). In 2015, she graduated in political sciences (Sciences Po Toulouse) and moved to Berlin, where she began studying photography at the Neue Schule für Fotografie. Following this, she joined the national school of photography (ENSP), in Arles, from which she graduated this year. She works in particular on the question of exoticism and on the family, using in her aesthetics the form of photographic documentary-fiction. This year, she is one of the photographers selected for the 35th edition of the Hyères Fashion, Photography and Fashion Accessories Festival at Villa Noailles.

### Elisa Galluzzo

Elisa Galluzzo is a photographer of architecture based in Milan, Italy. She is a multidisciplinary visual artist. Her work is characterized by an interdisciplinary and international artistic training that ranges from photography to set design. This multiplicity of interests has allowed her to come into contact with various clients and exhibitions.

### John Spyrou

John is a London-born and Brooklyn-based photographer and Art Director. Always shooting, exploring different interesting sides of photography. Bachelor of arts in photography, videographer, his work consists predominantly of portraits in which he strives to create different layers for the viewer to discover. He shoots mostly using

### Victor Moriyama

Victor Moriyama is a Brazilian photojournalist based in São Paulo covering South America and the Amazon rainforest for international press and NGOS. His works are based on a humanist photograph committed to documenting the processes of violence that prevail in social and environmental relations in Brazil. Agrarian conflicts, deforestation and conservation of tropical forests and their biodiversity, genocide of indigenous populations, acceleration of climate change are themes that have guided his photographic production in recent years. Concerned about the scarcity of in-depth reports on conflicts in the Amazon, Victor created in 2019 the project [@historiasamazonicas](https://twitter.com/historiasamazonicas), a community of Latin American photographers committed to documenting contemporary processes taking place in the Amazon and defining the present.

## Acknowledgments

This book attempts to consider the future of cities in light of the climate crisis. Trees and plants are vital for the overall biodiversity of the Planet, for the Earth's ecosystems balance; thus, it is also essential to re-evaluate their role within our existences and the urban fabric, reshaping a new symbiotic relationship between the Plant Kingdom and the Human beings. The research work here described would not have been possible without the stimulus, criticism, suggestions, and discussions we had at Stefano Boeri Architetti, especially within the Research Division, and with some great experts and professionals, we had the chance to meet during several occasions, such as the first World Forum on Urban Forests in Mantua in 2018, the World Forum on Urban Forests Milano Calling in 2019, and the Dutch Design Week in Eindhoven in 2019. We are indebted to experts and professionals who participated in private talks and interviews during the past three years and who helped us shape our thoughts on specific topics. In particular, we are grateful to Joe McBride, C.Y. Jim, Klaus Loenhardt, Kelly Shannon, Francesco Ferrini, Terry Hartig, Theodor Endreny, Piero Pelizzaro, Marc Palahi, Marco Marchetti, Alan Simson, Laura Petrella, Adam Freed, Jacob Koch, Amanda Burden, Dan Lambe, Noemie Fompeyrine, Richard Weller, Bas Smets. We are as well thankful to the experts, Fabio Salbitano, SISEF, and Simone Borelli, FAO, that accompanied our journey of knowledge. A special thank goes to Daniela De Donno, Christopher Hildreth - the Jane Goodall Institute -, and to Enrica Viganò - Admira -, Karen Machtinger and Alanna Joanne Smith - Edward Burtynsky Studio -, for their support and help. We are incredibly grateful to Francesca Casella and Fiona Watson, Survival International, and Juliette Lecorne, Foundation Cartier, for their tremendous support. We are also extremely grateful to the Graham Foundation for Advanced Studies in the Fine Arts that believed in this project and supported the publishing of this book. The Graham Foundation, founded in 1956, fosters the development and exchange of diverse and challenging ideas about architecture and its role in the arts, culture, and society. We want to thank all the photographers and authors that decided to contribute to this project with their art, their studies, and knowledge, and to give us the chance to show their stunning work through this book, joining our cause. Last but not least, we would like to thank Jon Cox, for the translation, his comments and suggestions on the English text, and Mario Piazza and Lorenzo Mazzali - Anchora Srl - who assisted us all along the way during the process of creation of this book. We are incredibly grateful for their passionate work and dedication, even in the darkest of times. This book displays Stefano Boeri Architetti's projects, discussion, and shared passion, and it has been realized thanks to the three Partners Stefano Boeri, Francesca Cesa Bianchi, Marco Giorgio, that have supported and trusted the overall path.

Green Obsession.  
Trees towards Cities,  
Humans towards Forests

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