RICE UNIVERSITY

THE EFFERVESCENT VOID CITY

RENEE REDER

A THESIS SUBMITTED
IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE

Master of Architecture

APPROVED, THESIS COMMITTEE:

SARAH WHITING, Dean and William Ward Watkin
Professor of Architecture

GORDON WITTENBERG, Professor of Architecture

SCOTT COLMAN, Senior Lecturer in Architecture

HOUSTON TEXAS
MAY 2014
THE EFFERVESCENT VOID CITY

BY: RENEE REDER
DIRECTOR: SARAH WHITING
THE EFFERVESCENT VOID CITY

ABSTRACT

In Tokyo, where the cost of one acre of land is $7.8 billion and the urban population has grown by about 100,000 per year, urban densification is a necessary but pricey reality. The issue is not new; overcrowding is a problem that has dominated urban visions in postwar Japan. The current mode of subdividing land, caused by Tokyo’s high inheritance tax, has produced smaller and smaller plots, each of which has been maxed out, based on the city’s FAR restrictions. Recent revisions to property laws have introduced the possibility of purchasing air rights, which has encouraged developers to clear Tokyo’s distinctive small-scale urbanism, replacing it with a landscape of tall towers.

The solution to this de-Tokyoism lies in the city’s Deep Underground Utilization Law, enacted in 2001, which established subterranean rights and allows owners to build to a depth of 40 meters below ground. As a new model of urban densification, the Effervescent Void City exploits the underground to increase density, both accommodating the rapidly growing population while preserving the urban fabric that makes Tokyo unique. The Effervescent Void City also includes large-scale programs like sporting facilities and auditoriums, that don’t fit into Tokyo’s tight existing fabric.

By embedding such super-scale programs in the underground, a contextual smaller scale urbanism is maintained above. Instead of privileging the above or below ground, the project transitions between both terrains by making the void an equal player to the mass. When combined, the project increases density (and openness) by merging the above and below ground, formal horizontality and verticality (as typified in towers and mat buildings), small and large scale programs. It is a model of radical contextualism that will shape the future of Tokyo.

HOUSTON TEXAS
MAY 2014
ACKNOWLEDGEMENTS

A THESIS PROJECT TAKES A VILLAGE

Thank you to the many people that have made this thesis project possible. I would like to first extend a thank you to Sarah Whiting, my advisor and dean of the school for her willingness to take me on as a thesis student and giving her time so freely—in the summer, throughout the semester, and even the night before my presentation. Thank you for sharing your knowledge of architecture, your criticisms, and questioning many of my assumptions along the way but giving me the freedom to take risks and explore my interests.

Thank you to Scott Colman for all your hard work and critique throughout prethesis and thesis. To Yasufumi Nakamori whose shared love of learning about all things Japanese helped me find nuggets of research to inspire this thesis. A special thank you to Alan and Pat Fleishacker for your sweetness and all the support at reviews over the years, outside of school, and whose encouragement for thesis was so crucial to finishing. Thank you to Tanya Domínguez and Kyle Henricks for all your assistance and to all the faculty and staff of the RSA.

In no particular order, thank you to my fellow thesis students and other students at the RSA past and present, especially Nimet Anwar, Maria Batista, Alicia Hergenroeder, Alex Hohman, and Elizabeth Marrin.

Thank you to my helpers not only for their hard work but for their friendships. To William Trotty, who showed incredible devotion to the project throughout the process including the day of pencils down and also whose help on presentation day was so valuable and generous. To Samuel Birouca for your involvement, your humor, and help in many ways that is so much appreciated. And especially to Amanda Crawley for treating the project as if it was your own, your moral and design support, and working so tirelessly from Florida up until the very last minute.

To my family, my mom, grandma, uncle, and sister for their belief in me even at the hardest junctures. Your support of me pursuing what I like most in architecture is so important. To Jeri for supporting me in ways that weren’t always visible. And finally to Tao—one of the most wonderful people I know. I really could not have done this without having you by my side.
CONTENTS

10 RESEARCH ON TOKYO
POSTWAR VISIONS
CURRENT DENSIFICATION
$7.8 BILLION/ACRE URBANISM

38 A NEW URBAN FRAMEWORK
URBAN VISION
TOWARDS RADICAL CONTEXTUALISM

58 A SITE FOR THE CITY
NAGATACHO TOKYO
EXPERIENCING LIFE IN THE CITY

102 THE CITY OF THE FUTURE
CONCLUSION

106 APPENDIX
PRESENTATION
CITATIONS
RESEARCH ON TOKYO
A HISTORY OF DENSITY
POSTWAR VISIONS FOR AN EXPANDING TOKYO

DENSITY IN TOKYO IS NOT A NEW ISSUE

Following the end of World War II, Tokyo faced the difficult task of rebuilding its heavily destroyed city. 65% of its residences were wiped out and as a result, five of the original seven million occupants left the city or were killed during the war.\(^1\)

As Tokyo sought to rebuild and accommodate a returning and increasing population, the role of architecture and urban planning was never more crucial. In the postwar period, several architects emerged whose mostly unrealized proposals addressed the ever-expanding city (Fig. 1).

A 1960 manifesto published by the metabolists, a certain group of these visionaries, acknowledged the future of the city required new solutions. Key to their inventions were vital and molecular processes interpreted architecturally and urbanistically as well as the incorporation organic growth and change over time in the city. Change as an important component of the Japanese city can be tied back to some of the most traditional architecture in Japan, epitomized by the Sengu of Ise Shrine.

While the Metabolists took on issues and ideas raised by modernism, it was a significant departure from Western architecture and urbanist visions. Projects ranging from the Ocean City (1960) of Kiyonori Kikutake to Toward Group Form (1960) of Fumihiko Maki looked at the city as a new project for Tokyo and for all of Japan.

URBAN EXPANSION OF TOKYO

In an introduction to Kenzo Tange’s Plan for Tokyo (1960) published in Japan Architect in 1961, the editor describes the growth of Tokyo over those fifteen years as beyond any estimation, a situation which “must be seen to be believed.”\(^2\)

The Plan for Tokyo called for the reconstruction of Tokyo and simultaneously, the reappropriation of Tokyo Bay as a site for 10 million people. Tange’s plan represents one method for increasing density in the city: horizontal expansion (Fig. 2). In comparison, the model of vertical expansion is represented by several projects, particularly Arata Isozaki’s Clusters in the Air (1962) which pictured towers extending above the city (Fig. 2).

But towers were not the only possibility proposed for vertical expansion: a prewar Depthscraper (1931) from Everyday Science and Mechanics magazine envisioned clearing the ground and pushing the tower underground (Fig. 2). Since the effects of earthquakes are minimized underground, the Depthscraper was touted as a viable solution. In addition, the project was purported to use an often untapped space in the city: the vast underground.

If we take the challenge articulated by Japan Architect in 1961, whereby the visionary planners must become more practical and the more practical planners must become visionary, Tokyo remains a fertile ground for exploration of what the city could be today and in the future.
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year</th>
<th>Architect(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WALL CITY</td>
<td>1959</td>
<td>Kisho Kurokawa</td>
</tr>
<tr>
<td>AGRICULTURAL CITY</td>
<td>1960</td>
<td>Kisho Kurokawa</td>
</tr>
<tr>
<td>HELIX CITY</td>
<td>1961</td>
<td>Kisho Kurokawa</td>
</tr>
<tr>
<td>CAPSULE TOWER</td>
<td>1972</td>
<td>Kisho Kurokawa</td>
</tr>
<tr>
<td>OCEAN CITY</td>
<td>1960</td>
<td>Kiyoriri Kikutake</td>
</tr>
<tr>
<td>MARINE CITY</td>
<td>1963</td>
<td>Kiyoriri Kikutake</td>
</tr>
<tr>
<td>CLUSTERS IN THE AIR</td>
<td>1962</td>
<td>Arata Isozaki</td>
</tr>
<tr>
<td>DEPTHSCRAPER</td>
<td>1931</td>
<td>Everyday Science and Mechanics</td>
</tr>
<tr>
<td>PLAN FOR TOKYO</td>
<td>1960</td>
<td>Kenzo Tange</td>
</tr>
</tbody>
</table>

Fig. 1 Urban Models
HISTORICAL MODELS OF DENSITY FOR TOKYO

- DEPTHSKAPER, 1931, EVERYDAY SCIENCE AND MECHANICS
- PLAN FOR TOKYO, 1960, KENZO TANGE
- CLUSTERS IN THE AIR, 1962, ARATA ISOZAKI

- VERTICAL EXPANSION
- HORIZONTAL EXPANSION
- VERTICAL EXPANSION

Fig. 2 Urban Models of Expansion
CURRENT DENSIFICATION TRENDS IN TOKYO

THE CITY IS REACHING ITS LIMITS

Tokyo, one of 26 megacities in the world, is home to 37 million occupants. Compare that population to London which is ranked #18 in the world. Tokyo has the largest population of any metropolitan area. Simultaneously, the population has grown over time and so too have the boundaries of the city. A time-based system of building limits was introduced as part of the 1919 City Planning Law, meant to mitigate unplanned development and bring some control to subdivisions. The law revolved around creating road infrastructure which would allow the buildable limits to adjust accordingly, similarly to the German Bebauungs-Plan.

The boundaries of Tokyo are significant: its large population is spread over an even larger area—7,408 square kilometers. London, once used as a comparison to Tokyo by Tange in his Plan for Tokyo, is both traditional and sprawled. While London may be ranked #18 in the world, it has a density of 5,300 people per square kilometer while Tokyo has a density of 4,300 people per kilometer (Fig. 3). These statistics indicate the current model of growth for Tokyo is horizontal expansion. Despite the time-based building limits system, the free-for-all in the aftermath of World War II pushed the city towards a model of owner-occupied land. This only served to fuel further expansion and led to a landscape of diverse, mixed-use programs.

Yet, much of the reason that Tokyo has persisted in this horizontal mode of expansion is tied to restrictions. Japanese zoning laws were meant to control building, particularly in residential areas. Since their inception in 1970, these laws led to a lower skyline than other comparable metropolises. Rather than having a zoning system which restricts usage, Japanese laws have instead relied on height as a limiting factor. Thus, the FAR of Tokyo is an average of 4 compared with a city like New York that boasts an average FAR of 10-15. Trends are changing but much of the city has remarkably remained a tight-knit village.

TRANSPORTATION IN THE HORIZONTALLY EXPANDING CITY

Tokyo’s population continues to grow, fueled today not as much by the birth rate, but instead by the move of people from rural areas to the urban areas. But in Tokyo, there is little space to expand further outwards: the average commute is 96 minutes and is often uncomfortable, with train cars completely filled and oshiya (“pushers”) making sure everyone gets safely packed in the cars. Today, almost 57 percent of all transportation in Tokyo is done by trains or buses, with 90% of commuters using the rail. 8.7 million people use the metro system daily and the busiest line, the Tozai Line, is at a staggering 199% capacity (Fig. 4-6). Even New York can’t top those numbers: the maximum capacity is 103%, which is still more comfortable than the M Line, Tokyo Metro’s least busy line, at a capacity of 159%. Critics may point out what might seem like the obvious solution—why don’t people just drive their cars instead? The infrastructure for supporting these cars is insufficient: many streets are still one-way roads tightly winding through densely packed neighborhoods, made to favor pedestrians. But even if the infrastructure was severely altered, parking is still a major problem. The cost of a parking space is often more than an apartment: the average cost is $744.00 per month, placing Tokyo as the most expensive in the world, only second to Hong Kong which is $1 more per month (Fig. 7-8). In fact, to buy a car, applicants need to complete various forms, including one to prove they already own a parking space. A study by Van der Architects on one small property found that a parking facility was more profitable than an apartment complex (Fig. 9).

We must revisit Tokyo’s norm for building, the horizontal model of expansion. A vertical mode of building can accommodate more people, services, and businesses in Tokyo. But is turning Tokyo into the next New York City the right solution?
Fig. 3 London vs. Tokyo Population and Density Comparisons

LONDON

1660
1750
1862
1945
2011
5,300 PEOPLE PER KM²

8 MILLION PEOPLE

#18 RANKED POPULATION BY METROPOLITAN AREA

= 500,000 PEOPLE

TOKYO

1880
1910
1932
1953
2011
4,300 PEOPLE PER KM²

37 MILLION PEOPLE

#1 RANKED POPULATION BY METROPOLITAN AREA
WHY THE CITY CAN’T KEEP EXPANDING HORIZONTALLY

Fig. 4 Map of Rail Routes in Tokyo (Metro/JR/Other)

<table>
<thead>
<tr>
<th>LINE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>199</td>
</tr>
<tr>
<td>C</td>
<td>181</td>
</tr>
<tr>
<td>S</td>
<td>181</td>
</tr>
<tr>
<td>E</td>
<td>178</td>
</tr>
<tr>
<td>Y</td>
<td>173</td>
</tr>
</tbody>
</table>

Fig. 5 Percentage Capacity for Tokyo’s Metro

MAPPING PUBLIC TRANSPORTATION

Fig. 6 Mapping and Depth Mapping of Tokyo’s Metro

<table>
<thead>
<tr>
<th>LINE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>173</td>
</tr>
<tr>
<td>G</td>
<td>168</td>
</tr>
<tr>
<td>H</td>
<td>164</td>
</tr>
<tr>
<td>T</td>
<td>164</td>
</tr>
<tr>
<td>M</td>
<td>159</td>
</tr>
</tbody>
</table>

PLAN VIEW OF METRO

DEPTH MAPPING OF METRO
THE HORIZONTAL CITY WITH EXPENSIVE PARKING

Fig. 7 Map of Major Highways in Tokyo

2ND MOST EXPENSIVE PARKING RENT IN THE WORLD

Fig. 8 Cost of Parking Rent

$744.00 MONTHLY PARKING RENT
($60 PER SQUARE METER)

Fig. 9 Comparing the Price and Payback for Site in Tokyo (Van der Architects)

PARKING DILEMMA

Fig. 8 Cost of Parking Rent

RETURN
CONSTRUCTION COSTS
**$7.8 BILLION/ACRE URBANISM**

**ONE LOT, ONE BUILDING**

Nowhere is the cost of horizontal expansion more evident than the price of one acre of land, a staggering $7.8 billion in Tokyo. Coupled with an urban population growing by about 100,000 per year, urban densification is pricey but necessary. In comparison, one acre in London costs 50 million dollars, while an acre in New York City, near the Empire State Building, costs 102 million dollars—both bargains in comparison to Tokyo (Fig. 10).

The rising cost of land in Tokyo can be tied to property laws. In the aftermath of World War II, the government was bankrupt and in various cases, unable to enforce many previous plans for city development. Thus, it focused on rebuilding infrastructure and supporting disaster relief. Its citizens were left to rebuild their city, producing new housing stock and commercial ventures. As a result, the city developed incrementally and remained largely unplanned (apart from infrastructure), developing the city into densely packed neighborhoods. Described as a city of villages by architect Arata Isozaki, the resemblance is uncanny: the one lot, one building system has made the city an easy plug-in model.

The intense subdivision of blocks has filled the city with small structures, each having their own lot (Fig. 11). The increase in the number and smallness of lots is driven by the high inheritance tax where 50% of the land value is assessed. By the early 1990s, inheritance tax rates had topped 30 million dollars leading more and more heirs to subdivide their lots to retain the rest of the land. The average lot in Tokyo has shrunk from 240 to 80 meters but many properties are as small as a parking space (Fig. 12). Along with the subdivision of blocks, there is a constant changeover of the buildings: the average lifespan of a home is 26 years as compared with London’s average of 100 years.

These drastic changes have created a unique pedestrian oriented fabric, programmatically and architecturally diverse. A car dealership is next to a rice paddy, a cat cafe adjacent to a pachinko parlor.

**HOW HIGH AND HOW LOW?**

The need for vertical density in Tokyo would seemingly have already produced a city of towers. Yet, much of the reason it has not already gone in this direction can be traced to restrictions from the 1970s. A 2002 law passed by Prime Minister Koizumi lifted regulations on zoning and building height. In exchange, developers would produce public parks and plazas. In the years following, a new plan, based on air rights, fueled city development to become more like New York and Hong Kong.

The aftermath of the law shows us the consequences of replacing the traditional fabric of the city with towers. While the tower addresses the need for increased density, it clears a block, creating a “tower in the park.” This model destroys some of what has made the traditional fabric so resilient and separates Tokyo from Western counterparts like New York: the emphasis on the pedestrian with scale and signage, the small roads, the small scale urbanism, and the low to mid rise profile that makes the city feel like a series of villages. Instead, the “park” often becomes a vacant expanse that alienates the pedestrian and relates instead to a highly car-centric planning model (Fig. 13).

But how do you get the vertical density of New York City or another tower metropolis without destroying the essence of small scale urbanism in Tokyo? The solution lies in looking down instead of up: the city’s 2001 Deep Underground Utilization Law allows owners to build to a depth of 40 meters which does not count towards FAR constraints (Fig. 14). Financially, to build underground is two to three times more when land costs millions per acre. But when that number jumps to the billions, the underground suddenly becomes affordable.

While we are accustomed to the skyscraper, perhaps its underappreciated brother, the depthscraper, offers new options for the city. As the prices of land in Tokyo continue to climb, how high and how low can we go? And is there a way to vertically add density while stopping the de-Tokyoism of one of the world’s most unique metropolises?
Fig. 10 London vs. NYC vs. Tokyo Cost per Acre

- **London:**
  - One Acre = $0.05 Billion

- **New York:**
  - One Acre = $0.11 Billion

- **Tokyo:**
  - One Acre = $7.8 Billion
Fig. 11 Block Subdivisions in Tokyo
100 square meters is the typical size of unsubdivided farmland property near or within Tokyo.

National land size is approximately 125 m²

Average land size in Tokyo is 120 m²

Land gets smaller to 90 m²

Land sizes get smaller to 70 or less than 50 m²

Where do I park my car?

Plots are tiny...

...CAN IT GET ANY SMALLER?
TOKYO TYPOLOGIES: TRADITIONAL AND TOWER FABRICS

TRADITIONAL FABRIC

TOWER FABRIC

Fig. 13 Axonometric and Sectional Diagrams Comparing Traditional and Tower Fabric
CURRENT TRENDS IN TOKYO VS. DEPTH LIMITS

EXISTING MID/LOW RISE CITY
TOWER CITY (MORI TOWER, TOKYO)
EXISTING MID/LOW RISE CITY

Fig. 14 Tower City and City Depth Limits
A NEW URBAN FRAMEWORK
REINVENTING THE LOT & BLOCK
THE EFFERVESCENT VOID CITY: AN URBAN VISION FOR TOKYO

PLAYING BY THE RULES

While zoning requirements are often found in a thick volume with plenty of percentages, Tokyo’s zoning laws revolve around two values, kenpeiritsu (% of plot) and yosekiritsu (FAR). Historically, much of Tokyo has an FAR of 4 or less, but in recent years, the overall city density has increased.

Figure 15 provides a snapshot of Tokyo land use values based on an average zone. While there are other laws that impact zoning in specific areas of the city, the analysis that follows looks specifically at these two values, kenpeiritsu and yosekiritsu, to understand the resulting massing of properties.

Figure 16 shows 70% coverage of the plot and an FAR of 6, documenting four identical blocks of nine-story buildings, a typical mid-rise neighborhood in Tokyo. A building with air rights added as shown in Figure 17 has the same percentage of coverage but a resulting FAR of 10. In the final sequence, shown in Figure 18, the tower in the plaza model has the same FAR of 10 but has cleared and stitched together four lots into one super-lot. The maximum overall floor square footage based on the 70% coverage of the plot and FAR 10 (which includes air rights) is 80,050 square meters. The resulting block resembles what a typical tower site in a city looks like; a model very different from the traditional fabric of Tokyo.

AIR RIGHTS ARE FOR THE BIRDS

The analysis of the existing conditions in Tokyo casts the Effervescent Void City in high relief. To increase density in the city requires bringing together the models of the tower and depthscraper. In the case of the tower, both the height and cleared plaza area are problematic within the low to mid-rise city. The depthscraper is equally problematic, clearing the ground, sacrificing the aboveground for the underground. The Effervescent Void City pushes the tower halfway underground or pulls the depthscraper halfway aboveground. This creates a mid-rise structure aboveground with additional density contained underground (Fig. 19).

However, this is not your typical underground parking garage with no natural light. Voids bubble throughout the city, embedded as an equal player in the urban fabric vis-à-vis building mass. Indoor and outdoor space are intertwined. In Figure 20, the resulting form of the section is made clear; the split on the ground plane, the resulting elongated facade from pairing void and building mass, the split to accommodate the street, and the resulting possibility of utilizing the space both above and below the street.

Instead of relying on air rights to increase density, the Effervescent Void City adheres to the basic constraints of kenpeiritsu and yosekiritsu but adds the 40 meter depth (Fig. 21). This is explored in more detail in Figures 22-24. The first possibility analyzed in Figure 22 shows what happens when 50% of the plot is mass and 50% is void on the ground plane and an FAR of 6 is maintained. However, it adds the 40 meter depth to create 100,000 total square meters of floor area, exceeding the amount of area allotted by the tower. But the model does not leverage the available space under the street.

By having two stories extend all the way across (the same depth as the mat building), plus ten stories underground and 12 stories above to reach the maximum FAR of 6, the square footage reaches 130,000 square meters (Fig. 23). This can be further increased by cantilevering over the street, possible because the void means building over the street won’t create a tunnel (Fig. 24). This final model reaches a maximum of 145,000 square meters—a new source of density (and openness) that exceeds the constraints of the tower.
% OF PLOT
Kenpeiritsu (70%) =
Footprint (70m²)
Land Size (100m²)

Yosekirisu (110%) =
Floor Area (40m² +70m²)
Land Size (100m²)

TOKYO LAND USE VALUES
<table>
<thead>
<tr>
<th>Category of Land Use Zone</th>
<th>Maximum Floor Area Ratio %</th>
<th>Maximum Building Coverage Ratio %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Rise Residential (category 1 and 2)</td>
<td>50-200</td>
<td>30-60</td>
</tr>
<tr>
<td>Mid/High Rise Residential (category 1 and 2)</td>
<td>100-500</td>
<td>30-60</td>
</tr>
<tr>
<td>Residential (category 1)</td>
<td>100-500</td>
<td>50-80</td>
</tr>
<tr>
<td>Quasi-Residential</td>
<td>100-500</td>
<td>50-80</td>
</tr>
<tr>
<td>Neighborhood Commercial</td>
<td>100-500</td>
<td>60-80</td>
</tr>
<tr>
<td>Commercial</td>
<td>200-1500</td>
<td>80</td>
</tr>
<tr>
<td>Quasi-Industrial</td>
<td>100-500</td>
<td>50-80</td>
</tr>
<tr>
<td>Industrial</td>
<td>100-400</td>
<td>30-60</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>200-400</td>
<td>60</td>
</tr>
</tbody>
</table>

CURRENT FAR URBAN ANALYSIS

9 STORIES
SINGLE LOT
BLOCK
SECTION
PLAN
STREET
LOTS
MASS

70% OF PLOT  FAR 6
50,000 SQ METERS
CURRENT FAR URBAN ANALYSIS

**SINGLE LOT BLOCK**

- **AIR RIGHTS + 5 STORIES**
- **9 STORIES**

**SECTION**
- Street

**PLAN**
- 45

**CURRENT FAR URBAN ANALYSIS**

**SINGLE LOT BLOCK**

- **56 STORIES**
  - **(9 STORIES X 4 + AIR RIGHTS)**

**SECTION**
- Street

**PLAN**
- 45

70% OF PLOT  FAR 10+  80,000 SQ METERS

13% OF PLOT  FAR 10+  80,050 SQ METERS
CONTEXTUALIZING A NEW URBAN MODEL

Fig. 19 The Effervescent Void City

Fig. 20 Explaining the Development of the Effervescent Void City
EFFERVESCENT VOID CITY URBAN ANALYSIS

% OF PLOT
Kenpeiritsu (50%) =
Footprint (50m²)
Land Size (100m²)

Yosekiritsu (80%) =
Floor Area (30m² + 50m²)
Land Size (100m²)

UNDERGROUND DEPTH
40 M CLEAR DEPTH

50% OF PLOT  FAR 6  40 M DEPTH  100,000 SQ METERS
TOWARDS RADICAL CONTEXTUALISM

COMBINING SMALL AND LARGE SCALE URBANISM IN TOKYO

Inherent in the Effervescent Void City model is recognition that not all programs are appropriate for the underground—the underground has certain capabilities and strengths that the aboveground does not have and vice-versa. Instead, the city model combines small and large scale urbanism, preserving the ground level and areas above for small scale insertions and using the expanse offered by the underground for large scale programs that cannot easily be inserted without erasing the fine tapestry of Tokyo’s blocks.

Thus, the method of insertion for the Effervescent Void City model is twofold. First, it helps to bridge the space between current traditional fabric and tower fabric to integrate both in their context. In addition, it moves larger programs underground so that the surface can accommodate more small scale programs (Fig. 25).

While the dichotomy of traditional fabric and tower fabric has been explained, the programmatic diversity of the city is a second critical component of Tokyoness that is seen particularly at the street level. The city model proposed would maintain the street level as a space for small retail, small service/hospitality, and small office. The aboveground would remain as apartments and small offices.

The underground space, however, will be used for larger programs like retail (department stores, grocery stores, etc.), entertainment (performance venues), storage, educational facilities, research facilities, and sports leisure programs (Fig. 26). Instead of vacating these uses to the periphery of the city or devoting large areas of land within the city to accommodating them, they are a perfect match for what the underground can offer.

Within this underground landscape, voids become embedded in these larger programs, as a way to bring sunlight and act visual system for perception to connect the underground to the aboveground. However, the voids are also be functional: a courtyard for outdoor growing research lab spaces, small outdoor performance spaces, or outdoor exercise spaces. The possibility for the voids to be of variable depth and square footage introduces a level of flexibility to what the Effervescent Void City can become.

The Effervescent Void City is a model for radical contextualism: understanding the need to move beyond a purely preservational model for the city while also trying to preserve what it is that the traditional fabric does best. Likewise, it exceeds the density of the tower and produces new types of spaces in Tokyo. It is an urban framework that responds to the constraints of Tokyo’s zoning but seeks to heighten the uniqueness of the city.
INTEGRATING TRADITIONAL FABRIC TO TOWER FABRIC

MOVING LARGE PROGRAMS UNDERGROUND AND PUTTING SMALL PROGRAMS ABOVEGROUND

**Fig. 25** Method of Insertion
PROGRAM SIZING

Fig. 26 Program Distribution: Small and Large Scale
A SITE FOR THE EFFERVESCENT VOID CITY
TESTING A NEW URBAN VISION IN NAGATACHO TOKYO
NAGATACHO TOKYO AS A SITE OF CHANGE

A NEXUS OF TRADITIONAL AND TOWER TYPOLOGIES

Located in Tokyo, Japan in the Chiyoda Ward, Nagatacho is the government center for the city (Fig. 27). As the site of the National Diet, the Diet Library, and Hie Jinja (the most urban of Tokyo’s shrines), it is a unique point of density in the city. While Tokyo boasts many important “centers” ranging from the Ginza district to Shinjuku to the iconic Cat Street, Nagatacho provides the perfect context for testing the Effervescent Void City model.

Nagatacho is home to small scale urbanism but the tower is beginning to become more prevalent in this area. Projects like the redevelopment of the Grand Prince Hotel (Akasaka) or the Sanno Park Tower are starting to take over. The lower right image of Figure 28 shows the large scale urbanism starting to eat away at the traditional fabric.

Several possible sites of insertion for the Effervescent Void City (Fig. 28) were identified within a five to seven minute walk from public transportation. Their selection was based on two key criteria detailed in the urban framework: integrating traditional and tower fabrics, while also accommodating small and large scale programs (Fig. 25).

THE MAT BUILDING AND THE TOWER

The project is a center for healthy living, including sports facilities, a supermarket, research growing centers, and more. It provides services to both residents and workers in the city. However, it will maintain the ground level for diverse retail and service businesses with the aboveground volumes to contain apartments, a hotel (which replaces the one currently on the site), and small offices (Fig. 29). One elevator ride downwards brings residents, visitors, and workers to the underground facilities.

The site plan shows the project in its context, oscillating from a large insertion that breaks down into small scale urbanism aboveground (Fig. 30).

The three dimensional model makes clear the negotiation of these various scales, responding to both density and diversity (Fig. 31-34). Looking at the insertion itself, model elevations show how the voids appear when layered sectionally (Fig. 35-36) to create a new type of cross-section for the city.

Formally, the project leverages the mass and void inherent in the project. The void symbiotically blends between the above and below street levels and brings airiness to the project. Below ground, a thickened mat type building accommodates pockets of air that become smaller as the project goes deeper and small slab towers grow more distinct from one another and more airy as they emerge from the ground. The void works to increase density but also formally merges the horizontality and verticality as typified in towers and mat buildings (Fig. 37).

Programmatically, the project merges small and large scale programs as the floors transition, using the voids as linchpins for outdoor space and visual access to the exterior. An ice skating rink and pool exist at the lowest depths of the city, enclosed spaces that are home to the most artificial of environments. A climbing wall is located both indoors and outdoors, adjacent to a metro line. Each usage is labeled by type, ranging from residential and office to retail and service/hospitality to leisure and storage (Fig. 38).

Analytically, Nagatacho’s Effervescent Void City brings more openness without adding height, changing the solid to void proportion in comparison to a typical city block (Fig. 39). It introduces a higher level of programmatic diversity while increasing the overall square footage to reach 100,000 square meters (Fig. 40). It is a new type of living and working environment in the city, coupled with a unique way to experience leisure.
TOKYO, JAPAN
CHIYODA WARD, TOKYO
Fig. 27

NAGATACHO
Fig. 28

NAGATACHO SITE DRAWING

0.4 KM DISTANCE
5-7 MINUTE WALK

TERRITORIAL SITE DRAWING

LARGE

NAgATACHo
Fig. 27
NAGATACHO (BUILDING SCALES)

small

METRO

5-7 MINUTE WALK
Fig. 31 Full Model and Effervescent Void City

Fig. 32 Effervescent Void City in Context
MODEL IN CONTEXT NIGHT AND DAY

Fig. 33 Model in Context at Night

Fig. 34 Model in Context During the Day
Fig. 35  Effervescent Void City South Elevation View

Fig. 36  Effervescent Void City North Elevation View
**SOLID/VOID SHIFT**

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

-11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8

**4 BLOCKS**

**PROGRAMMATIC SHIFT**

-8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

-11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8

**4 BLOCKS**

**Fig. 37** Solid and Void Plan Diagrams

**Fig. 38** Programmatic Plan Diagrams

- RESIDENTIAL
- SERVICE & RETAIL
- RESEARCH
- OFFICE
- LEISURE
- PARKING
LOT/BLOCK SOLID/VOID ANALYSIS

TYPICAL TOKYO BLOCK

THE EFFERVESCENT VOID CITY

100,000 SQ METERS   FAR 6

SOLID/VOID PERCENTAGES

LOT/BLOCK PROGRAM ANALYSIS

TYPICAL TOKYO BLOCK

THE EFFERVESCENT VOID CITY

100,000 SQ METERS   FAR 6

PROGRAM PERCENTAGES

Fig. 39 Solid/Void Percentages Comparing Typical Tokyo Block to the Effervescent Void City

Fig. 40 Programmatic Percentages Comparing Typical Tokyo Block to the Effervescent Void City
EXPERIENCING LIFE IN THE EFFERVESCENT VOID CITY

A NEW NEIGHBORHOOD FOR NAGATACHO

The Effervescent Void City for Nagatacho produces a space that is pedestrian-friendly by maintaining a system of one-way streets prevalent in Tokyo while adding diversity to the streetscape. Imagine looking over a railing to an underground world: plants growing, people eating at a restaurant (Fig. 41), students practicing karate outdoors, a window to a pool below, or a crazy climbing wall stretching to the street level.

The voids in this city model work like courtyards, creating outdoor spaces nestled in the interior that also promote safe spaces, especially for young children. but although these spaces are separate, the ability to visually observe moments from above creates an even more exciting city for the pedestrian. That interest is only possible because of the smallness produces unique views and in turn, translates into new ways to experience activities.

From a car, drivers get small glimpses into the penetrating forms finding that the towers start to lean inwards and outwards, taking advantage of the space over the street to bring more openness to the voids. The landscape changes the experience of driving, an affect that differs from what the pedestrian experiences. Yet, it produces a unique view of the city on the street level.

The facades themselves are blank glacier-like forms projected to be translucent, admitting light but providing privacy on the interior (Fig. 42). on the baths’ level, you can find the perfect escape after a dip in the pool or a volleyball match. You can walk around naked hidden behind the facade but still see soft outdoor light in the space.

Likewise, the forms, appearing muted during the day, are lit from within at night to become beacons of light with the voids literally effervescing (Fig. 43—see the contents page).

The forms, at first glance, are similar to one another, but they respond locally to the height of nearby structures. The similarities of the facades are purposeful, blurring the lines between the aboveground and the underground. However, the facades are also a template ripe for adding signage or balconies and for other forms of differentiation that respond to the interior programs (Fig. 42).

The interior is also home to its own diversity as evidenced by the overlapped void, supermarket, and track. Imagine going to run a loop: below, people are perusing products on the shelves or someone is preparing food at the bakery counter. From the opposite viewpoint, you can watch people circling overhead as you make your purchases (Fig. 44).

It is a lifestyle that is possible because of what the Effervescent Void City can do to change urban recreation and shopping.

A CENTER FOR HEALTHY LIVING IS ONLY AN ELEVATOR RIDE AWAY

The Effervescent Void City makes leisure an elevator ride away, whether you reside or work in the building, live nearby, or arrive by metro. It is within distance of public transportation but doesn’t sacrifice an entire city block. You can go to a sushi restaurant and go downstairs to play basketball. The plans illustrate how the experience can shift between the underground, the street level, and the aboveground (Fig. 45-47).

In particular, the supermarket level shows the overlap with the running track and how growing spaces can integrate with the endless rows of shelving. It also depicts the back of house and how it can plug into the parking and the necessary freight elevator access (Fig. 45). But most importantly, the plans demonstrate the possibility for a large open...
EXPERIENCING LIFE IN THE EFFERVESCENT VOID CITY

space to have windows that do not alienate shoppers from the aboveground.

In comparison, the street level is filled with small scale retail, service/hospitality, and small offices. Shoe and clothing stores are next to restaurants; a mail center is down the street from a cat cafe; a bank is close to a pachinko parlor—a mix that would not be an unusual sight in Tokyo today. It is this diversity that is a hallmark of small scale urbanism. But the street itself is reinvented by the addition of the void (Fig. 46).

The void brings airiness to the city, creating a 50% openness on the ground level which visually alters the experience of the street (Fig. 46).

Finally, the aboveground becomes a series of towers: one is a hotel, four are offices, and the rest are residential. Each tower becomes distinct from the others. From above, viewers can see them bundle together as they descend towards the ground plane. Residents will feel like they are living in a highrise—but will be able to observe the voids and various ground planes below (Fig. 47).

The oscillation of the section both in depth and program provides an interesting study (Fig. 48). By taking one particular snapshot of the project in section, it is possible to create a case study for how this new neighborhood in Nagatacho functions and what possibilities exist for a similar model to be adopted elsewhere.

Explore the project for yourself—the section and section details hold surprises nestled within the depths of the Effervescent Void City (Fig. 49-58). While the verticality produces a coexistence of various programs, it also changes how we experience the street level. It is possible to understand the spaces below street level from above. We can even be fooled: are we actually underground? By nature of the voids penetrating into the depths of the city, it is difficult to tell. The main fear of the underground as a place with no windows doesn’t hold true.

There is a new frontier that the Effervescent Void City produces—a space of density and tradition.
Fig. 41 View of Restaurant Void
Fig. 42 View of Form of Project in Context
Fig. 44 Interior with Track Overlooking Voids and Supermarket
KEY TO PLANS

PLAN -6
01 OFFICE
02 RESIDENTIAL
03 HOTEL

STREET LEVEL
04 CONVENIENCE STORE
05 BOUTIQUE
06 FLOWER SHOP
07 LOBBY
08 FREIGHT STORAGE
09 DESIGN OFFICE
10 CELL PHONE STORE
11 COMPUTER STORE
12 ACCESSORY BOUTIQUE
13 BEAUTY PARLOR
14 SHOE STORE
15 CONFERENCE SPACE
16 CALL CENTER
17 CLOTHING STORE
18 BANK
19 DENTIST

PLAN -6
36 PARKING
37 SUPERMARKET
38 OUTDOOR GROWING FOOD
39 SUPERMARKET BACK OF HOUSE

SCALE
0 20 60 M
Fig. 46: Ground Plan with Small Scale Retail, Service/Hospitality, and Office

Fig. 47: Tower Plan with Apartments and Small Office
Fig. 48 Overlaid Sections Cut Every Five Meters

Fig. 49 Section Key Drawing for Details To Follow
Fig. 52 Street Level with Circulation and Small Sushi Restaurant Section Detail

Fig. 53 Street Level Showing Growing Pod Void with Basketball Court Below Section Detail
Fig. 54 Street Level with Shoe Store With Office Above and Both a Restaurant and Lab Below Section Detail

Fig. 55 Underground Showing Track Over Supermarket with Karate, Basketball Court, Changing Rooms, and Lab Above Section Detail
Fig. 56 Underground Pool Level with Void and Aerobics Space Above Section Detail

Fig. 57 Underground Ice Skating Rink with Void, Karate, Aerobics, and Labs Above Section Detail
CONCLUSION

A NEW FRONTIER

The Effervescent Void City has a future for both Tokyo and other cities. The project analyzes the issue of density both past and present in Tokyo and seeks to find an alternative to the tower. Not every city needs to be the next New York City, despite its obvious appeal—difference and uniqueness in cities creates heterogeneity.

Though Tokyo was chosen as a test case because it is home to the largest population anywhere in the world and boasts a low to mid-rise profile, the issue of density is and will continue to be a problem around the globe. Tokyo can function as a model for how cities can grow: it already does that in how it has shifted from a slum to an incrementally developing city, a shining example for other cities undergoing intense densification.

But to posit this thesis project merely as a solution to the problem of density is to miss the point: what it proves is that constraints are only disguised opportunities for innovation just as problems do not produce solutions but instead project new possibilities. A new city typology and thus architectural typology evolves from creatively interpreting the constraints of the city. However, this city project is not creating something new for newness’ sake: it is grounded in certain realities that make it move from a purely visionary stance to one that also has practical merit.

Other cities are beginning to look at the space beneath their feet, realizing that the underground is a space ripe for new consideration as a usable, interesting environment. Helsinki has created a masterplan for the underground; a recent article from BLDGBLOG looks at Hong Kong’s underground as a new viable space;22 while another article through the New York Times sees Singapore’s visions of the underground as new opportunities.23

Even the Boston Globe announced “Our Underground Future,” touting it as a new source of real estate in what they see as a growing trend downwards amongst metropolises.24 The underground is an expansive frontier and a space that offers certain opportunities but building beneath our feet doesn’t mean disregarding the buildings that reach towards the sky. The potential inherent in the underground, paired with the aboveground, should continue to be probed for what they both can offer.

In addition to exploring the application of the Effervescent Void City to other metropolises, the programmatic implications for this city model have only been applied here to leisure and healthy living. The Effervescent Void City will produce different results as various programs are tested.

Consider education—how can this city model create new opportunities for schooling? Or what if IKEA opens up a shop underground? There are endless possibilities yet to be explored. What the research proves is that density and property costs make the underground, in connection with the aboveground, viable. The Effervescent Void City creates a space where you would want to live and work, both analytically and experientially.

While this section may be titled as the conclusion, it is really a beginning. The Effervescent Void City provides increased possibilities for density and its impact on living in the city. A new research and design frontier awaits.
On January 17, 2014, in Farish Gallery, the Effervescent Void City was presented to critics, students, and others present. This was not meant to be a simple slideshow and board presentation but used both mediums to illustrate certain critical aspects of the project.

The slideshow presented the research and urban framework as a developmental plan for the city. But the boards for the thesis presentation focused on creating an immersive environment for the viewers: the street level of the sectional boards was above the standing height of the average student. The model allowed viewers to look at the city aerially, to see the penetration of the voids, while experiencing the three dimensional affect of the space on the city level vis-a-vis the context.

The oscillation between the analytical aspects of the urban framework and the affectual space produced by the insertion itself were balanced to achieve a duality: the practical with the visionary.
JURY CONVERSATION

Fig. 62 In Conversation with Lars Lerup (right) and Caroline O’Donnell, Antonio Petrov and Albert Pope (left)

Fig. 63 (top right) Caroline O’Donnell, Antonio Petrov and Albert Pope Looking at the Model (top left) Discussion with Yasufumi Nakamori (bottom left) Joshua Prince-Ramus Observing the Model (bottom right) Sarah Whiting in Conversation
NOTES


A NEW URBAN FRAMEWORK


THE CITY OF THE FUTURE


**CITATIONS**

**IMAGE CREDITS**

**RESEARCH ON THE CITY**

**FRONT IMAGE**
Photograph from “When Tokyo was a Slum” The informal City Dialogues (1945)

**Fig. 1** URBAN MODELS
Drawn by Renee Reder with research and photographs from Metabolism, City of the Future (2011) and Metabolism: Proposals for a New Urbanism (1960)

**Fig. 2** URBAN MODELS OF EXPANSION

**Fig. 3** LONDON VS. TOKYO POPULATION AND DENSITY
Drawn by Renee Reder with statistics from google and wikipedia and mapping from “A plan for Tokyo” Japan Architect (1960) and “measuring the human Urban footprint” (2011)

**Fig. 4** MAPS OF RAIL ROUTES IN TOKYO
Redrawn by Renee Reder from “Tokyo Subway map Including Suburban Railways and Trams” Urban rail (2011)

**Fig. 5** PERCENTAGE CAPACITY OF TOKYO’S METRO
Drawn by Renee Reder from “Take a Look at Why the Tokyo Metro is Known as ‘Commuter Hell’” Business Insider (2012)

**Fig. 6** MAPPING AND DEPTH MAPPING OF TOKYO’S METRO
Drawn by Renee Reder from “Tokyo Metro Network Map—Depths of the Underground” Prosthetic Knowledge (2009)

**Fig. 7** MAPS OF MAJOR HIGHWAYS IN TOKYO
Drawn by Renee Reder from Google Maps

**Fig. 8** COST OF PARKING RENT
Drawn by Renee Reder from “World’s Most Expensive Parking Places” CNN (2013)

**Fig. 9** COMPARING PRICE AND PAYBACK FOR SITE IN TOKYO
Drawings by Van der Architects from “In Tokyo, Parking Cars Makes More Money Than Parking People” (2011)

**Fig. 10** LONDON VS. TOKYO COST PER ACRE
Drawn by Renee Reder from Google Maps

**Fig. 11** BLOCK SUBDIVISIONS IN TOKYO
Drawings from Koh Kitayama, Ryue Nishizawa, and Yoshifuru Tsuchimoto in “Tokyo Metabolizing” (2010)

**Fig. 12** LOT SUBDIVISIONS IN TOKYO
Redrawn by Renee Reder from “Fetishism of Space Tokyo Land Shrinking” Urban Lab Global Cities (2009)

**Fig. 13** AXONOMETRIC AND SECTIONAL DIAGRAMS COMPARING TRADITIONAL AND TOWER FABRIC
Drawn by Renee Reder

**Fig. 14** TOWER CITY AND CITY DEPTH LIMITS
Drawn by Renee Reder with research compiled from “Deep Underground Usage for Effective Executing of City Facility Construction” (2007)

**A NEW URBAN FRAMEWORK**

**FRONT IMAGE**
Photograph from Investigations in Collective Form (1964)

**Fig. 15** TOKYO LAND USE VALUES
Drawn by Renee Reder from “Japanese Real Estate Class: Building Coverage Ratio / Floor Area Ratio” (2012)

**Fig. 16** FAR VALUES: 70% OF PLOT, FAR 6: 50,000 M²
Drawn by Renee Reder

**Fig. 17** FAR VALUES: 70% OF PLOT, FAR 10: 80,000 M²
Drawn by Renee Reder

**Fig. 18** FAR VALUES: 70% OF PLOT, FAR 10: 80,050 M²
Drawn by Renee Reder

**Fig. 19** THE EFFERVESCENT VOID CITY
Drawn by Renee Reder

**Fig. 20** EXPLAINING THE DEVELOPMENT OF THE EFFERVESCENT VOID CITY
Drawn by Renee Reder

**Fig. 21** ADDING UNDERGROUND DEPTH TO LAND VALUES
Drawn by Renee Reder

**Fig. 22** EFFERVESCENT VOID CITY VALUES: 50% OF PLOT, FAR 6, 40 M DEPTH: 100,000 M²
Drawn by Renee Reder

**Fig. 23** EFFERVESCENT VOID CITY VALUES: 50% OF PLOT, FAR 6, 40 M DEPTH, AREA BELOW STREET: 150,000 M²
Drawn by Renee Reder

**Fig. 24** EFFERVESCENT VOID CITY VALUES: 50% OF PLOT, FAR 6, 40 M DEPTH, AREA BELOW & ABOVE STREET: 145,000 M²
Drawn by Renee Reder

**Fig. 25** METHOD OF INSERTION
Drawn by Renee Reder

**Fig. 26** PROGRAM DISTRIBUTION: SMALL AND LARGE SCALE
Drawn by Renee Reder

**A SITE FOR THE EFFERVESCENT VOID CITY**

**FRONT IMAGE**
Photograph of Contemporary Tokyo from Google Images Stock Photo (2013)

**Fig. 27** TERRITORIAL SITE DRAWING
Drawn by Renee Reder

**Fig. 28** NAGATACHO SITE DRAWING
Drawn by Renee Reder

**Fig. 29** AXONOMETRIC PROGRAM DISTRIBUTION
Drawn by Renee Reder

Bibliography / Atelier Bow-Wow; Yoshiharu Tsukamoto + Angelidou, Ioanna. “Metabolism and after: A Correspondence with Alter, lloyd.” In Tokyo, parking Cars makes more money Than “Alice City: The Underground Wonderland.”

BIBLIOGRAPHY


伊藤豊雄 統一設計事務所
伊藤豊雄建築設計事務所:
伊藤豊雄
山本繁男

伊藤豊雄 統一設計事務所
伊藤豊雄建築設計事務所:
伊藤豊雄
山本繁男