

From Pre-Forest to Real Forest: Tokyo's Otemachi Project

Peter Thurman describes the creation of a forest in
the heart of a city



Typical view within the Otemachi Forest. Copyright: Michel Desvigne Pasaygiste

Tokyo has been Japan's capital city since the establishment of the Edo Shogunate (the military government of Japan during the Edo period from 1603 to 1868) and has grown into one of the world's megacities. Greater Tokyo has a population of over 40 million and covers 12,350sqkm or 4,768 square miles. The central metropolitan area of 23 wards is home to around 14 million people and occupies 687 square miles, with a population density of 6,100 people per km². This is very similar to Greater London and its 32 boroughs, with a population density of 5,300 per km².

However public green space is in short supply. During WWII, just over 50 per cent (41 km²) of Tokyo, as it was then, was bombed and, as most of the buildings were made of wood, completely razed to the ground. The city was rebuilt in a hurry and public open spaces, parks and gardens were not high on the list of requirements. Greater Tokyo's public green spaces (parks and gardens) take up 7.5 per cent of the land, which is low compared to most major cities. In London, the figure is 33 per cent and for Singapore it is 47 per cent. In central Tokyo, just 3 per cent of the land is dedicated to green open spaces. So there is a big push to squeeze in green, shady spaces wherever possible, and today developers are incentivised to support this. Private enterprises now play a leading role in greening Tokyo's downtown core, encouraged by new regulations on building design and urban planning. Any greening effort needs to be collaborative and innovative, and developers can qualify for volume or height control easements if projects fulfil certain criteria for environmental quality.

A transplanted natural forest

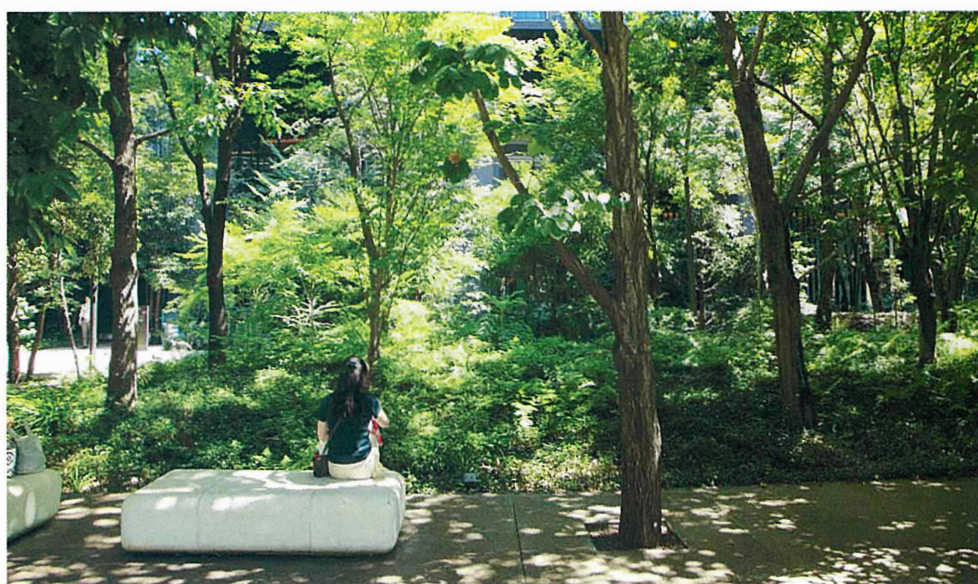
The Otemachi Tower skyscraper in the heart of Tokyo's financial district is close to both the Imperial Palace and the city's central railway station. Completed in 2013 it includes 0.36ha (0.9 acres) of transplanted woodland called the Otemachi Forest. When the real-estate firm Tokyo Tatemono and construction-engineering giant Taisei Corporation first announced their development plans for Otemachi Tower (designed by Kohn Pedersen Fox Associates PC), their greening proposal seemed almost utopian: an instant natural forest including its layered understorey. Occupying a third of the property's total site area, the forest is a real departure from the typical urban plaza dotted with a few manicured trees, each one sprouting forlornly from a square patch of earth in a single pit, and amongst a hard expanse of brick or stone paving.

The proposal was to create a small woodland as wild and natural-looking as possible, and that was both biodiverse and sustainable. The objective was to create a stronger feature than the usual green space in order to draw people into the commercial development from the surrounding business district. The lower levels of the Otemachi Tower are open but partially underground or low-rise spaces bathed in natural light. The large-scale atrium is open from the second basement floor to the first floor and serves as a hub for offices, hotels, shops and the subway entrance.

The design team wanted visitors to enjoy and be comfortable with a real forest in their midst, and so they went out of Tokyo to visit and observe some. They soon realised what tree professionals and ecologists already take for granted: that forests are dynamic and ever-changing entities with different layers or zones of habitat, and that trees can be



The street side of the forest



Lunch in the forest. Source: Tokyo.Tokyo

densely packed or sparsely arranged in complex mixes. Trees of all ages are present with different trunk sizes, and they are not all straight and tall, in fact some are suppressed through competition and may die quite young and fall over.

The creation of the Otemachi Forest began in 2004 when the property was initially flagged for redevelopment. Over time the project evolved into a full-scale study of how natural woodlands grow and mature, and how such an ecosystem could be successfully planted to thrive in the city given this site's particular conditions: soil (none), wind (a lot), and light (very little). With few, if any, pertinent case studies to emulate, the developers did the unprecedented: years before

the Otemachi Tower was completed, they established a test nursery at a rural arboretum 70km away across Tokyo Bay in Kimitsu, Chiba Prefecture. It was approximately a third of the size of the Otemachi Forest, and it was known as the 'Pre-Forest'.

There, the proposed site was recreated on a sculpted concrete base with an undulating topography filled with local soil. Then two hundred carefully chosen trees – a mixture of 70 per cent deciduous and 30 per cent evergreen species – were selected from the surrounding area and planted in the test area. Natural-looking and imperfect trees with unbalanced crowns were selected, rather than well-shaped garden-worthy specimens.



A pond and stream form part of the drainage system. Copyright: 45g Photography



The basement floor with the forest beyond. Copyright: 45g Photography

The planting was at varying spacings with some clumped very close together and using a wide range of differing tree heights and girth sizes. A typical native understorey matrix of plants was added beneath the trees, and some halos of dappled shade were formed so that woodland edge plants would flourish.

Over three years, the team was able to validate the best construction methods, monitor plant growth, and determine appropriate management methods.

After a further six years of growing, this trial pre-forest was 'dismantled' and moved to its central urban destination, along with the soil and preformed base.

Trees, soil and water

The tree mix – 18 species altogether – including maples (*Acer palmatum*), beech (*Fagus japonica* & *F. crenata*), oaks (*Quercus acuta* & *Q. myrsinifolia*), and pine

(*Pinus thunbergii*) – were rootballed for transportation, delivered to the site and planted back into their soil in their previous groupings. The idea was to create an instant and genuine forest, with an appropriate density and variety of trees, and an understorey and rooting medium that would foster natural woodland processes from the start. It is thought that the real key to the success of this project was to bring the forest soil as well – 2m in depth.

The trees selected were all native species that would tolerate an urban setting and require little maintenance and aftercare: so being resilient as a key requirement. The ground layer was made up of endemic herbaceous flowering species, plus ferns and grasses. All of this is watered by manmade conduits fed by rainwater and engineered to mimic the underground streams of a naturally undulating landscape. Rainwater collected from the tower's roof and seepage through the forest floor is stored underground in tanks, and recycled into the sprinkler system and the stream that runs through the site.

The Otemachi Forest is not just about creating a shaded area of natural beauty. Aside from these benefits, the project arose from a desire to enhance the underground section of the building, transforming it into a bright space rich in natural light, alleviating the building's heat, and contributing to the prevention of flood damage.

A developing ecosystem

A year-long biodiversity survey conducted from October 2013, when the building was completed, yielded surprising results. Initially, about 100 species of plants including trees and ground cover were intentionally planted at the time of construction, but after about a year

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and a half, the number of confirmed plant species had grown to about 300, an increase of around 200 species. Most of them have grown by germinating from seeds already contained in the forest soil, such as dogtooth violets, lilies and wood anemones. But the flora present also includes rare species listed on national and metropolitan red lists – the globally recognised way of identifying the threat of extinction to species.

It is also known that several bird species have settled there, and migratory birds have also stopped by. As for insects, there are many dragonflies, probably due to the presence of water holes, and it is assumed that they are flying in from the Imperial Palace nearby.

Without fussy manicuring, the trees appear as they do in nature. Weeding is relaxed, conducted weekly and targeting only invasive species not native to the region. Leaves are mostly left to decompose where they fall, eventually returning to the soil. The forest's planners hope that its proximity to the Imperial Palace Gardens will boost the area's bird population further still. Brown-eared bulbuls, white-eyes, dusky thrushes, turtle doves, sparrows, green finches and more have already caught on to their new digs.

As a relatively young ecosystem as woodlands go, the plan is to let the Otemachi Forest evolve naturally for at least another century or two. The size of the planting and its artificial urban location no doubt create severe ecological limitations, but it does at least mimic a genuine forest experience. Nevertheless, this pocket forest has become a popular lunch venue for office workers, as well as a destination for visitors. It performs well at forming cool spots and contributes to alleviating the heat island effect. In the summer, many people cool off on the benches, making it a place of relaxation. In addition, even in the event of localised heavy rainfalls, which have

been occurring frequently in recent years, it has a much-needed water retention function that helps to prevent flood damage. Since construction was completed, there have been no incidents of soil washing away due to heavy rain. In recognition of its effectiveness, the Otemachi Tower project has therefore received various environmental awards and certifications.

The Japanese have a deep-rooted passion for trees and nature. They also recognise and respect all things old and imperfect (*wabi-sabi* – 侘寂). This urban greening project ticks many boxes for wellbeing and psyche.

The future

The great wonder of this project is threefold: firstly, the inclusion of forest soil and its vital cocktail of organisms has been a major contributor to the success of the project. Secondly, there is the coordination and creativity involved in achieving such an imaginative goal. And lastly, the enthusiasm and support of the city government and local communities which encouraged investment from the private sector companies involved. Multi-million dollar projects will always raise questions about equity and social inclusiveness. When dense urban areas are greened, there is a real risk of gentrification and social exclusion. But this illustrates that urban forestry will often only succeed through partnerships, including unconventional ones.

Urban forestry aims to cross many boundaries, including the artificial divide between humans and nature, between city and forest. Recent years have seen the emergence of a range of approaches and policies that aim for more integration and symbioses. Urban foresters and ecologists can assist architects, engineers and planners in



Otemachi Tower with the forest below. Credit Nacasa & Partners courtesy of KPF

developing forest experiences adapted to local demands and contexts. They can also help to develop resilient plantings with higher species diversity, buffering against the impacts of climate change and the increasing threats of pests and diseases. Looking ahead, the importance of nature-based solutions and green infrastructure planning needs to be elevated. ●

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