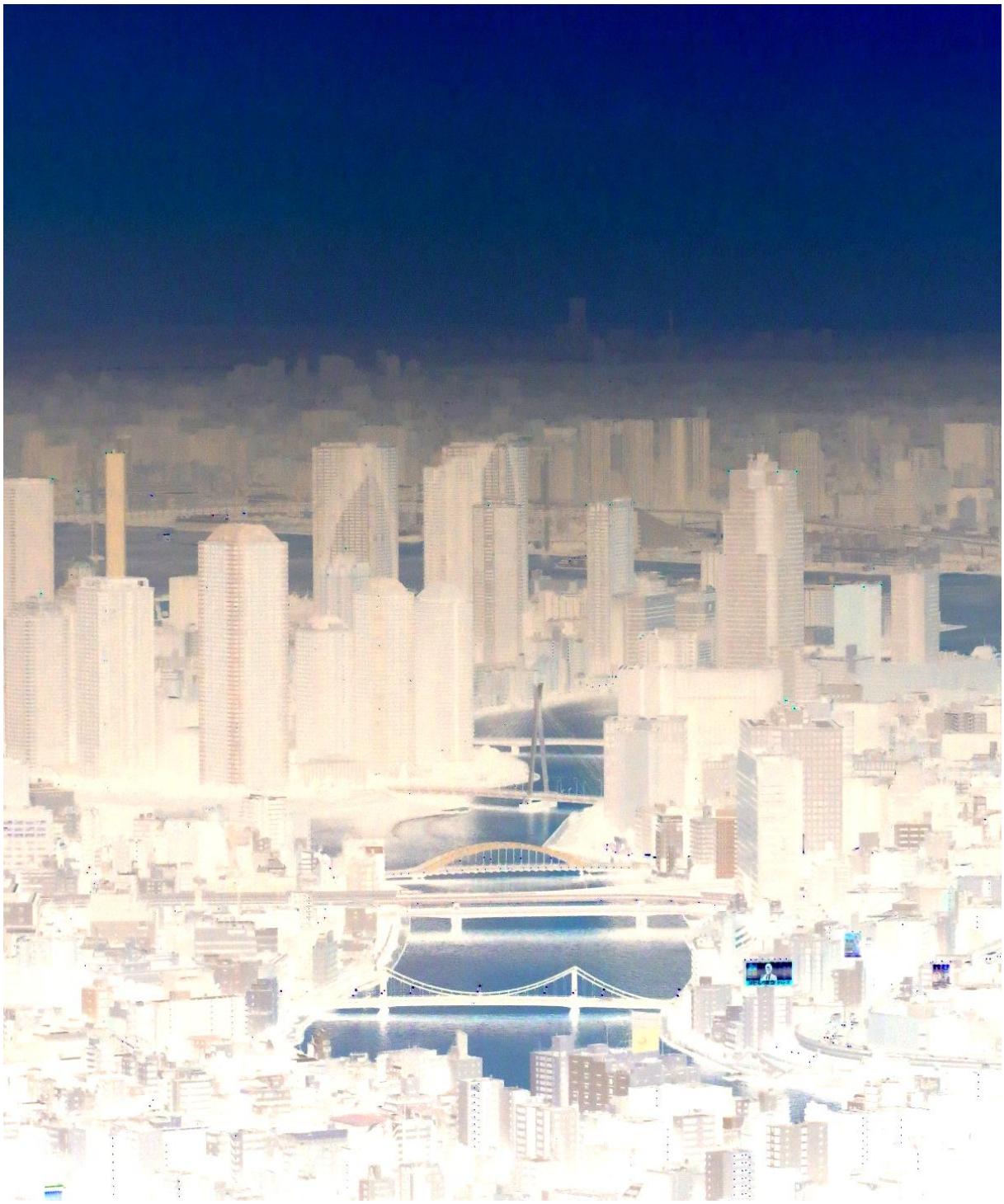

Tracing metropolitan post'networks in the fast changing East
Findings from Tokyo

João Rafael Santos

Post-doctoral research, Ohno Laboratory, Graduate School of Frontier Sciences, The University of Tokyo

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Contents


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Introduction

This report sums the contents and findings of the author's post-doctoral research developed at Prof. Ohno Hidetoshi's Laboratory at the Graduate School of Frontier Sciences of The University of Tokyo, between September 2013 and February 2014, funded by **AUSMIP +** Program's Post-Doc research grant.

The topic

The research topic is focused on the morphological understanding of the intersection/mediation between public space, landscape and infrastructure, in face of changing paradigms of post-networked metropolises. Tokyo metropolis stands as the territorial corpus for the research with its large scale and complex networks combined and patched into thinly weaved urban fabrics, having water and landscape as a powerful ground for its morphogenesis and offering a privileged perspective to contemporary urban debate.

The rise of networks and large technical systems as the drivers and backbones for urban and national development during the 19th and 20th century is now critically assessed in its conceptual fundamentals and spatial production processes. This criticism points out the uneven, elusive and highly distributed condition which undermines the fabric of the city as a continuous, democratic and redistributive realm. The concept of 'post-networked' cities (Coutard & Rutherford, 2011), made out of alternative infrastructural configurations – composite, decentralized, working as an urban ecocycle –, stands as a fresh and challenging conceptual framework, while allowing bridges between different geographical and cultural realities.

The topic is seen as critical in the context of recent economic, social and disciplinary trends, in cities and nations where the transition to a post-industrial economy is accompanied by changing demographic patterns (ageing, shrinkage), socio-political constructions (liberalization, glocal integration) and infrastructural-spatial apparatus (splintering, utility commoditization, premium bypassing). It also poses considerable challenges for urban planning and urban governance, while requiring innovative tools for analysis and decoding, not only within the disciplinary boundaries of urban morphology but also in its trans-disciplinary bridges with landscape and spatial design.

Research background

Acknowledging this conceptual challenge, previous research defined the concept of 'spaces of infrastructural mediation' (Santos, 2012, PhD in Urbanism) as an interpretative and design instrument for the metropolitan condition, as well as a morphogenetic mechanism. It proposes an understanding of the metropolitan fabric beyond conventional dichotomies and dual antinomies between infrastructure and territory. 'Infrastructural mediation' claims for a level of interaction in which sectoral approaches in analysis, planning and design are replaced by an account of trans-scalar and spatial features.

Results from various threads of research regarding Lisbon and its current state, acknowledge some of the characters of the 'post-networked' condition: the consolidation of the 'modern' national and metropolitan network for transport and mobility, water and energy supply and communications; the medium-term postponement of a new stage and level of infrastructural development (Trans-European Networks – High-speed train and logistic platforms) due to economical and financial crisis; the drastic stalling in urban growth, along with declining consumer demand and industrial production; the cracking down of the nation- and welfare-state as a guarantee and agent for equitable service provision. At the same time, recent urban renewal initiatives point out some interesting development strategies, namely resorting to landscape and open space and bridging them as structural elements in the making of local fabrics and public space.

Tokyo, on the other hand, although quite distinct from Lisbon in its geographical and cultural character, offers a unique point of view to develop comparative and transversal perspectives. This uniqueness comes from two aspects: a) the centuries long relationship between Portugal and Japan, sharing seafaring as a common ground for cultural and trade exchange, driving much of the urban and coastal development in both countries; b) the perception of a common position in terms of structural transition in the urban realm, associated to predicted population decrease and ageing, raising critical issues in the medium-to-long term: infrastructure and housing maintenance, socio-economical re-composition within the metropolitan territory, the changing role of public space and suburban fabrics in future development and adaptation strategies.

This is the level at which the large scale infrastructure is confronted with the rich process of morphogenic layering, through the agency of projects for urban renewal and public space improvement. Whether in Lisbon or Tokyo, this layering raises new questions regarding the role of spaces which previously and a clear functional and infrastructural use and rationale. In the context of a changing (post-networked) metropolis, in which functional hierarchies and administrative boundaries are blurred under the elasticity of a 'connective fabric', further inquiry into the specific characters of interfacing infrastructural, public space and landscape is seen as a challenge and opportunity.

In this context three questions arise:

- which spatial design tools and strategies are best suited to address the overall trend to socio-economical latency, scarcity and shrinkage felt in post-industrial and post-networked metropolises?
- despite acknowledging the continuing presence and prominent role of 'networked infrastructures', what role can be envisaged for urban infrastructure in face of emerging post-networked features?
- how can the attributes associated to the concept of a 'connective fabric' – made out of multi-layered built and infrastructural spaces but also of elastic thresholds and continuities of open space – contribute to build a spatial imaginary at the scale of the metropolis? Or in other words, a 'metropolitan landscape'?

Aims and methodology

Three key research aims were identified:

- The assessment of earlier research results in face of new urban and geographical contexts;
- The identification of critical features to address in the frame of a perceived transition in urban development paradigms;
- And a contribution to advanced research in metropolitan morphology and design.

The research was developed through what was seen in a streamlined and feasible methodology, given the short-lenght of its time frame. It was mainly targeted at defining Tokyo as a case study to assess the concept of 'port-networked metropolitan landscape' through:

- The framing of recent metropolitan development of Tokyo and its infrastructural spaces, resorting to specialized literature and cartography;
- The identification of critical issues associated to the 'post-networked' transition and its spatial features in Tokyo;
- And a critical discussion and conceptual assessment in terms of contemporary metropolitan morphology and design, especially in its potential to interface with other geographical realities.

The structure of the report

The report is structured in seven chapters, aimed at offering a systematized view of Tokyo's metropolitan development, the role of infrastructures and networks in that process, the planning proposals and architectural visions that both framed and emerged from its powerful transformation, and a topical overview of some relevant characters of a new (post)networked condition.

Chapter 1 offers a brief outline of Tokyo, its geographical and demographical data, and a short overview of its history and general settlement structure. Chapter 2 traces the main elements of network development which stand as the backbone of Tokyo's everyday flow and life, in their reciprocal and ever-changing relationship with the rich physical landscape. Chapter 3 introduces the spatial and morphological patterns that shape this diversified urbanscape, while paying some attention to some of the more elusive cultural concepts that play an important role in Japanese place-making. In chapter 4, a brief discussion is made on the cultural framing of city and urban-ness in Japan and its relationship with the urban planning policies, along with a reference to celebrated visions on Tokyo's future as an urban laboratory.

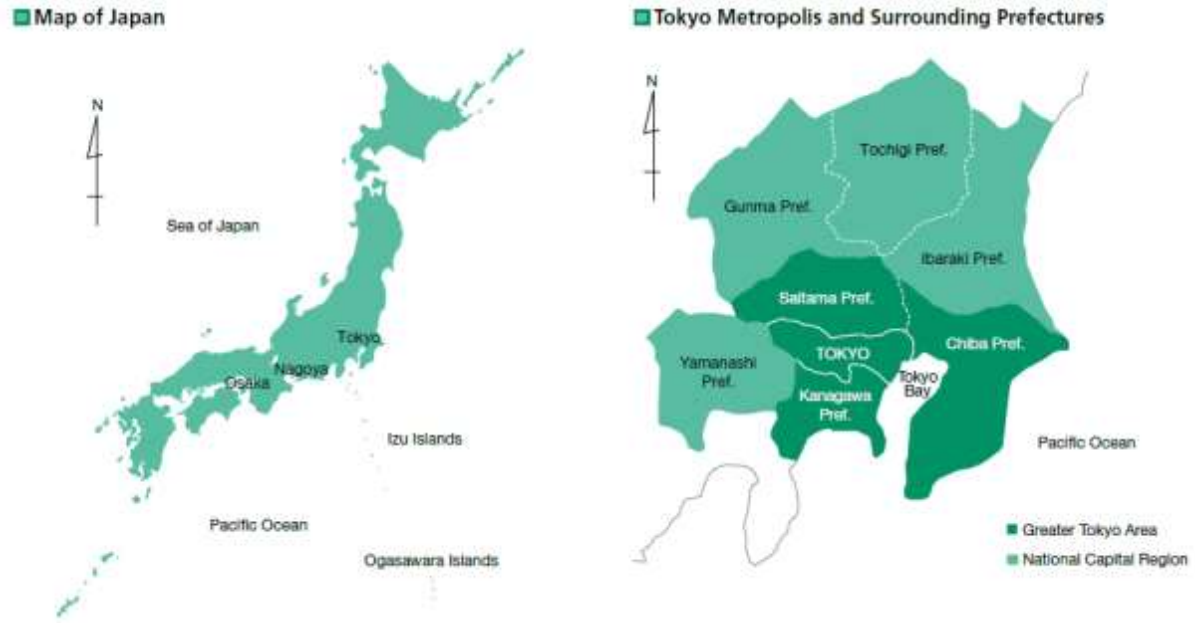
Chapter 5 stands as an interface between the overview of Tokyo's metropolitan development and the critical issues regarding network transitions, changing socio-economic paradigms and the contributions of Fibercity theory and design. Meaningful lines of transition with potential to offer alternative paths of development are outlined in chapter 6, resorting to relevant cases in Tokyo's urban and architectural panorama, with brief references to international cases (examples from Lisbon are also outlined). Chapter 7 offers some impressions on what could be discussed as traces of (post)networking in other Asian metropolises, gathered from a phenomenological experience and comparison with Tokyo. Finally, a short overview of main findings and synthesis with *post-network* and *Fibercity*'s are presented in Chapter 8.

1 Tokyo: a metropolitan outline

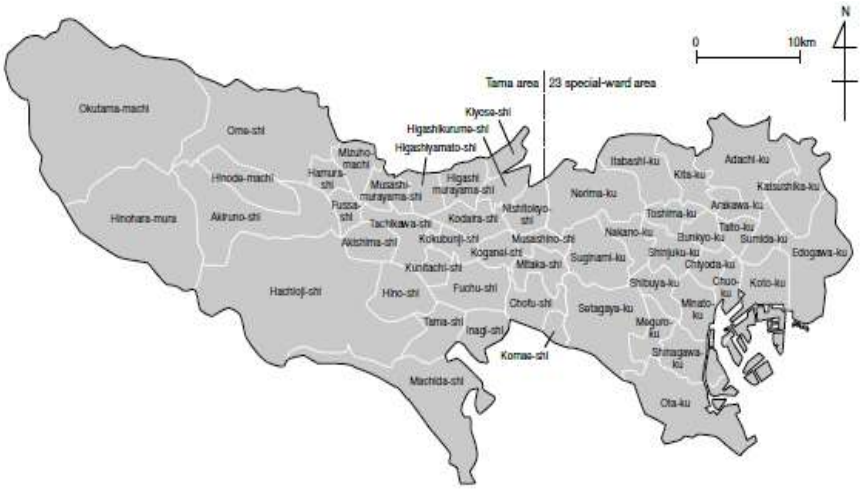
"Deciphering the massive and complex metropolis of Tokyo as a 'text' requires more than ordinary methods.

But if we persevere in our reading (…) no other city is as rewarding. (…)

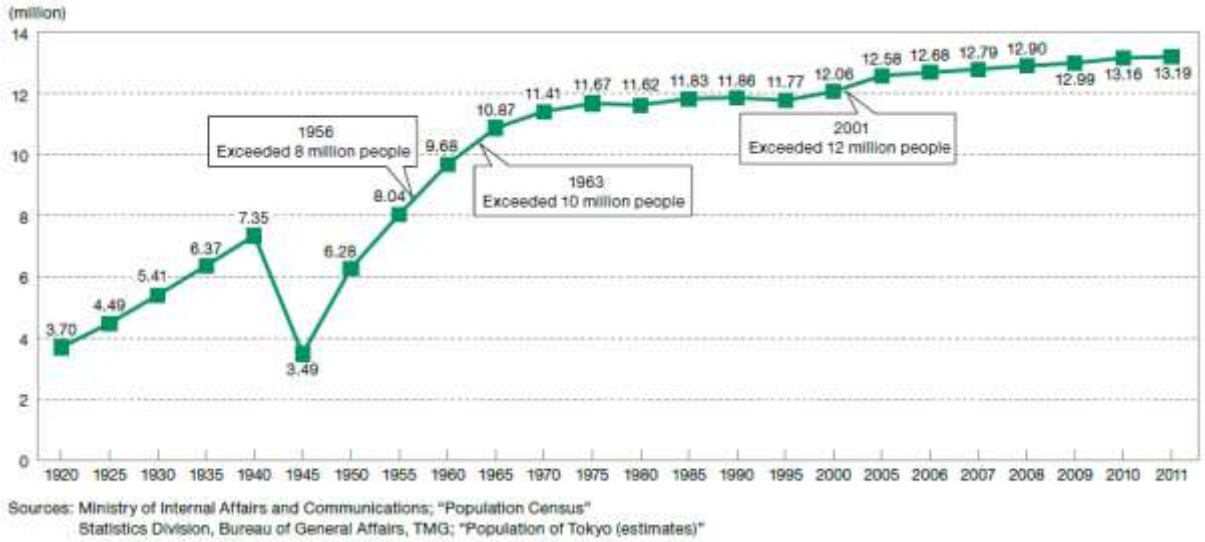
If we can read Tokyo, no other city in Japan, or in the world, can possibly faze us." (Jinnai, 1995, p. ix)



Japan and Tokyo Metropolis and Surrounding Prefectures. Source: TMG, sd, *Overview of Tokyo*



Administrative Areas of Tokyo. Source: TMG, sd, *Overview of Tokyo*



Sources: Ministry of Internal Affairs and Communications; "Population Census"
Statistics Division, Bureau of General Affairs, TMG; "Population of Tokyo (estimates)"

Trends in Population of Tokyo. Source: TMG, 2012, *Overview of Tokyo*

1.1 Geography, population, administration

When speaking of Tokyo, one must clarify the geographical scope to which is referring. There are three levels to which reference can be made:

- The ’23 Wards’ area
- TMG Area – Tokyo Metropolitan Government Area
- TMA – Tokyo Metropolitan Area

The ’23 Wards’ (population of 9 million in 2011, 622 km2) make the former Tokyo City limits, until it was abolished in 1943. The three central wards of Chuo, Chiyoda and Minato plus the five inner wards of Shibuya, Shinjuku, Toshima, Bunkyo and Taito, make up the area that can be defined as Central Tokyo, as it concentrates the main commercial, administration, cultural and touristic areas encircled by the Yamanote ring railroad line. The Wards (*ku*) are a special level of local government, with similar regulations and duties as Cities, but adapted to the specific administration needs within metropolitan areas. In Tokyo, the Wards are responsible for matters such as education, housing and welfare, whereas utilities and infrastructure provision such as sewage, water-supply and fire-fighting are handled at the next higher level – Tokyo Metropolitan Government.

Tokyo Metropolis (population of 13,2 million in 2011, 2188 km2) is a metropolitan Prefecture, along with the other 46 that make the whole of Japan, administered by the Tokyo Metropolitan Government (TMG). It comprises the 23 Special Wards, a long and narrow area to the west known as the Tama area, in which 23 cities, 3 towns and 1 village exist, and the Izu and Ogasawara group of islands. Cities, town and villages have the status of municipalities, and as such, they have a considerable degree of autonomy in their relation to TMG. Tokyo Metropolitan Governor takes the role of Mayor for the area comprised of the 23 Wards.

Tokyo Metropolitan Area (TMA), also known as Greater Tokyo, is made of Tokyo Metropolis and the three adjacent Prefectures of Saitama, Kanagawa and Chiba (population of 35 million in 2011, 13551 km2). At this level there is no government structure but it is seen as being a functionally integrated megalopolis, currently the largest one in the world.

Daimyo Procession at Kasumigaseki in Edo (1863). Utagawa Hiroshige II.
Source: http://collections.lacma.org/sites/default/files/remote_images/piction/ma-1330160-O3.jpg

Nihonbashi, 1911. Source: National Diet Library; Marunouchi building. Source: http://www.baxleystamps.com/litho/meiji/1912100623.shtml
Akasaka Palace of the Crown Prince, 1911; The Bank of Japan, 1900. Source: National Diet Library

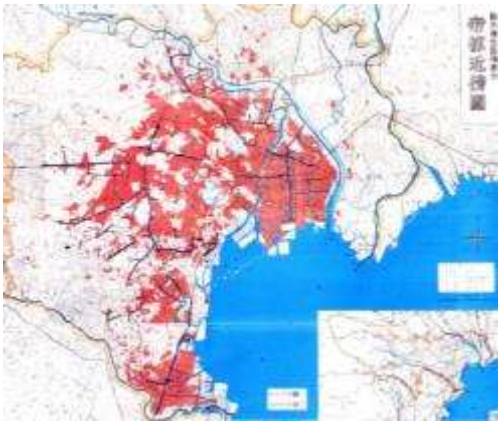
1.2 A brief historical overview

Tokyo (*To* – east, *kyo* – place of emperor) was established more than 400 years ago, in 1603, by Tokugawa Ieyasu, the founder of the Tokugawa Shogunate. At that time, only a small fishing village, it was named Edo (*estuary* in Japanese), bearing it until 1868, when it was changed to Tokyo and became the national capital of Japan in the wake of the newly established Meiji Regime. By the time of Edo's founding, Kyoto was the Japanese capital, but it quickly became the political, economic and cultural driver of Japan during the nearly 260 years of the Tokugawa period. During this period, also known as the Shogunate (from *shogun*, the military and *de facto* political leader) period, political and military power was firmly held by Ieyasu and its successors, through the maintenance of a strictly centralised and hierarchical system of feudal characteristics. *Daimyo* lords were given ruling privileges for regional domains across the country, but were under close control by the Shogun. A peculiar form of such control can be found in the *bakufu* system, in which an annual or bi-annual attendance to Edo to which *daimyo* lords were obliged as a sign of loyalty to the Shogun. The *daimyo* 'processions' apparatus was impressive and portrayed in some of Japan's most renowned cultural national treasures. They were important in the development of Japan's inland highways (*kaido*): Tokaido, connecting Tokyo and Kyoto going southwest through Yokohama, Nikko and Oshu, both to the northeast, Koshu and Nakasendo, both converging in Kyoto but through north-eastern routes. Post towns (*shukubamachi*) were laid at regular intervals along them providing support, accommodation and leisure for the travellers.

During the Tokagawa Period there was a rigid social class division, mainly in four groups, hierarchically ordered: the *samurai* (Japanese warriors), the peasants, the artisans and the merchants. The social status had visible repercussion in the layout of towns and cities, with the *samurai* holding the highest grounds with generous lots and, close to the castle. Castle towns (*Jokamachi*) were planned concentrating military and administrative power, following lines of communication and water resources in the 17th century, after Genna Edict: 'one castle, one domain'. This led to the development of a hierarchized network of cities heading large territories around them, managed by an increasingly powerful and centralized bureaucracy. Some 200 castle towns were settled. Edo, Kyoto and Osaka were the most important 'metropolises' at the time.

The most common urban layout had the walled *daimyo* castle as its focus. Unlike European castle towns, these bounded premises were off-limits to others than the *daimyo* and its close court and servants. Other classes surrounded the castle, in class separated locations. Commoner mob rising and rival daimyo insurgences were vital defence issues in spatial layout. *Machi* districts were laid in grid patterns in which a block structure (*cho*) housed artisans' and merchants' shops, their houses and backyard tenant houses (*nagaya*). Temple districts, made up of considerable open space, were located on the fringe, namely for defensive purposes. *Sakariba* districts emerged in the vicinities of religious gathering places, around which leisure and entertainment were

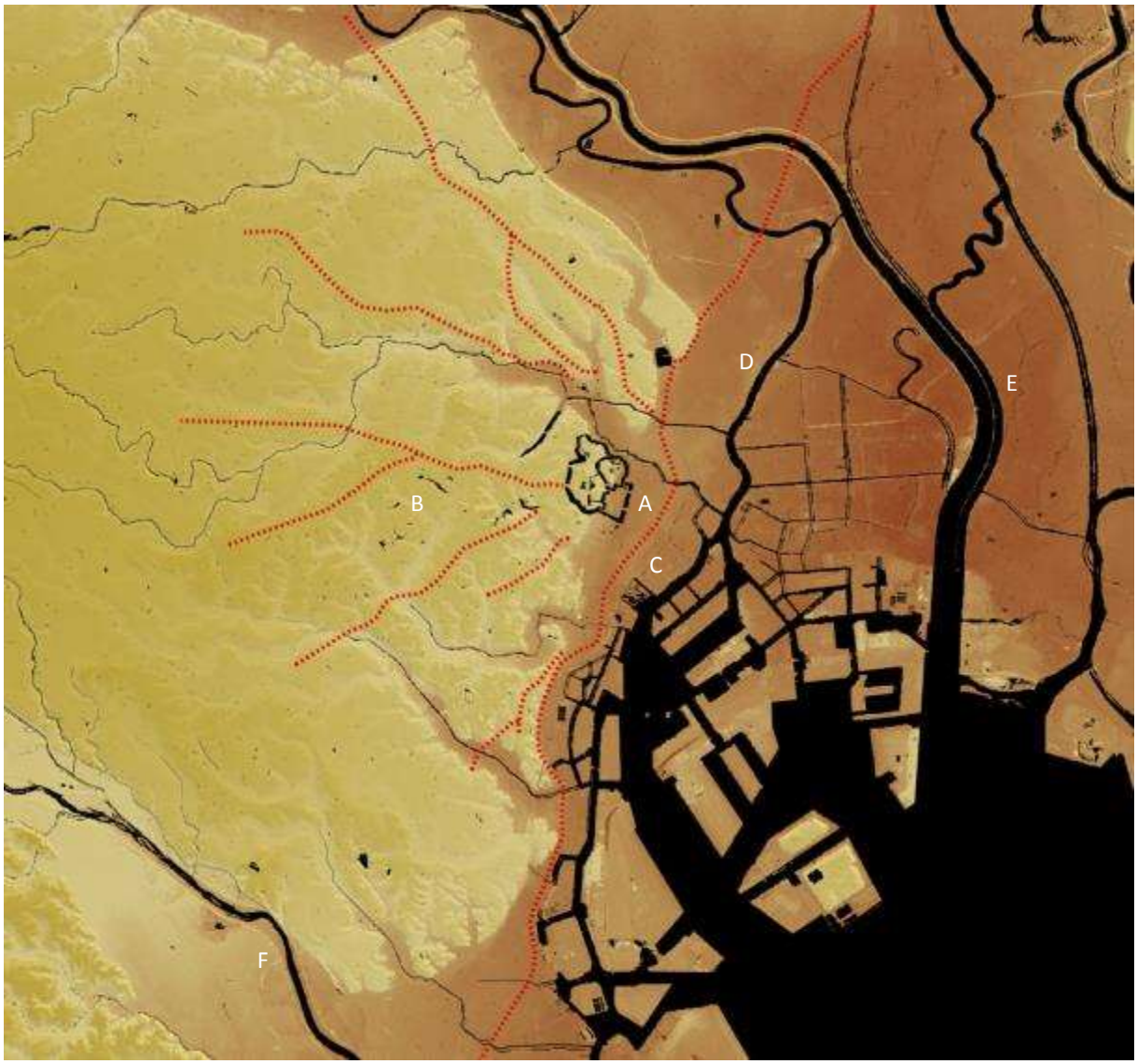

Elevated railway in Chiyoda Ward, 1911; View of Ichigaya seen from Yotsuya-mitsuke, 1911. Source: National Diet Library. Source: National Diet Library

Damage in Mitsukoshimae after the Great Kanto Earthquake of 1923. Source: Tokyo Metropolitan Library
War damaged area. Source: *A hundred years of Tokyo city planning*


The World War II devastation of Tokyo: Sumida River east bank and Tokyo station. Source: http://www.japanairraids.org/

laid. They often stood close to the city boundaries, taking advantage of its location along main routes and nearby bridges and the blurred authority in the boundaries between different administration areas.



The site and main road structure of Edo.A: Edo castle; B: Yamanote plateau; C: Shitamashi (low-town); D: Sumida river; E: Edo river.
Drawing by the author

Despite Japan's international isolation and a rudimentary feudal economy, Tokyo prospered thanks to a long period of political and military stability and to its prominent role as the undisputed administrative and high-society centre of the country. This system, enduring for quite longer time than its western counterparts, was deemed to face its internal and external tensions in a world of increasing political, economic and cultural interdependency and reorganization.

The Meiji restoration in 1868 was accompanied by the moving of the Emperor to the renamed city of Tokyo, confirming it as Japan's head city. A new political constitution was drafted, political power transferred from the *shogun* lords to the Emperor and his ministers, and great effort was put into economic, educational and

Tokyo's contemporary cityscape. Photos by the author

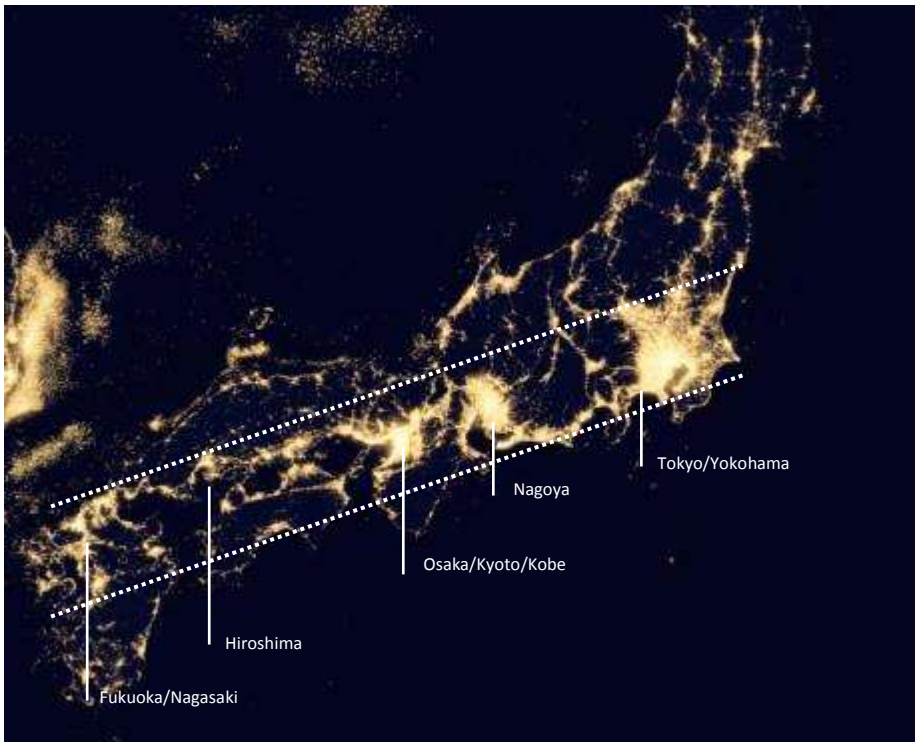
cultural modernization. This modernization actually meant *westernization*, given Japan's considerable delay in regard to the most developed countries at the time and a strong willing to meet the expectations and accomplishments of its international counterparts. As the capital city, Tokyo portrayed as the showcase for foreign powers to witness Japan's resolve and accomplishment in becoming a respected player in the international arena. In 1889 it reached a population of almost 1.400.000 people making it the largest metropolis in the world at the time.

After 1912, Taisho period was seen as one of change and transition, both towards cultural openness and social emancipation, but also towards militaristic nationalism and regional superiority. Tokyo's remarkable development during the Meiji period was flourishing during Taisho early years as the metropolitan way of life brought greater affluence and cultural avant-garde, in a trend not so far from the freeing air common to contemporary great cities as Paris and Berlin. However, this freshness suddenly vanished in 1923, when Tokyo was devastated by the Great Kanto Earthquake, destroying 300.000 houses and leaving 140.000 dead. Reconstruction was fast-paced and brought a number of modern infrastructures such as the first subway line (1927), Haneda Airport (1931) and the Port of Tokyo (1941). By 1935, Tokyo reached a population of 6,3 million. The 1930's saw the increasing engagement of Japan in a number of military conflicts with its neighbouring countries, eventually leading to the Pacific War and World War II. Destruction and loss of life reached yet unseen expression and a whole new start had to be made from ashes.

Post war years were single-mindedly dedicated to economic reconstruction and growth opening the path to one the Japanese ascent to one of the largest players in the world, reaching second only after the US in the late 1968. Tight limitations to individual and social amenities and levels of consumption were put in place, with priority being set to industrial development and export market. Japanese endurance and work-dedication culture became widely known, along with some of its corporate and industrial organization models, such as the *toyotism.* Cutting-edge technology in mechanical, transportation and electronics sectors became not only a brand of Japan, but also a distinct feature of the spatial and cultural way of life of inhabitants, especially in the large metropolises such as Tokyo, where train commuting, electronics mediated entertainment and architectural utopias – such as the ones endeavoured by the *Metabolist Movement* – found its way to everyday life.

Tokyo's development into the 1980's was mainly characterized by a shift from industrial to services and financial sectors growth. The sheer size of its economy allowed for the development of high profile service sectors being concentrated in the capital, in tandem with Japan's increasingly internationalized investment. By the 1990's it had become one of the worlds' *global cities* together with London and New York (Sassen, 1991), commanding a highly sophisticated network of investment generated by Japan's trade surplus. From that point onwards, Tokyo's economic driving force was no longer its traditional industrial sector which had grown through domestic consumption and technology exports, but one of capital-based trade, in which banking, stock market, financial funds and investment securities took the leading role. At the level of administration and

The maiden voyage of Shinkansen in 1964. Source: http://www.japantimes.co.jp
Current Shinkansen series N7000 trains. Photo by the author



The Japan Megalopolis (Tokyo- Fukuoka). Source: Adapted from NASA Earth Observatory & http://www.blue-marble.de/nightlights/2012

Sumida River at night. Photo by the author

urban planning initiative, the word was for ‘de-regulation’ and liberalization, in a process akin to the UK’s and USA’s, leading to considerable withdrawing of government from active policy making and investment. The early 1990’s were also known for the collapse of Japan’s ‘bubble economy’, a period during which largely speculative investment was pursued through land management deregulation and debt-funded multi-million yen projects, leading to soaring and unrealistic land prices and asset values.

Profound economic reorganization and the end of an almost unstopped line of economic growth since post-war hit Japan hard; much more moderate levels of economic growth were going to be the new paradigm, with the collapse of the belief in a forever-growing scenario. Economy had a limit after all, and so had the environment and the burdens in quality of life Tokyoites had to endure for its economic prosperity. At the turn of the century Tokyo had done considerable investment in improving its environmental quality, with sharp decrease in pollution levels and higher level of investment in urban amenities. It became also a worldwide beacon in new areas related to high-technology, leaving conventional heavy industry behind to cities like Osaka and to foreign countries, along with the emergence of creative industries in the fields of media, fashion, design and entertainment.

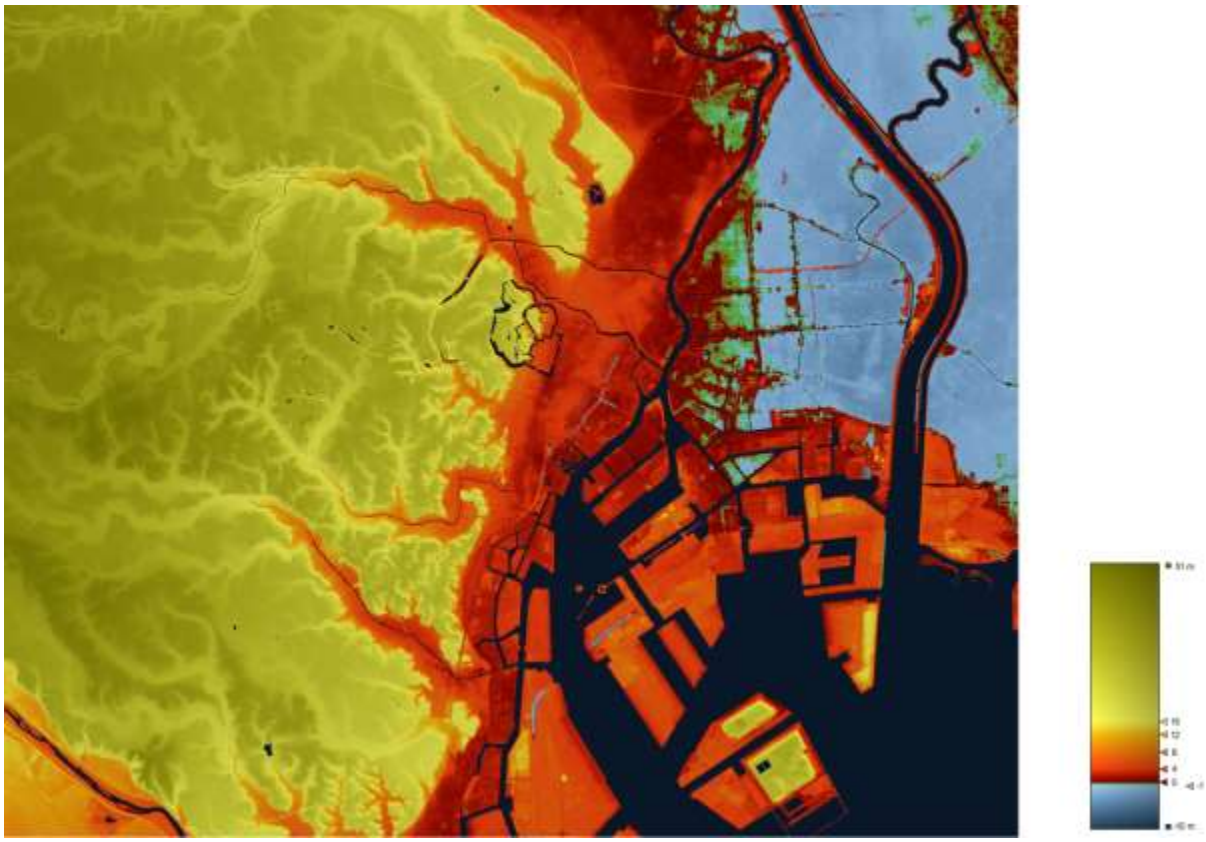
1.3 The site and basic settlement structure

Tokyo is located in a central position regarding the country’s geographical area, at the edge of Kanto plain, Japan’s largest and most fertile region, with open though protected access to the sea. Geographically it is shaped by the combination of plateau highlands of Yamanote to the west and the highly irrigated flat low lands, where the flow of Edogawa, Arakawa and Sumidagawa (*kawa* - river) converges to shape a meandered fertile plain before reaching Tokyo’s bay. Sumidagawa and Tamagawa bound Edo to the northeast and southwest respectively. Yamanote plateau is shaped by a number of valleys and smaller streams (Koishikawa, Megurogawa, Nihombashigawa) draining to the lowlands. They carve a rich and waving topography which used to be covered by dense forest and greenery.

Edo’s founding footprint can be traced to Tokugawa Ieyasu Castle in Chiyoda, today’s Imperial Palace grounds, a fortified structure surrounded by a system of walls and moats. Its position at the edge of Yamanote’s plateau and facing the low land area offered a strategic control of both the land and water approaches, over the main highways (*kaido*). Edo’s basic settlement structure is often described in simple terms as the laying side by side of two different areas: the Yamanote high land and the *Shitamashi* (lower town) in the lowlands by the water.

A bird's eye view of Edo from the 1850's. Source: Jinnai, 1987

Cargo ships on the river-side of Edo with bridge on the forefront. Source: Jinnai, 1987



Tokyo's topography. Drawing by the author

Yamanote higher grounds were the site for the *samurai* settlement. Lands were subdivided in rather irregular patterns shaped by the topographic features, and usually following the pathways converging in Chiyoda. Ridge lines were the main guidance for these paths, allowing for the siting of generous lots with detached houses and gardens, leaving the slopes and lower land to lower status *samurai*, often mingled with commoner lots in a much denser and subdivided fabric. Woodlands, *daimyo* and *samurai* gardens along with shrine and temple premises made Yamanote a quiet and attractive green mosaic of winding roads and walled estates. Many shrines and temples were established at the edge between the high and low lands, occupying the slopes, over which a steep staircase and pathway was laid as their entrance. Topography and ground – mountains, rivers, and trees – are, in fact, a key and sacred element in Shintoism religion. Hill sides were named as *Shiomi-zaka* if sloping to the water (eastward) or *Fujimi-zaka* if facing Fuji Mountain (westward). Water and land, bay and mountain are meaningful in the way how space is identified and named, bridging a large scale territorial awareness with the micro-topography details of place making.

Shitamachi low lands, by the rivers and the bay were the site of commoner people, namely merchants and artisans, taking advantage of the good access by road and mainly water. *Shitamashi* was laid according to the aforementioned regular grid and block structure, mixing shop and housing uses. The common typology in these districts was the *Machiya* townhouses (*Machi*-town; *ya*-houses), in which the street front age was used for commercial activities and the shop owners house, and the backyard was occupied by small, fragile and very low quality tenant houses (*nagaya*) along narrow alleys (*roji*). The laying of urban blocks followed a somewhat

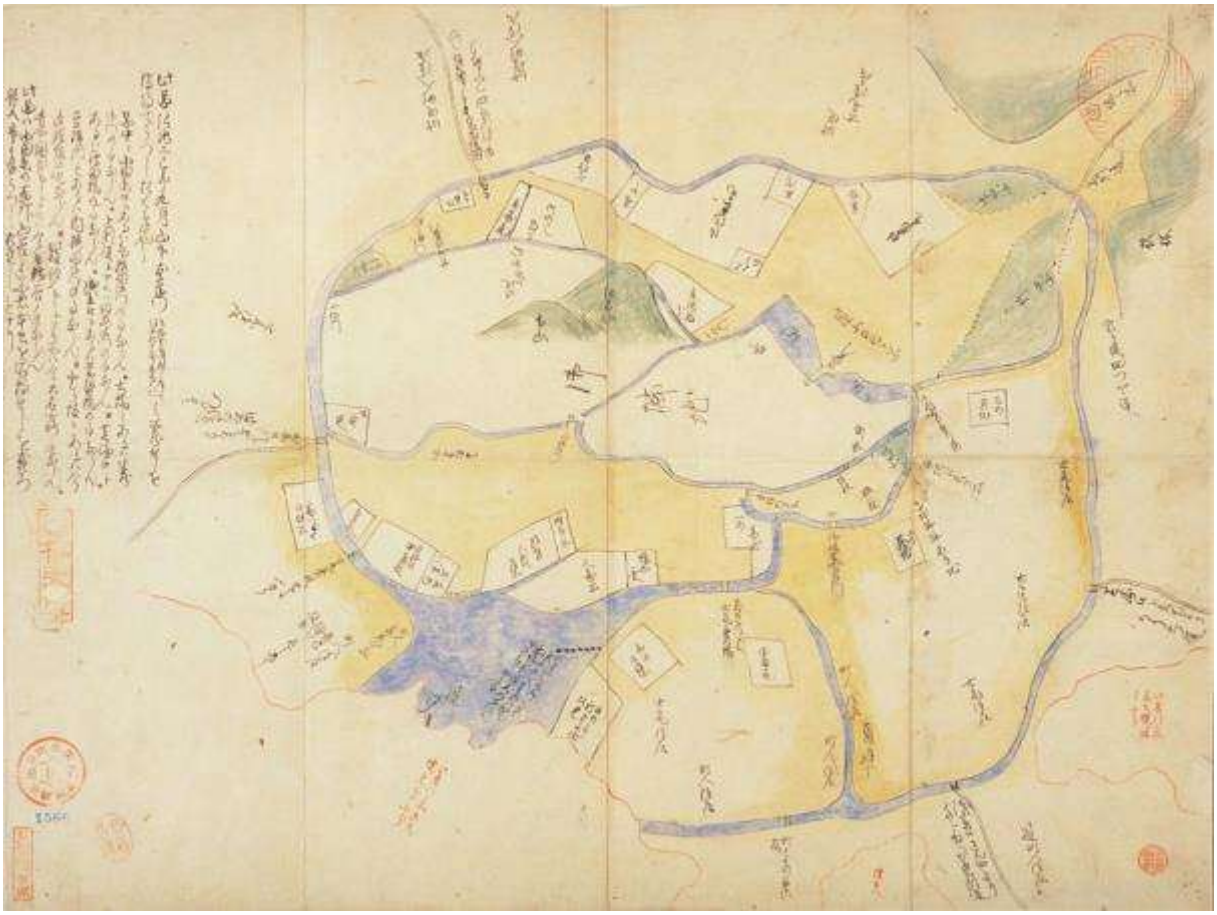
Bundo Edo oezu: kan / Ishikawa Ryusen. Hoei 7 [1710]. Digitalized and available at East Asian Library, University of California/Berkeley

Edo jushigori shiho yochizu [c. 1845]. Source: Digitalized and available at East Asian Library, University of California/Berkeley

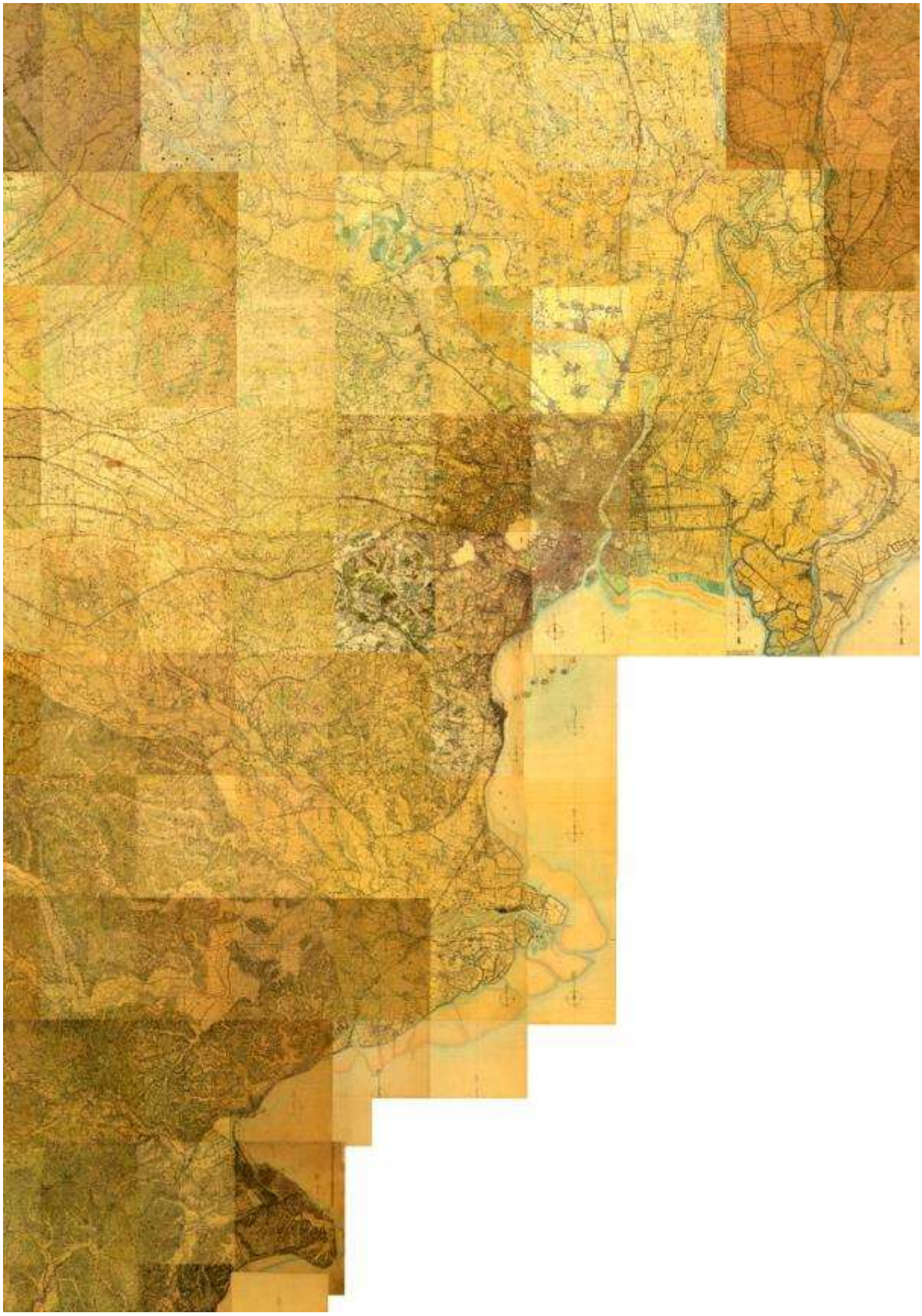
'standard' subdivision metric of 1 *cho*, approximately 60x60 *ken* (each *ken* is 1,818 meters). These *cho* formed not only a geometrical pattern that can still be seen in some of today's Tokyo districts such as Nihonbashi, but also an administrative unit and a basic form of community and vicinity.

Shitamashi districts grid pattern must also be understood in its relationship to the land reclamation process which allowed building over rather wet land, often subject to flooding. In fact, the regular grid structure is clearly associated with drainage and shipping canals and moats, straightened tracts of river mouths, and protection barriers against tides and floods. Tokyo's *shitamashi* is basically a water city, revealed in the traces that artificially shaped its land and water. Waterways were the arteries through which city life and goods flowed. Bridges, although kept at a low number for defensive reasons during the Tokagawa Period, were focal points of trade and entertainment.

1.4 Cartography of Edo and Tokyo

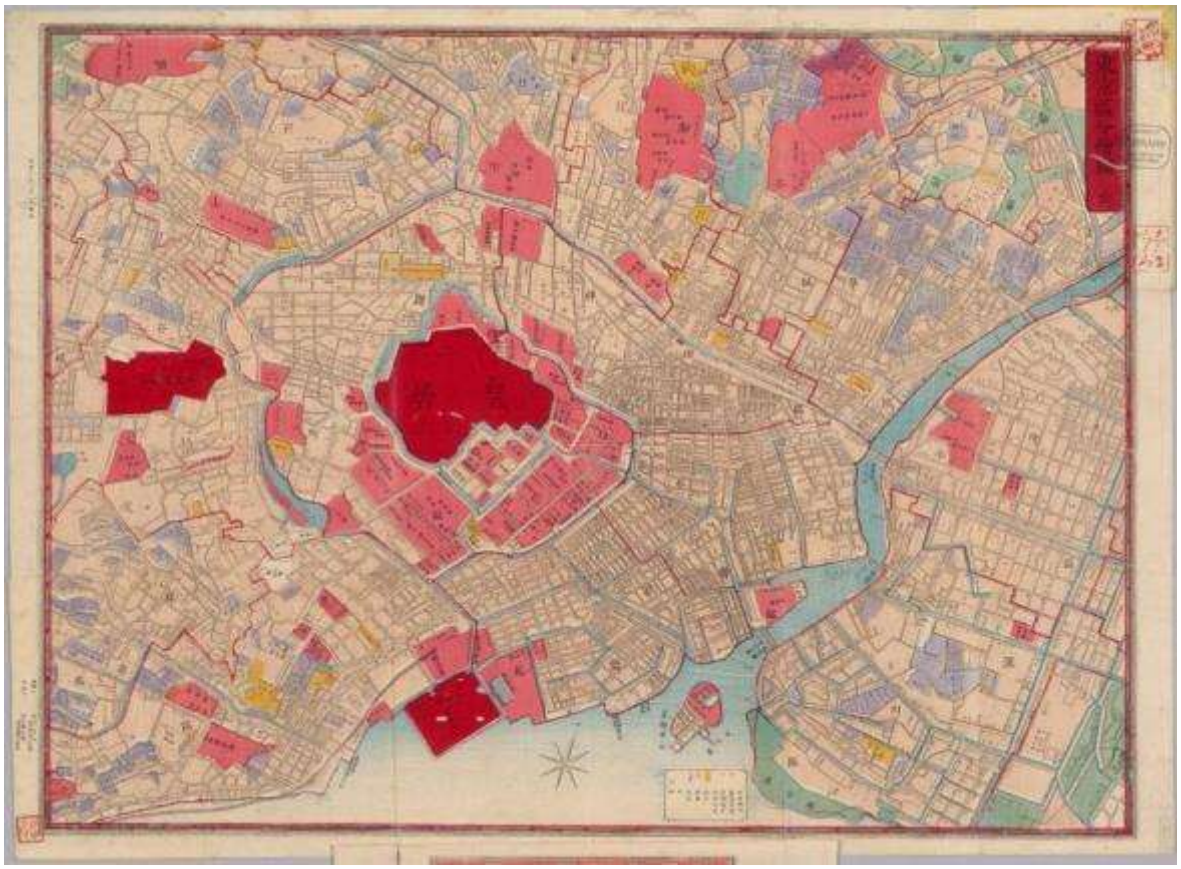


Edo Keicho Map [otherwise known as the copy of Edo Keicho Map]. 1845.
Source: http://www.library.metro.tokyo.jp/Portals/0/edo/tokyo_library/english/upimage/big/055.jpg



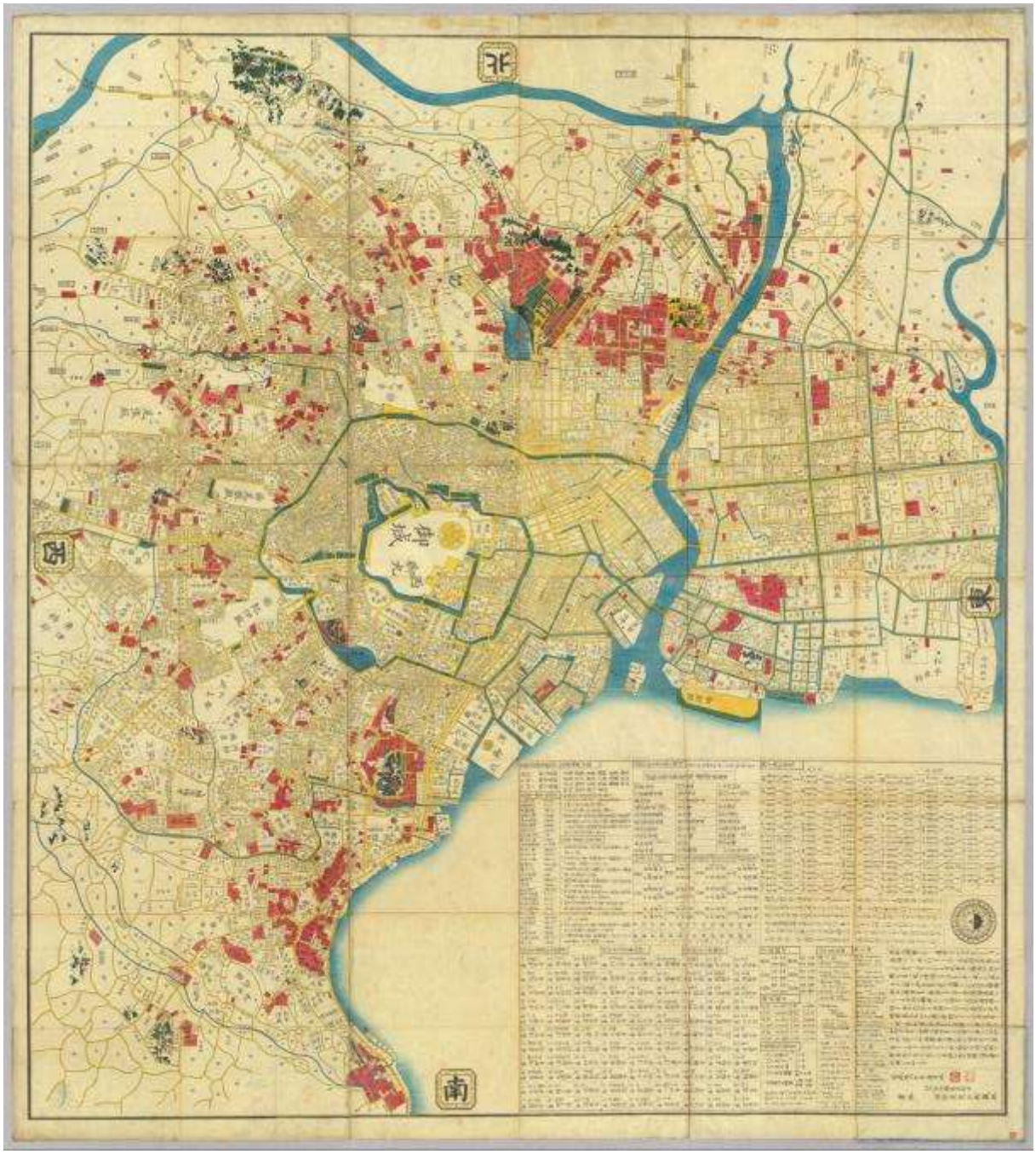
Rapid Survey Map in Kanto Plain" - 1:25000 map in Kanto Plain. Created on 1880 (Meiji 13) - 1886 (Meiji 19).
Source: Digitized by Historical Agro-Environment Browsing System, http://habs.dc.affrc.go.jp/ (mosaic joined by the author)

Edo zukan komoku / gako Ishikawa-shi Toshiyuki. Genroku 2 [1689]. Digitalized and available at East Asian Library, University of California/Berkeley

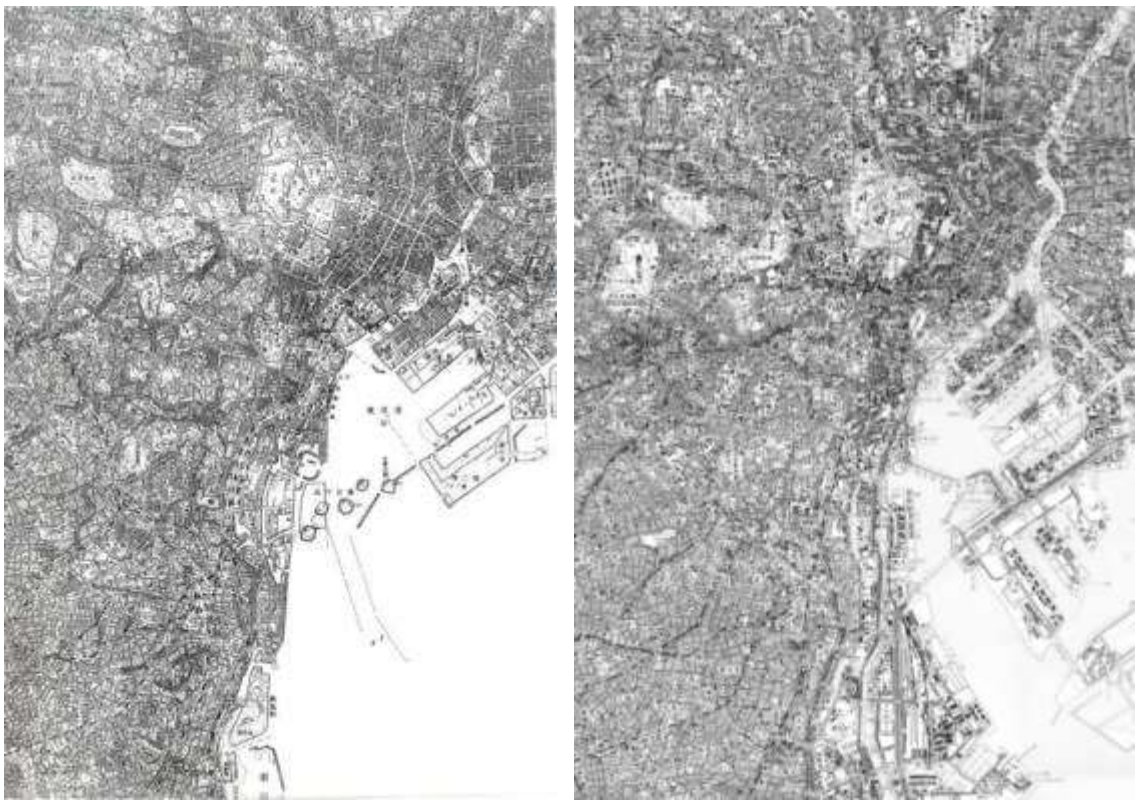


Tokyo kubun ezu: zen / Shimizu, Shigeyuki. Meiji 13 [1880]. Source: Digitalized and available at East Asian Library, University of California/Berkeley

Tokyo shigai oyobi kinko no zu / Tokyo-shi. [between 1907 and 1911]. Digitalized and available at East Asian Library, University of California/Berkeley



Bunken Edo oezu: kan / Fusai Mori. Ansei 5 [1858]. Digitalized and available at East Asian Library, University of California/Berkeley



Tokyo Topographic Map, 1955 and 1995, 1:20000

1:5000 map in Tokyo Central. Created on 1883.
Digitized by Historical Agro-Environment Browsing System, http://habs.dc.affrc.go.jp/ (mosaic joined by the author)

Tokyo and Environs (Nihombashi sheet), US Survey, 1945, 1:12500. Source: http://www.lib.utexas.edu/maps/ams/japan_city_plans/index_tokyo.html

Tokyo-shi zenzu / Ando Rikinosuke. Dai 5-han zotei. Meiji 38 [1905]. Digitalized and available at East Asian Library, University of California/Berkeley

2 Networking Tokyo: infrastructure and landscape

"[Tokyo] has to operate with mechanical precision or otherwise it would come to a grinding halt, and this is a reflection of a highly ordered and indeed a hierarchical society, one in which there is no place for chaos."

(Waley, 2006, p. 368)

Ukiyo-e painting of Nihonbashi and canal. Katsushika Hokusai. Source: http://www.katsushikahokusai.org/

Ginza Dori, 1873. Source: City Planning Institute of Japan, 1988
Nihonbashi. Source: http://www.baxleystamps.com/litho/meiji/1912100623.shtml

The Meiji period set the socio-political background in which profound modernization took place. Until 1868 Japan's political, economic and social structure resembled much of Middle Ages' European feudal characteristics. This meant that the basic infrastructure and industrial base was still characterized by poor road networks and pedestrian and horse mobility favoured instead of carriage technologies. A mostly agricultural and low-tech manufacturing based economy was the basis for limited pre-modern urban utility services and deeply rooted indigenous socio-cultural traces.

The opening of Japan to the international economy was accompanied by a strong commitment of the new regime to the modernization of the country's economic, educational and infrastructural fabric. Western influence was paramount in this process, with regular visits of Japanese technical staff to Western countries and large scale import not only of foreign technology, but also urban planning references and cultural habits. The development of railways was probably the most visible and structural process in the long term. Though starting relatively late when comparing to Western countries, in 1872, railroad network became the backbone of Japan and, of course, of its largest metropolis, weaving a dense, complex and tightly knit network which probably makes contemporary Japan the most advanced country in the world in this field. Probably being a quite righteous metaphor for the smooth efficient running of Tokyo metropolis, the railways are actually just one of the many networks that shape Japan's capital city as a clock-like synchronized flowing landscape.

2.1 Moving around, from water to motorways

Japan being an island, water transport has had a prominent role in the development of its urban structure. In times in which land travel was very difficult, sea and river faring were far more important in connecting people and markets, cities and overseas cultures. Tokyo, of course, standing in the strategic confluence of a deep penetrating river network with the shallow and protected waters of its bay, could be nothing else than a water-based hub for local, regional and national transport along its coast line. The rivers embankments were once the natural quays and harbours, bridges and their premises the places where people and goods converged between water to land. Bridges stood, in fact, as the central features in shaping pre-modern Tokyo mobility network, as they distinctively combined the water and land paths. *Nihombashi* – literally 'Japan's bridge' – is probably Tokyo's foremost historical landmark in tandem with the Imperial Palace: the former, a place of bustling activity, the proud of a trading and burgeoning city; the latter, a bounded and inaccessible guardian of political power, a vortex around which the city swirls in a spiral without ever reaching its core.

Yamanote plateau's road pattern was shaped by the west highway converging towards Edo's castle, and the smaller and narrow streets highly partitioned and moulded by the topographic contours, whereas *shitamachi* districts in the lower plains had its road system shaped by the straight lined Tokaido highway, set in a tangential line in relation to the castle's premises. This tangentially allowed for a continuous development, with

Aerial view of Nihombashi and its vicinity, 1954. Source: Tokyo-Edo Museum Exhibition
Tokyo Expressway under construction, 1964. Source: Associated Press, available at http://online.wsj.com/news/articles/SB10001424127887323623304579054211566880336#1

The expressway network planned for the Olympics.
Source: City Planning Institute of Japan, 1988, p. 41

Current metropolitan expressway network

little constraint from any hierarchical approach to the castle. *Shitamashi's* plain and reclaimed ground, together with its water channel network, provided the basis for its regular gridded street pattern, prone to extension, densification and subdivision in a quite flexible and incremental process.

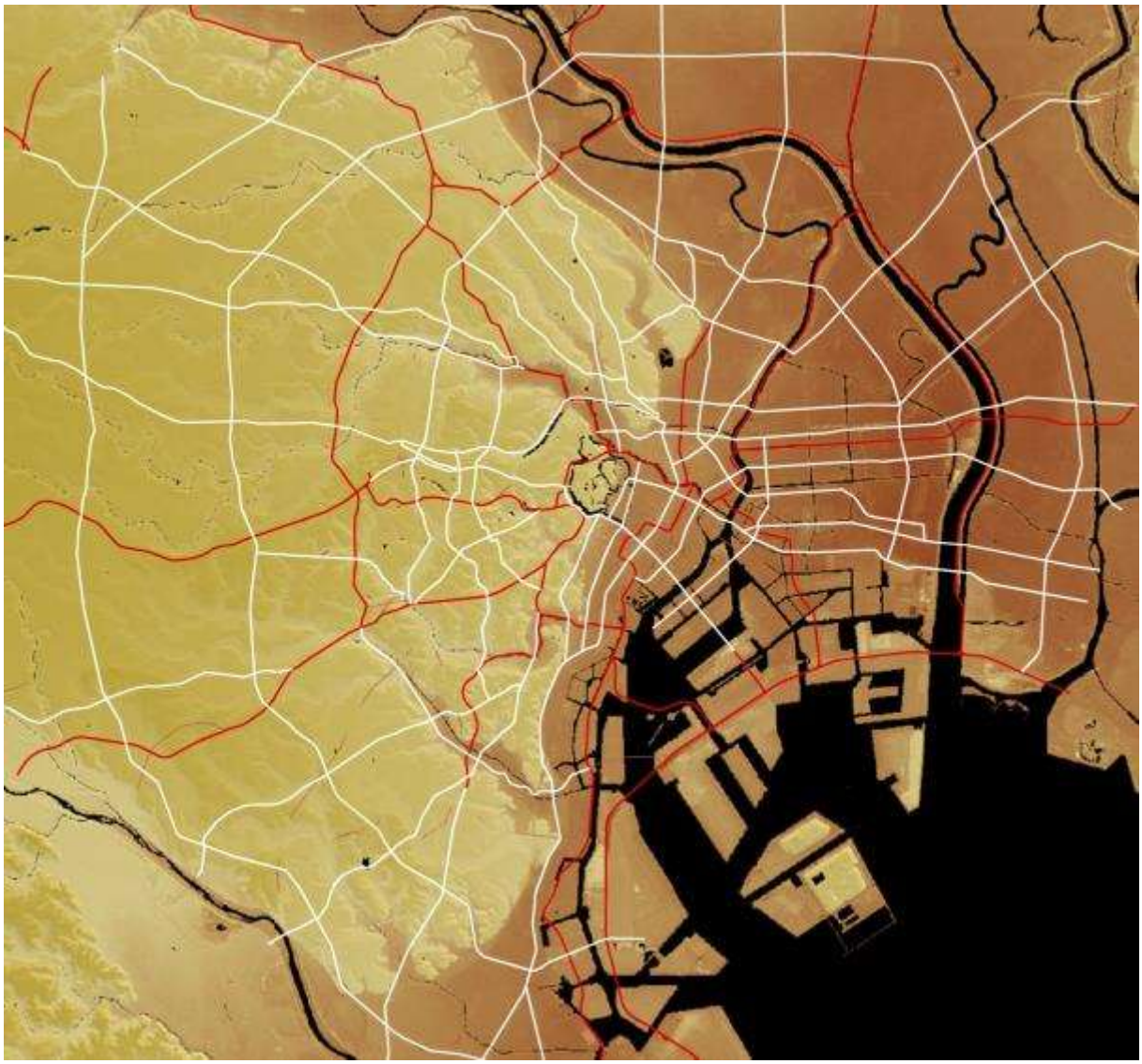
The persistence of this regular pattern is clearly noted as one traces Tokyo's cartography since the middle 19th century and finds today's street and block structure largely unchanged in its fundamentals. Major change was made after the Great Kanto Earthquake of 1923, with some of its main roads considerably widened, and with the filling in of former water channels turned into new streets. Today's hierarchy and slight variations in Tokyo's lower districts' grid pattern are the result of this interplay between the fundamental structure of water spaces and simple road axes. In the 1960's, this relationship would be exploited to its climax with building of the metropolitan express motorway system.

The introduction of high speed motorways reshaped Tokyo's landscape as they were overlapped in a densely built space. The urge for completion in time for the 1964 Olympics and the difficulty in crossing through existing fabric led to the option for using the city's riverbeds as the channels for the motorway network. They were linear open spaces, connecting major areas of the city with its surroundings and, most importantly, didn't require expropriation. The valleys and rivers, previously important lanes for trade and transport with the hinterland, became the bed for the modern lines of motorized flow. In most parts, this network was built on an elevated level, avoiding landfilling or difficult crossings at ground level. As such it can be seen as strong and omnipresent architectural element, although often invisible by high-rising buildings the block the view from many of Tokyo's streets.

The elevated express motorways have also played an important role in defining and revealing Tokyo's contemporary landscape. It has become a symbol of the city network's complexity and efficiency and a moving lens through which Tokyo's urban forest can be appreciated like in no other way. The way how the express motorways articulate with the water below and surrounding fabrics triggered wide criticism but also notes of appraisal. One of the city's most well-known landmark sites – Nihombashi Bridge – has been dwarfed by the overpassing viaducts of the *Inner Circular Route*. On the other hand, in Ginza, one of few Expressway tracts that doesn't actually overlaps water – though that area was once a canal –, a clever design mixing commercial spaces and the roadway into one coherent structure has allowed for a widely celebrated bundle between infrastructure and architecture.

The future of the express motorway's future in central Tokyo is open to debate with recent proposals to bury at deep underground (below 60 m) its main sections, namely the *Inner Circular Route*, as legislation exempts procuring land for public use at depths greater than 40 meters. Increasing maintenance costs and disaster resistance concerns of these ageing structures are claiming for renewed interest in its future.

Tokyo's roadscape: (from upper left to lower right) Expressways in Nihombashi, Showa Dori, Ohashi, Sumida River and Misato-chuo. Photos by the author



Expressways (in red) and highways (in white) in central Tokyo. Drawing by the author

On a wider scale, and during its first decades, Tokyo's motorway network had a clearly radial structure, which contributed to high congestion levels at the central areas. Only recently has it been changing to a radio-concentric overall layout, with the building of new ring tracts: the *Bay Shore Route* (crossing several artificial landfills in the bay area) in 1994 and the *Central Circular Route* (defining an approximately 8 km radius around the Imperial Palace), opened in 2010. Two outer ring motorways (*Gaikan Expressway* and *Ken-O Expressway*) are also partially built at approximately 15 and 40-60 km radius respectively, with some of its tracts still on planning stage. This new layout reinforced Tokyo's organization in looping structures, with the Imperial Palace and Gardens as the innermost 'hollow' space. It is also expected to help reducing congestion, travel time and cost while improving distribution efficiency and allowing passing traffic to bypass the capital.

The share of car travel is relatively lower when comparing to other developed countries' metropolises. Low car ownership, lack of a good and efficient road network and shortage of parking space in central city districts have contributed to give rail based public transport the predominance in metropolitan mobility patterns.




Odaiba island: Rainbow bridge; Yurikamome New Line; Tokyo Teleport; Fuji TV Headquarters. Photos by the athor

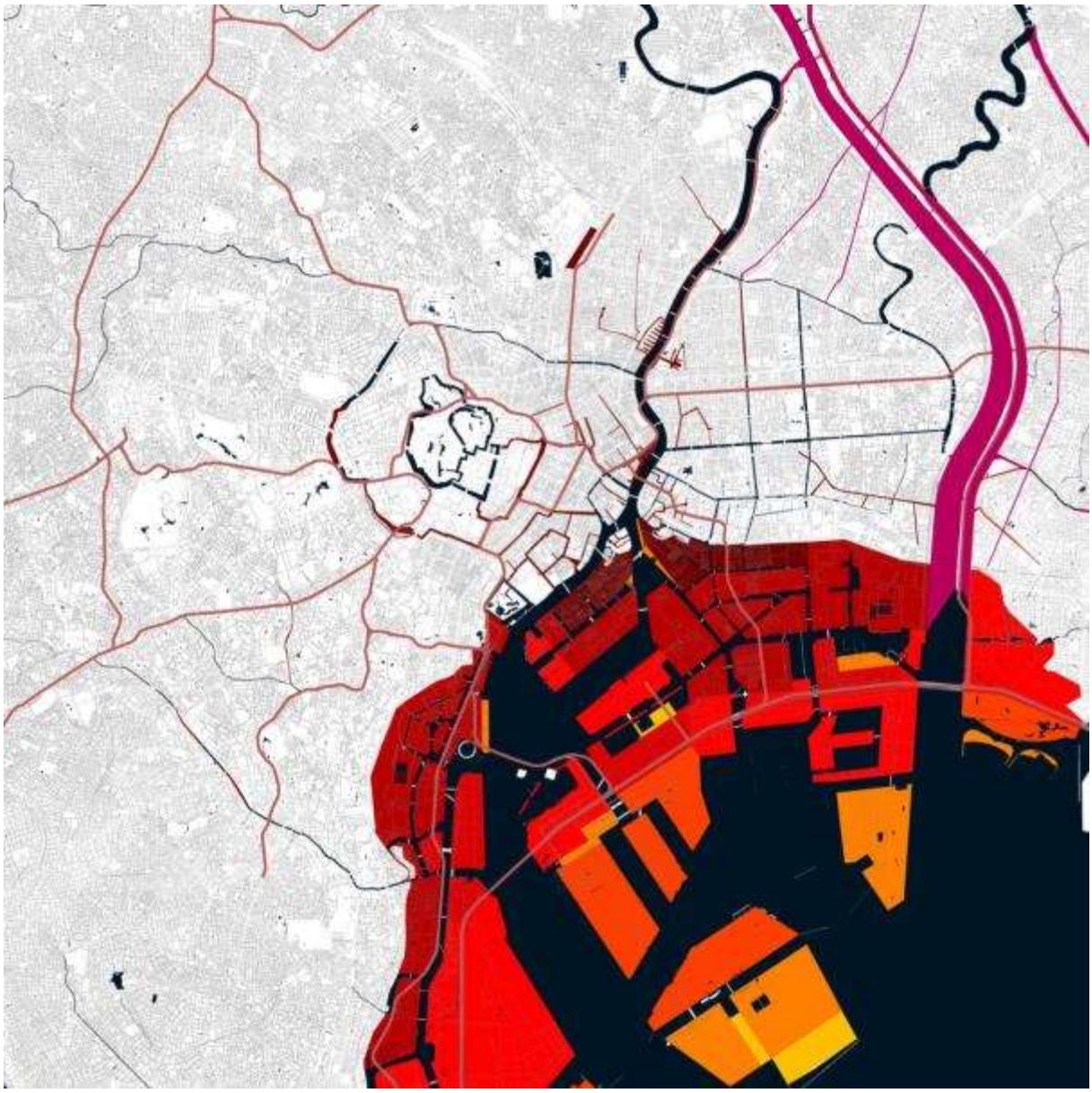
2.2 The making of an artificial bay

The large marshlands standing to the east of Tokyo were once a major barrier to the trade and supply between the city and its agricultural hinterland in the eastern and northern provinces, as well as to the rich salt fields in the Gyotoku area. They were often flooded and difficult to cross by foot, demanding considerable detours by boat or around through the northern roads. One of Edo first rulers' priorities was to improve the connection over this wide tract of low lands. An extensive network of regularly laid crisscrossing canals was built, shaping today's wards of Koto and Sumida.

Reclamation of this alluvial low land has been a process observed in other cities in Japan, usually associated to socio-spatial and political-administrative urban partitions (Ishida, 2001): during Edo times, low land was mainly reclaimed for mass housing for lower classes, resorting to rather simple and regular grid layouts that made administration easier, while the higher lands were kept for ruling classes with more labyrinthic street layouts for defensive purposes. As a productive land meant to house commoners, merchants and port facilities, Tokyo's low lands and its waterfront have been seen as sites for pragmatic use since old times. In a context in which the mountains, gardens and high lands were assigned high cultural and social value, Tokyo's relationship with its bay have been relatively bounded by utilitarian and socially undervalued criteria. It is no difficult to understand how these spaces have become the main heavy industrial and infrastructural support for the huge metropolis during the 20th century. Military facilities, harbour and storage areas, railroad yards and large industrial complexes were built along a deep belt around the Bay, closing it to the inland urban areas. As part of this complex infrastructural apparatus relying on artificial land on the Bay, the waste dumping sites stand out as mirrors of a long established concept of the water as mainly functional and infrastructural space. The first waste landfill on the bay started operations in 1927 and, since then, seven more sites have been built to that purpose. Currently, only one site remains in operation at Chubo landfill, around the central break-water in the southernmost part of the bay.




Tokyo and the water: Kanda River at Ochanomizu; Tokyo Bay and Kyu Shiba Rikyu garden; Hama-Rikyu Gardens; Odaiba waterfront. Photos by the athor



Evolution of landfills in Tokyo Bay; expressways superimposed (purple). Drawing by the author

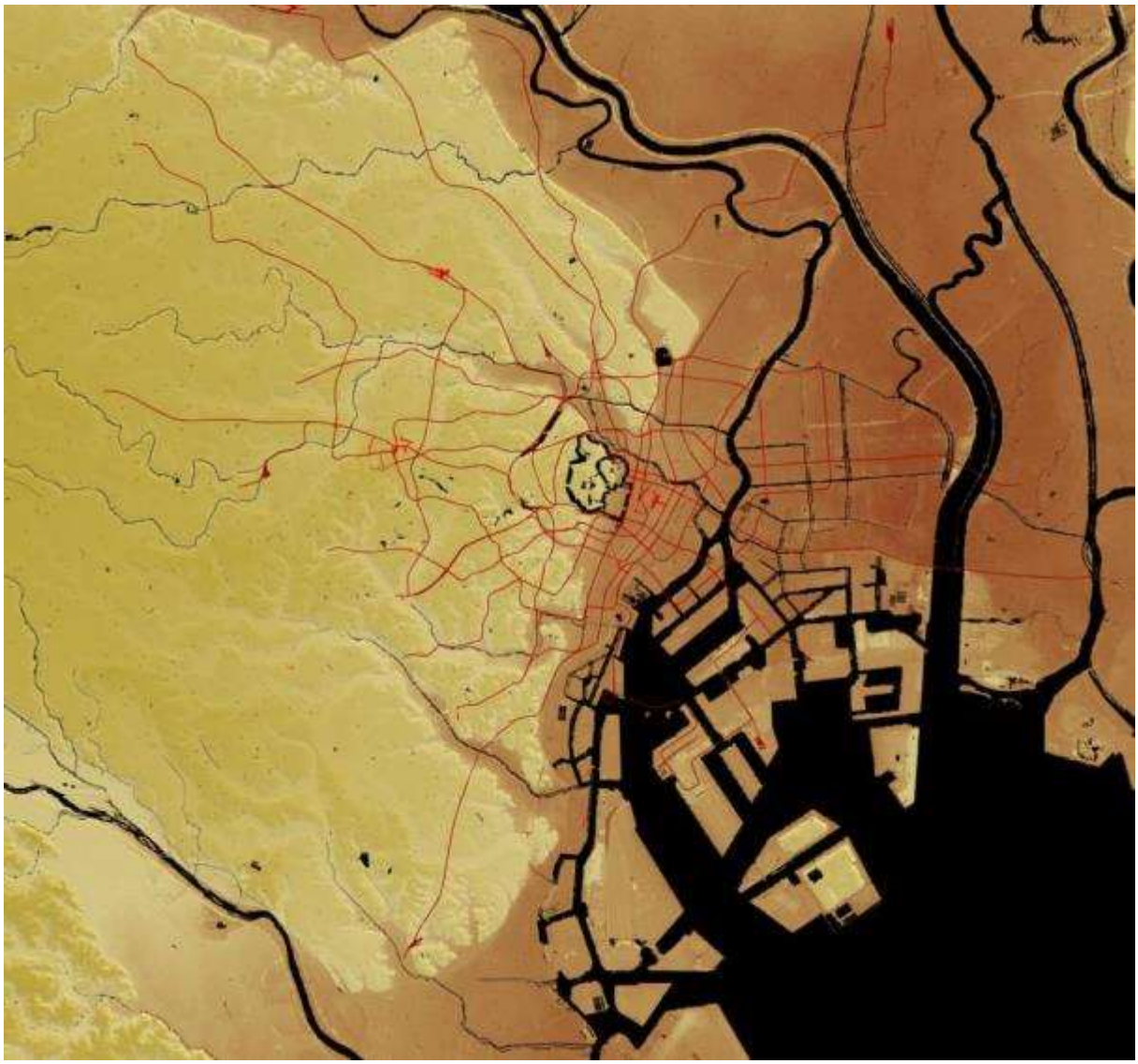
Even today, it is very easy to wonder around central Tokyo without ever putting eye on its Bay. Aside from the top of some skyscrapers, water is still at a considerable distance from everyday streetscape. However, this distance hides the fact that much of contemporary Tokyo is actually built on relatively new artificial ground. Especially in the fast growth period of the 1950's and 60's, metropolitan expansion reached alarming levels, as much of its infrastructure had been disrupted in World War II or was in poor and outdated condition. The only available space where new infrastructure, expansion areas, and economic cores with the size and scale needed to cope with such unprecedented growth was the Bay. In 1959, an ambitious plan to fill most of the Bay was proposed by the Industrial Planning Conference, a semi-private research body associated to and funded by large energy and industrial interests. This plan called for the building of a central island in the middle of the bay, which would become the hub for metropolitan transportation, with a new airport. It was connected to

Masterplan for Tokyo Bay sub-centre. Source: City Planning Institute of Japan (1988), p. 211

Tokyo and Boso peninsula through railroad and highway which provided the backbone of a new large scale metropolis encompassing Chiba and Yokohama Prefectures around the Bay. Other smaller islands and landfills were to be built along the shores turning most of the Bay into a man-made solid landscape. Although the plan was probably too ambitious even for booming Tokyo, some of its key elements were recently built as the cross-bay tunnel and bridge and the circular motorway around it.

Since then, the Bay has been at the core of many of the most captivating urban visions (Lin, 2007) such as Kenzo Tange's widely known project for Tokyo Bay, discussed with more detail further ahead. Despite not seeing the day light, such visionary projects anticipated an *alter* condition of the bay. A place where contemporary heterotopias could find a proper setting emerging from *tabula rasa*. The landfill artificiality and the physical and psychological distance to Tokyo's urban fabric has allowed for the development of new programs taking advantage of that unique condition, such as leisure and entertainment areas, thematic parks, large shopping malls, golf courses and sport facilities which make now part of the holiday itineraries of many Tokyoites.

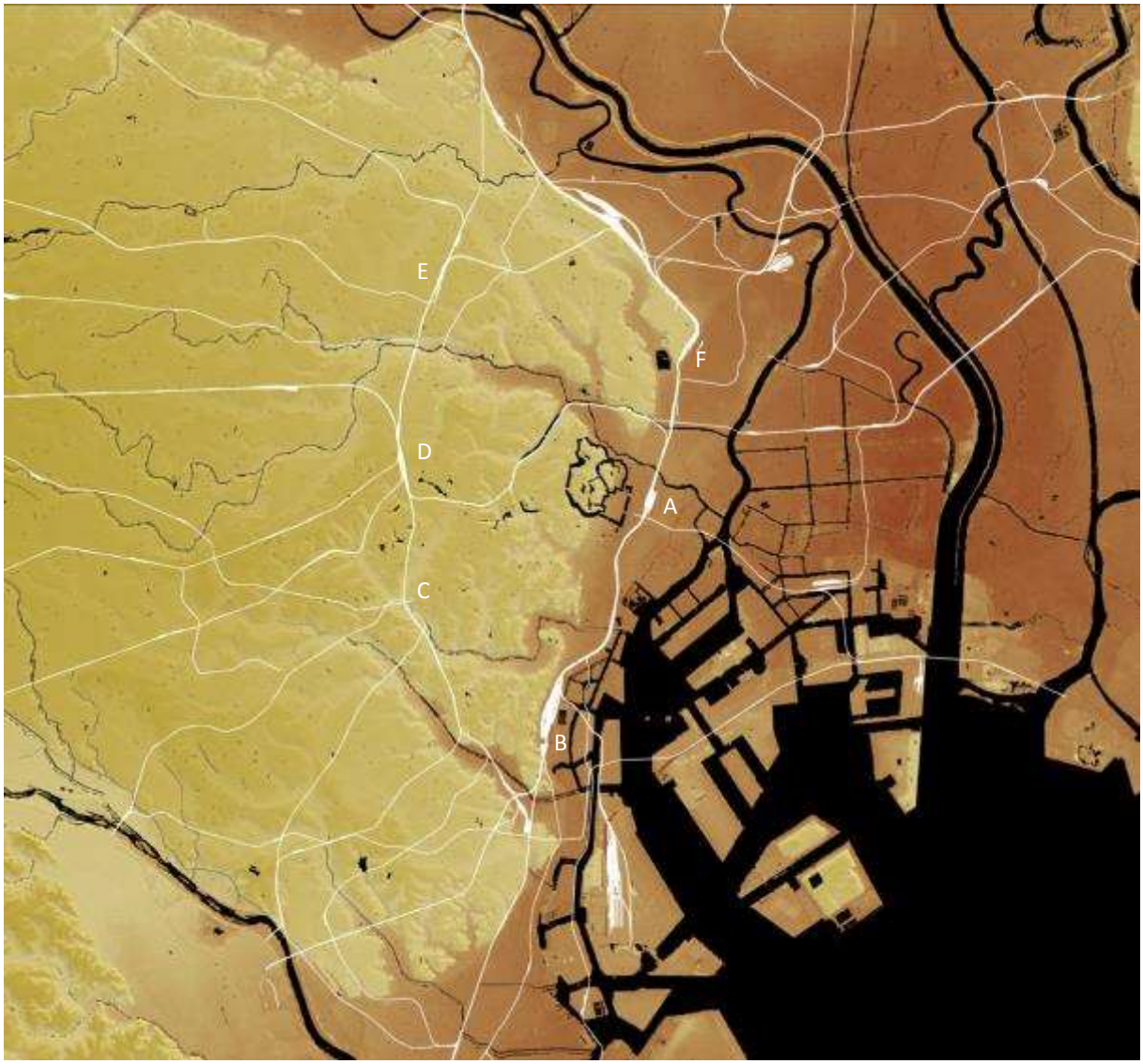
These waterfront sites have also been the focus for large facilities designed to make Tokyo a key player in the global network of cities and economies (Ueno, 2001). They were designated as one of Tokyo's seven sub-centres, aimed at leveraging the metropolis development during the economic boom of the 1980's and meeting the sky-rocketing demand for office space. The Teleport Town was one of the first projects built around a large conference and exhibition centre, served by powerful connections to the worldwide IT network. Projects for a World Expo ensued along with many other privately developed real-estate operations. However, the blow of the 'bubble economy' in 1991 rendered many of these projects unfeasible and left large newly reclaimed areas with no clear destiny. Yet today, almost a quarter of a century later, it can be seen a renewed thrust of the bay attraction to unique development, as the winning bid for 2020 Olympics has shown. The Olympic village and many of the new sport facilities are to be built in the bay landfills, along with large scale landscape projects in former waste landfills. Despite the economic turmoil it went through in past decades, Tokyo's Bay condition as a rather alien landscape has no doubt resisted well as a provider of much demanded consumer-focused attractions. As such, its mega-block structures and buildings, served by various threads of mono-rail shuttle, railroad lines and motorways, are probably a close reminder of Tange's mega-structural skeleton proposal. Temporality and continuous renewal are therefore on the waterfront agenda for the next decades, as they are vital to keep up with the insatiable desire of Tokyoites for novelty and stimulating experiences (Ueno, 2001).



Tokyo’s subway network. Drawing by the author

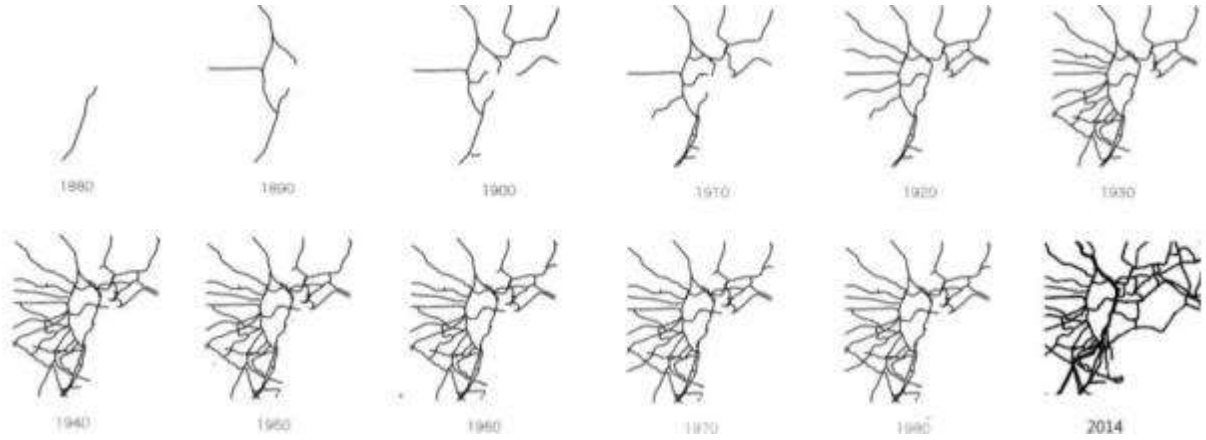
2.3 Railways between line and node

Tokyo's railway structure is known for its sheer size, efficiency and schedule precision. It has also become a living space on its own, an organic system animated by the daily flow of people, goods and trains. This railroad network bridges long-range travellers and local commuters, flowing into a common spatial and temporal frame. It is a multi-scale and multi-speed device through which the urban landscape is filtered into a fluidic and always changing entity.

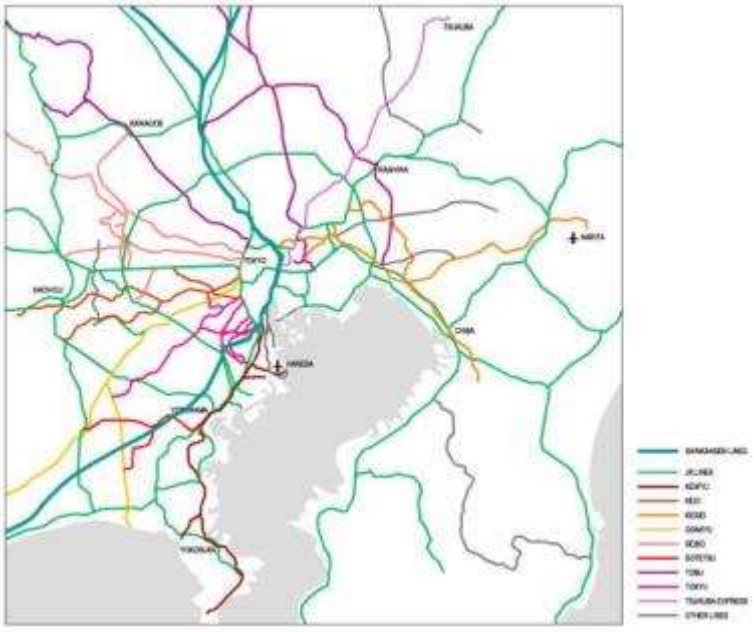


Railroad network in central Tokyo. A: Tokyo station, B: Shimbashi, C: Shibuya, D: Shinjuku, E: Ikebukuro, F: Ueno
Drawing by the author

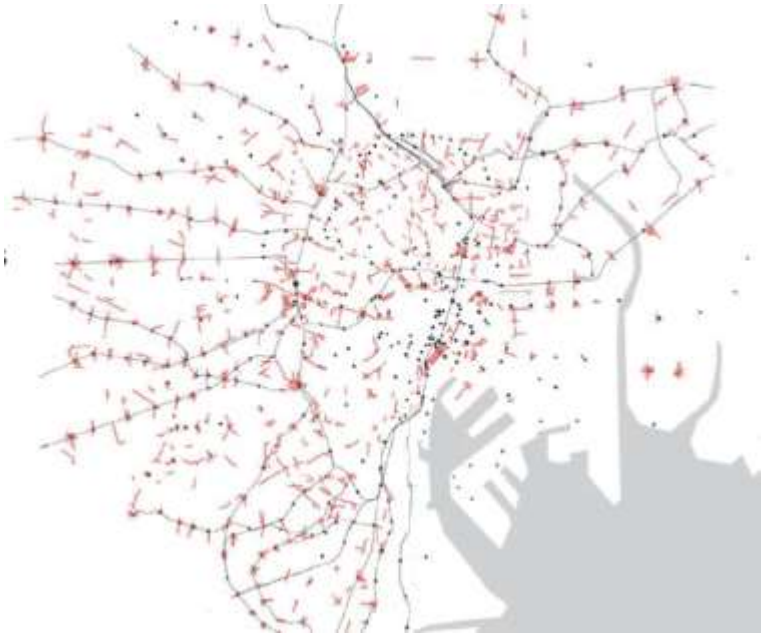
The first line was opened between Yokohama and Tokyo, having its terminal station in Shinagawa, at the southern edge of Tokyo. Yokohama was Japan's main port and the door to international sea trade. This line was also the first section of a national network that would connect Tokyo and Osaka. Since then a 'clock-wise spiralling' movement of lines was built. By 1890, two more lines were built connecting Tokyo with its west



Evolution of Tokyo's railroad network.
Source: adapted from Ohno, 2004



Tokyo's railroad operators. Drawing by the author



Tokyo crossings. The pattern of commercial streets perpendicular to train stations. Source: Ohno, 2006

(Chuo line) and north (Keihin Tohoku line) regions and by 1900 the eastern areas were serviced (Joban and Sobu lines). They were all connected through a ring rail line encircling Tokyo's central area by the west and through the Yamanote hills. This partial ring line was the genesis of Yamanote line, finally completed as a full loop in 1925, with the connection through the Marunouchi district and the establishment of Tokyo's central station. As Tardits (1992) observes, the closing of Yamanote line offered the opportunity to develop department stores as the drivers of a uniquely Japanese urban concept. In the context of Meiji period's showcasing policy to western powers, the economical and architectural apparatus of these big structures in the city soon became the footprint of further commercial development along Tokyo's metropolitan railway lines.

With the national government concentrating in the national network, private operators sought the opportunity to build suburban lines in metropolitan Tokyo. They were not allowed however to cross the Yamanote loop into the central districts, leading to the development of many terminal stations along Yamanote. By 1940, Tokyo's railway network had a fully developed and dense radial pattern converging in a big ring, in which the centre was almost empty – the only line crossing it was an extension track of Chuo line between Shinjuku in the west and Akihabara in the east, where it connected to Sobu line. The area bounded by the Yamanote line lacked well-developed transport network, since railway was too costly to run through its dense urban fabric. This led to development of the subway and tramcar systems, mainly serving the central districts.

Tramcar was introduced after 1903, becoming a driver of street widening in many areas, in combination with the modernization of infrastructure and fire-proofing measures undertaken by the government (Sorensen, 2002). Many of straight and wide streets that crisscross the city's densest fabrics had tram lines along them. These lines provided the basis for city edge urban growth and inner-city commercial development (namely, the large department stores). However, tram network after World War II faced considerable decrease in demand and conflict with the rising of automobile ridership, being almost completely shut down in the 1960's with Toden Arakawa line remaining as the only in operation today.

Subway, on the other hand, proved to be a major success in the city wide mobility. With operation starting in 1927, it was not until the 1960's, when Tokyo hosted the Olympics that the subway networked became a city-wide system with many new radial lines. From the 1980's onwards, this radial system started to knit the inner fabrics bounded by Yamanote line, improving interchanges with railroad stations. As it became a fully-fledged network by the late 1990's, subway network not only reached far-reaching areas over 10 km from central Tokyo, but it started to function with an increasingly level of reticulation, with the opening of the Oedo loop line.

In fact, railroad and subway together are the backbone of public transport in Tokyo, and unlike many European cities, very limited role is assigned to bus service. This is probably explained by the operational limits of road based services in such an extensive, dense and populated urban area. 15 car trains running every 5 minutes are

The Yamanote Line, converging lines and hub stations. Drawing by the author

Ueno, Akihabara and Tokyo stations.
Shimbashi, Shinagawa and Ebisu stations.
Shibuya, Shinjuku and Ikebukuru stations. Photos by the author

the only mass transit system able to withstand the massive demand of a 30 million metropolis. Tokyo's combined subway systems sum up to 290 stations and 13 lines as of 2013.

Despite its far-reaching extension, density and interfacing, along with various schedule offers of local, express and rapid trains, two hours commuting travel is not uncommon in Tokyo. This reliance on train commuting for everyday life has been associated to a strong and resistant pattern of mono-centrality of Tokyo's main commercial and business activities throughout the fast growth period and until the 1980's. Since the beginning of the 20th century, metropolitan growth was mainly structured by the radial railroad lines followed by residential development. Since the 1970's however, metropolitan railway structure became increasingly complex and reticulate as new transversal and ring lines were built, allowing independent connections from the central area.

Since 2000, growth continues in metropolitan Tokyo railway network. Tsukuba Express line has improved connection to high-population settlements and specialized science and university campuses in the north-eastern quadrant, such as Kashiwanoha or Tsukuba City. Transit-oriented development (TOD) continues to be promoted around the new stations, with high-density and intensive residential and commercial use, along with improved connections the secondary towns.

Current issues In rail network development strategy include: the rapid aging in suburban areas, expected changes in travel behaviour associated to new demands and ageing, train and station overcrowding at peak hours, service delay, improvement of accessibility to airports and to rail stations at business districts, and resilient rail service under emergency conditions. A change in policy focus from quantitative growth to qualitative improvement has been acknowledged since the 2000's master plan for Tokyo's railway development (*Council for Transport Policy no. 18*). Comfort, reduced congestion, optimized and decreasing travel time, easy connection and interchanges and smart information are seen as new goals for future development.

There are about 30 railway operators currently in Greater Tokyo, with JR East, a privatized branch of the former state owned company, being the holder of the largest network. The presence of multiple private railway companies operating suburban lines became a central feature of Tokyo's metropolitan growth pattern, as railway companies were also involved in residential development and retail (Calimente, 2012). This relationship between infrastructure, residential and commercial development has had a tremendous impact on the spatial structure, locational pattern of activities and lifestyle trends in contemporary Tokyo. Railway stations have become the focal point of daily life and the attractor of commercial activities. The scale, intensity and type of building and activity change in close relationship with locational and hierarchical position in the railroad network.

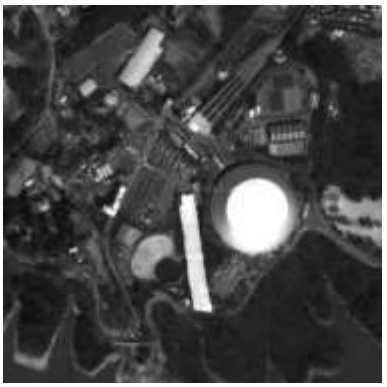
Hubs

Tokyo station/Marunouchi: prestige CBD
Ikebukuro: transport/department store hub
Kashiwa: metropolitan city
Mitaka: metropolitan intensification

Suburban nodes

Den-en-chofu: *garden city* development
Edogawadai: suburban low desnity town
Tama New Town: large scale planned developm.
Kashiwanoha Campus: Mixed-use, university

Specific use



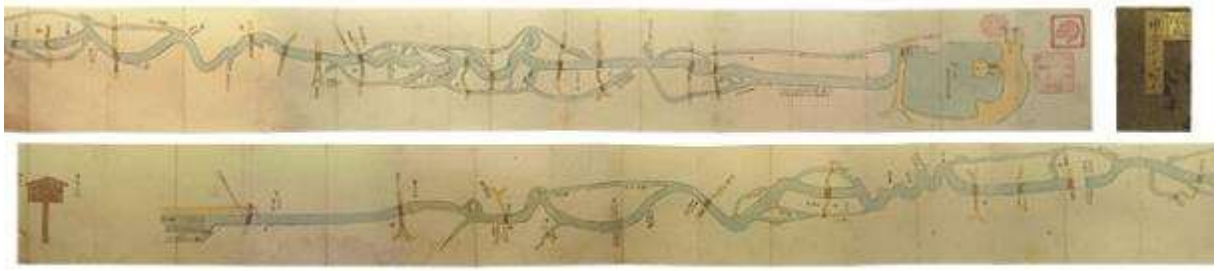
Hiyoshi: University campus
Tokyo port: logistics entrepôt
Seibukyujomae: entertainment park
Minamimachida: large shopping/retail

Large terminal and interchange stations along Yamanote line (i.e. Shinjuku, Ikebukuro or Shibuiya) are made of cocooning building conglomerates built over, under and around the station itself. As each railroad line converges on them, they bring a new station platform, various ticket gates, a large department store of its brand (i.e. Tokyu, Tobu, Odakyu) and a labyrintic rhizomic structure of under- and above-ground passages and exits. The competition for customers is so intense they make the boundary between station and shopping space indistinguishable. In fact, in most cases the station itself disappears in the middle of overwhelming box-like buildings and signage apparatus. With a thinner analysis of the largest hubs such as Shinjuku and Ikebukuro, one can identify several stations side by side, enveloped by the almost window-less department stores. This additive adjacency builds an ever-changing streetscape, as buildings are demolished and rebuilt or new advertisement is put in place. Commuting and shopping becomes a flowing experience, bounded by the permanent enclosure and attraction of commercial signs, brands and sounds.

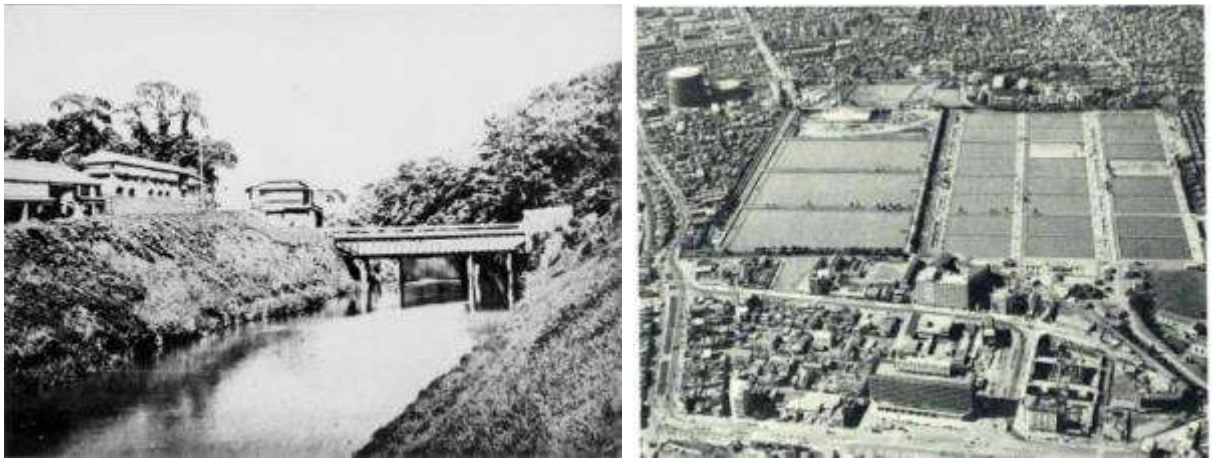
Smaller and peripheral stations show the same attraction of commercial activities, although in simpler and modest settings. Commercial streets transversally converging on the station are a distinctively character of many suburban settlements. These 'crossings' (Ohno, 2004) play an important role in the everyday life of commuters but the stations themselves and the public space around them lacks any trace of architectural sophistication. On the contrary, the station is often hidden behind larger buildings and colourful signs. Its entrances and gates guarantee seamless flow but no monumental or referential expression in the urban townscape. As many railroad lines are elevated, stations are often located underneath the structure. In those cases they are discretely packed in between the railroad steel or concrete frame, next to small shops, counter snack restaurants, bike parks and storage facilities. In some areas of Tokyo such as Iidabashi and Ichigaya, the railroad follows the river bed. In these cases, stations are often merged with overpassing bridges that cross both river and rail.

On a nation-wide scale, the most important structure is undoubtedly the *Shinkansen* bullet train, with its first line between Tokyo and Osaka opening in 1964, just in time for the Olympics. Built on dedicated rail lines, it became a symbol of Japanese advanced technology feats and economic prosperity, while taking its righteous place among the most developed countries in the world. Its path through Tokyo metropolitan area reinforces the commercial districts of Marunouchi, around its main terminal (Tokyo station), but also the office and commercial areas around Shinagawa and Yokohama to the south and Ueno and Omiya to the north. *Shinkansen* origins can be traced to the 1920's (Sorensen, 2002, Hood, 2006), with ambitious plans in line with Japanese colonial claims as a regional power in Asia. It was not until the 1960's that the opportunity and financial capacity were available to implement the project. It is probably one of the most embedded expressions of Japanese policy and belief in infrastructure as a key driver of economic development.

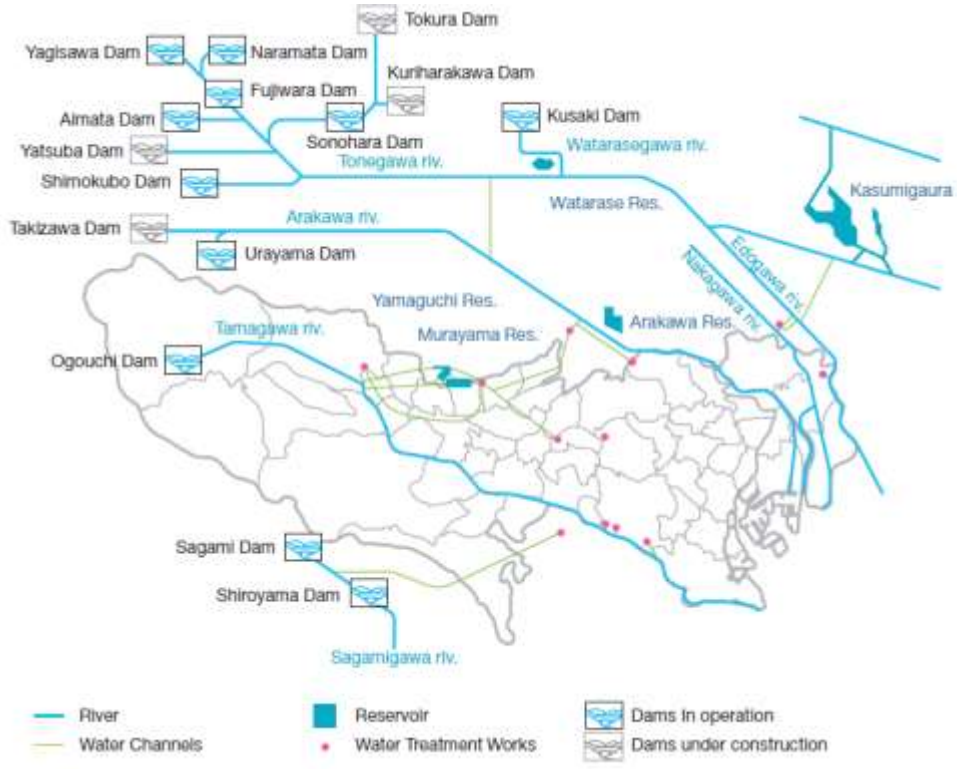
Providing the most time-efficient and convenient service to areas around a 500 km radius, the 300 km/h speed *Shinkansen* has proved to be the transportation backbone of the Tokyo-Osaka axis, Japan's largest economic megalopolis. It has also spread to the distant regions, despite rising costs and the astronomical debt it



Kanda waterworks (Kanda Jōsui no Moto-ezu). Source: http://www.library.metro.tokyo.jp/Portals/0/edo/tokyo_library/english/machi/page1-1.html



Kanda aqueduct near Ochanomizu Kyusuido Mannen-bashi. Source: National Diet Library
Yodabashi Water Purification plant in Shinjuku. Source: City Planning Institute of Japan, 1988, p. 43



Water supply network. Source: Endo and Ota, 2005, p. 19

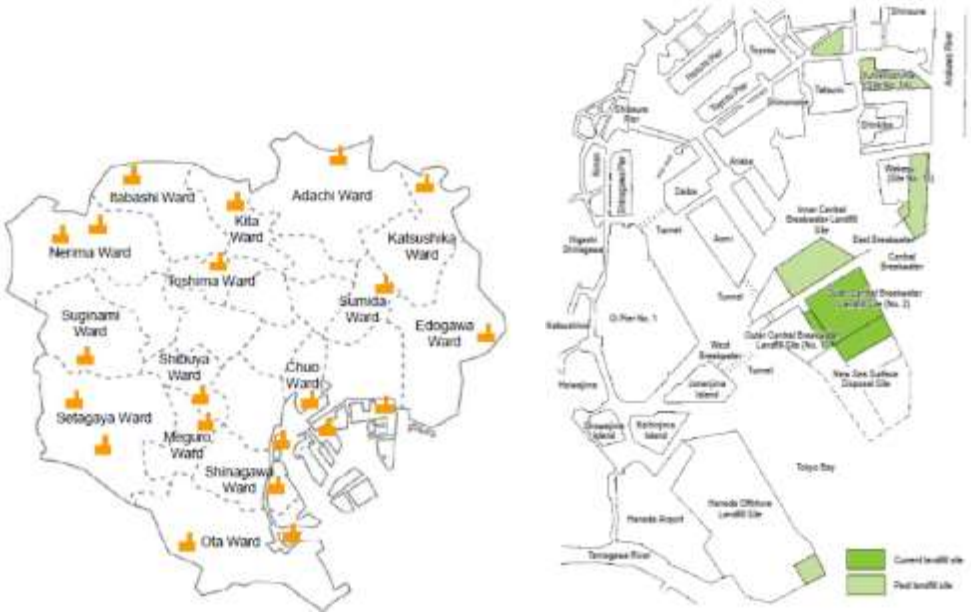
represents to the Japanese finances. Its benefits must be assessed not only in the time and convenience, but also on the environmental benefits it assures, when comparing to car or air travel. In fact, Japan's reliance on train networks – in which high-speed stands as the proud flagship – is certainly one of the reasons why the rate of motorized transport by car or bus was and is considerably lower than most western developed countries. In Tokyo, the interface between *shinkansen* and Narita and Haneda international airports is seen as challenge, since it requires further development on smoother connections.

2.4 The cycles of supply: water, waste and energy

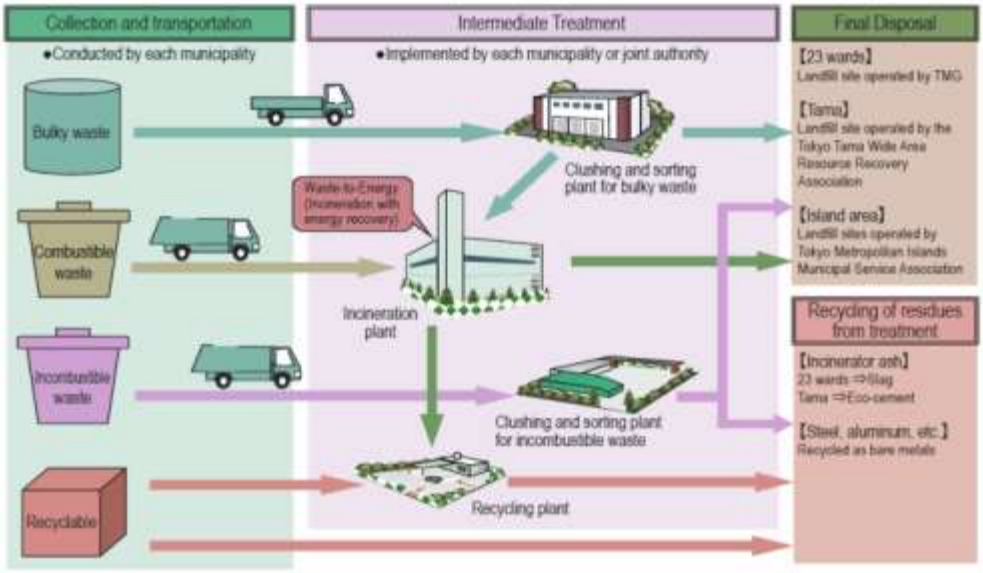
Urban water supply has always been a critical issue in large cities and metropolises. Japanese culture has a long established relationship with water through the widely available of natural water springs across the country and a deeply rooted culture of daily body hygiene, testified by the common offer of public baths. Since its times as Edo, Tokyo's megalopolis is dependent on an extensive and sophisticated network for fresh water supply. During Tokugawa period, water sources were mainly found in rivers and ponds in the western higher lands as traditional wells weren't able to guarantee supply to the fast growing city, especially in low lands where salt contamination of watersheds was most noticeable. Edo's Water System was established and worked until the 19th century, when it was faced with growing capacity and sanitary shortcomings due to contamination and population overcrowding.

Shortly after the establishment of Edo by Tokagawa rule in early 1600's, two canals were built redirected the flow of small river's to increase Edo's supply of water. The bigger of the two, Kanda Canal started at Inokashira, a small pond 10 km west of the city and ran to Edo's central areas, bearing the name of the district where it joined one of Edo's small rivers in lowland. Kanda canal supplied a 63 km network of underground wooden pipes which led water to some 3600 wells in the city. Fifty years later, a third large canal was built known as the Tamagawa-josui (*josui* – good water), extending through 43 kilometres from the Hamura weir in Hamura City to the Yotsuya district in Shinjuku Ward, where it joins Kanda canal. It was meant not only for fresh water supply but for agriculture irrigation. As it started working in mid-17th century, its banks were quickly transformed into small farming towns growing vegetables.

Wooden and bamboo tubes were laid under and above ground in rather ingenious assemblages. *Daimyo* and *samurai* estates were the firsts to benefit from this system as they lay in the higher grounds, with the remaining water being used to supply commoner low lands. Water boats and water salesmen (*mizu-ya*) distributed fresh water in the low land neighbourhoods where shallow salt water made the use of wells impossible. In Meiji period, water works were extensively renewed and modernized in response to greater demand and sanitation issues. Yodobashi water purification plant in west Shinjuku was opened in 1898 as the first large scale facility of the modern water network in Tokyo. In 1911, pressurized pipe supply was introduced,



Location of waste incinerators in central Tokyo; location of waste landfills around Tokyo Bay.
Source: http://www.kankyo.metro.tokyo.jp/en/attachement/waste.pdf



Tokyo's waste management flow. Source: http://www.kankyo.metro.tokyo.jp/en/attachement/waste.pdf

Minato garbage incineration plant. Photo by the author

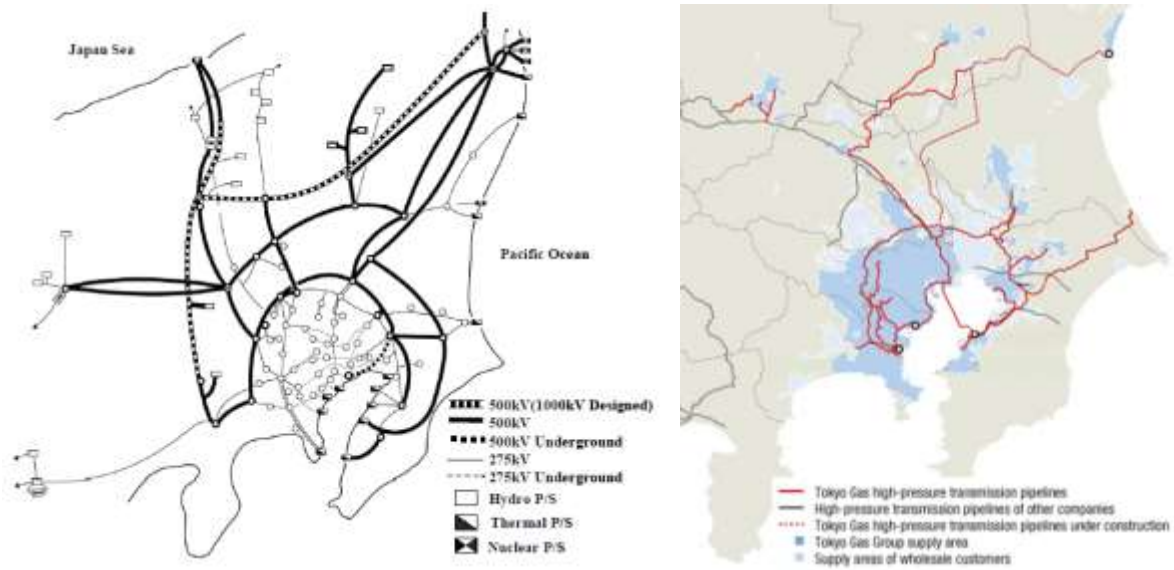
replacing the old well storage system, and allowing for higher-rising architectural typologies and extensive urban development freed from local water source limitations. Some pre-modern water related traditions have, nevertheless, been retained, such as the *sento* (public baths) – once there used to be one in every block or neighbourhood.

As was the case in many large metropolises of the time, Tokyo's water system was actively redefining the boundaries of its infrastructural and administration governance, as it sourced water far away from its city limits. Tama river system continued being the main water source for Tokyo until the 1960's when large scale improvements were made through the caption of new and farthest away sources in the Tone and Ara rivers basins. Ogouchi, Shimokubu and Yagisawa reservoirs located 75, 120, 200 km respectively away from Tokyo central districts were built in from the late 1950's to the late 1960's. Since then new dam and aqueduct projects have increased supply offer bringing total capacity to over 7 million cubic meters, the world's largest, with most of the water being sourced out of Tama and Arakawa river systems.

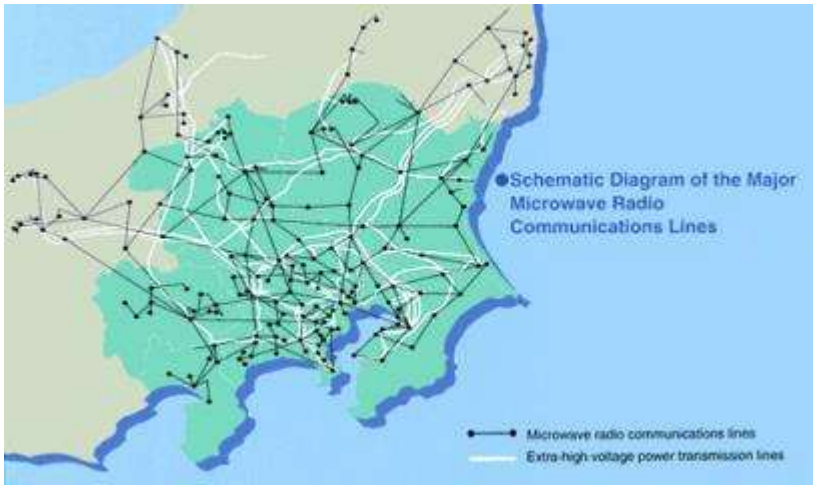
On the other hand, and since 1901, Tokyo manages an area of forest woodlands in the mountainous area to the west of Tokyo with approximately 21600 ha, at an altitude ranging from 500 to 2000 meters. The management of these forests is mainly aimed at the conservation of water resources, including the prevention of water contamination and soil runoff, river flow and reservoir management. Land acquisition is continuing in these areas, as new goals are set, namely as important contributors to CO2 absorption. However, the global scenario facing Japanese forests is of considerable concern as its traditional economic value derived of timber production is sharply decreasing, leaving many tracts of forest abandoned and in risk of being purchased for speculative purposes (The Tokyo Foundation, 2009). Bottled water demand is rising many times fold in fast growing economies, such as China, and water sources are being targeted by global investment funds. This seems to be a new face of the trans-national interlocking between capital and networks, and a challenge for maintaining sustainable water supply.

Since Edo's times waste was always dealt in a resource minded way. Human excrements were stored at the community's common toilet and later sold and transported to serve as soil fertilizer for agriculture. That flow separation prevented serious contamination as it was common in many western cities, where cholera and other epidemics were a regular phenomenon. Edo's night soil collection and re-use was indeed a profitable and efficient business run by landlords and their agents. Although it started declining in the early 20th century, it ran smoothly well into the 1960's especially in suburban areas, where growth patterns were often haphazard and under-serviced by basic infrastructure.

Current waste management system is based on a highly decentralized collecting system, in which households handle waste separation before it's collected and transported to garbage incinerators – 21 plants in the 23 ward area. Waste volume has been steadily decreasing for the last 20 years (Fujita and Hill, 2007) as a result of greater commitment to waste reducing and recycling policies and practice. Non-recyclable and special kinds of



Tokyo's electricity transmission network. Source: Kitajima (2008)
Tokyo's gas pipeline network



Schematic diagram of major radio microwave radio communication lines and extra-high voltage electrical network in Tokyo.
Source: http://www.tepco.co.jp/en/corpinfo/consultant/facilities/2-commu-e.html

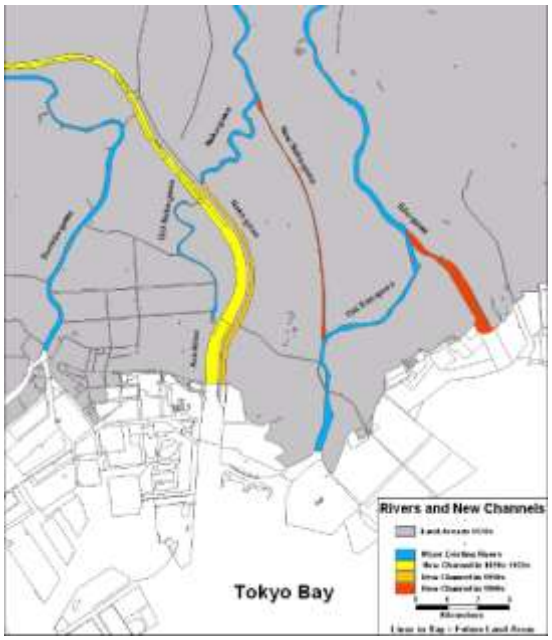
waste are turned to the large landfill Chubo site at the Tokyo Bay, with plans for extension as required. Plans for a Super-Eco Town developed on Chubo and Shinagawa landfills aim at fostering the setting up of environmental industries and facilities.

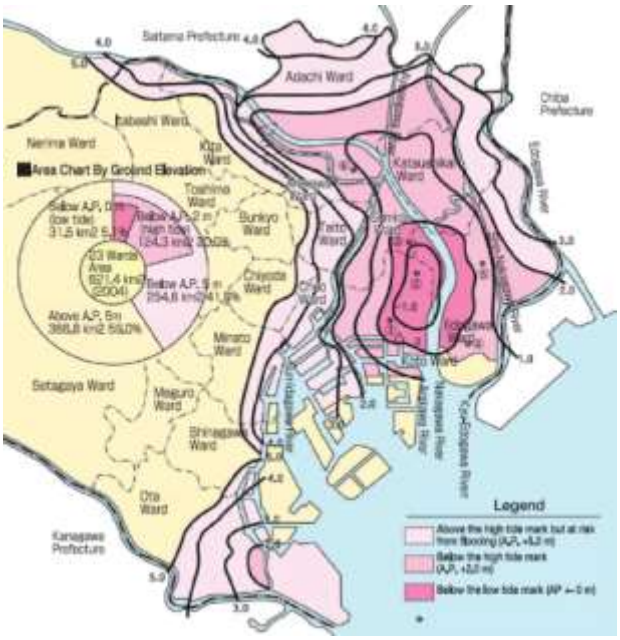
Urban electrical distribution in Tokyo started in 1887, and like many Western cities, from where technology was largely imported, it had a rapid repercussion in many areas, namely the development of streetcars right at the first years of the 20th century. With electricity, profound changes came to the architectural phenomenological perception, as was outstandingly described by Junichiro Tanizaki's *In Praise of Shadows* of 1933. From a space filtered by soft light and shadows of multiple layers of changing texture and transparency, Japan's architecture and its urban manifestation switched to a rather plain and surface edged envelopment. However, light and electricity have come to take a unique place in Tokyo's urbanscape as the multiple advertising and media screens light up at night to become themselves a communicative urban device.

Energy provision has also been a critical issue in Tokyo and Japan as a whole, given its limitations in fossil fuel natural resources and geographical constraints as an island, preventing network interconnection with neighbouring countries. With the most its primary energy needs being dependent on overseas imports, the energy-generation mix is highly dependent on coal, oil and gas, with hydroelectric and nuclear accounting significantly to the country's generation capacity. However, and since the 2011 Fukushima tsunami accident, other sources are being procured and developed, with strong debate over the future of nuclear power. Most of the 50 nuclear reactors have its operations suspended, despite rising costs in gas import. Moreover, the earthquake's subsequent power shortages due to damage to power plants have resurfaced the need to develop highly resilient systems, in case of disaster.

Tokyo's electrical transmission network links the production units – fossil fuel plants are located in the Bay area, with easy access to port facilities, hydro plants are mostly located at the western and northern mountains' rivers, and nuclear plants are at Fukushima and Niigate Prefectures in the north-eastern area – with the main substations located around central wards. This network is structured with two major ring lines which act as the interface between the extra-high voltage lines originating from distant power generation plants and the inner city distribution lines. The control of this system is itself an overlaid network of communication systems by optical cable, microwave radio and satellite.

Besides the storage tank facilities on Tokyo's Bay, trunk gas pipelines between Tokyo and the ports of Naoetsu and Kashima are increasing the metropolis' capacity in gas based power. Regional distribution is networked through one major ring pipeline circumventing Tokyo, from Chiba to Yokohama. Two other lines supply the Bay area, reinforcing its waterfront's infrastructural and industrial apparatus, with a subsea link across the Bay.





Diverted and channeled rivers in Tokyo. Source: Siebert, 2002. Available at http://pnclink.org/annual/annual2002/pdf/0922/16/h221602.pdf
Low lands subject to flooding in central Tokyo. Source: http://www.kensetsu.metro.tokyo.jp/english/kasen/gaiyo/pdf_/14-3.pdf

Flood protection walls along Kanda River in Akihabara. Secondary levee in Fukatotamagawa.
Tone River – Edogawa River diversion canal. Flood barrier at Kato Ward. Photos by the author

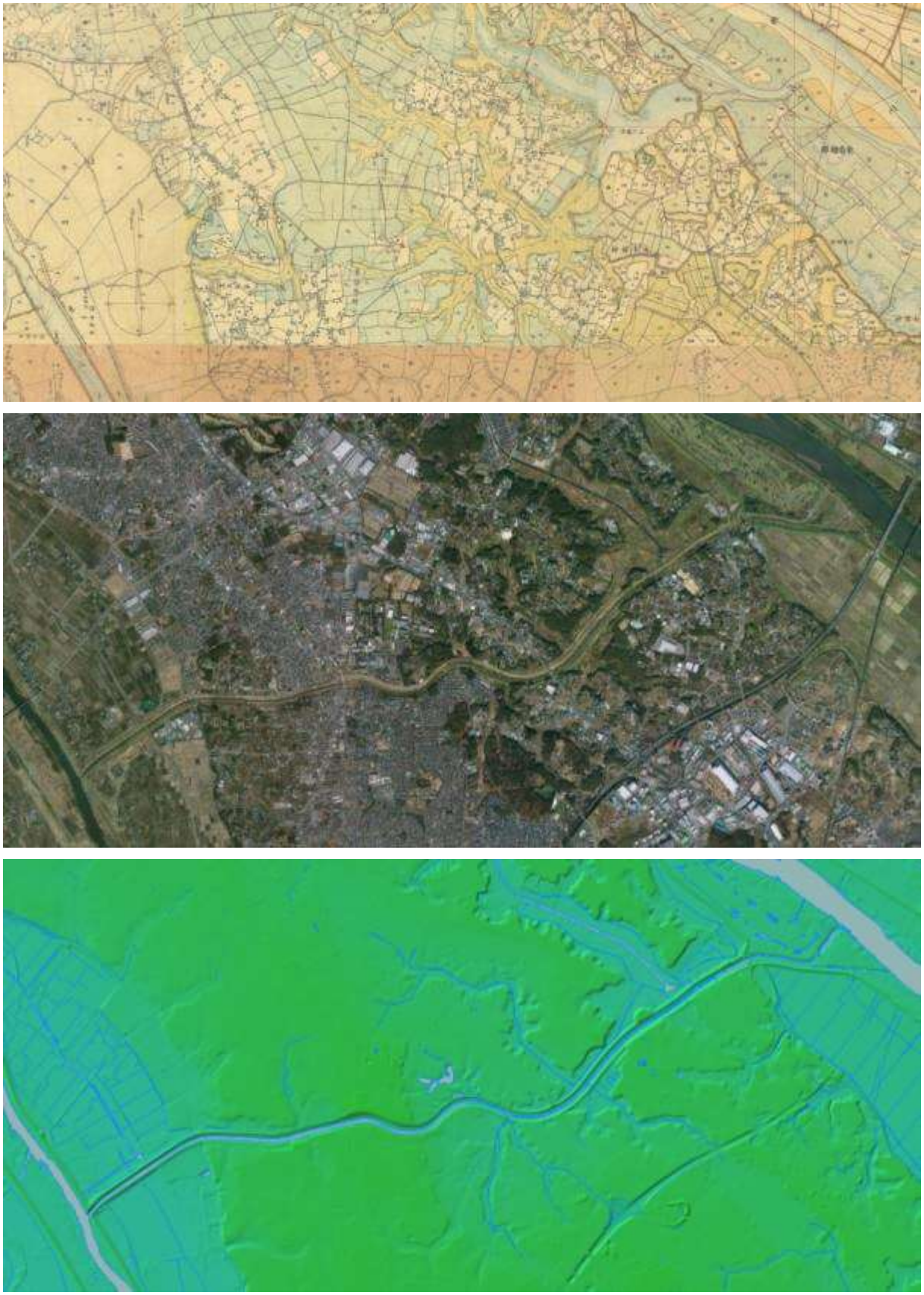
2.5 Securing from natural hazards

The pressure of urban development during the rapid growth decades has led to a widespread occupation of land once dedicated to agriculture and rice paddies. The alluvial land that made part of Tokyo's character as a water city was step by step occupied and paved into a largely impermeable surface. As low land was often hit by flood and was at risk in the event of tsunami, long tracts of the once meandering Sumida, Edo and small other rivers were straightened and bounded by flood barriers and levees at each side, along with the opening of new channels and artificial riverbeds (Takahasi, 2004). Much of these riverbed regularization projects were initiated in the Meiji period, under advice of Dutch engineers, and "next to railroads, flood control projects became the most important infrastructure issue in Japan at that time." (Takahasi, 2004, p. 99).

The *River Act* of 1897 was the policy background for large-scale flood-control and river improvement projects, aiming at the protection of rich agricultural areas in alluvial plains, in a context of increasing food demand and urban growth. Most of the Japanese large rivers had been leveed or otherwise artificialized by the end of the 1930's, followed by widespread dam development in the post-war period. In its wake and despite creating wealth for the construction industry and cheap electricity production, considerable loss of ecological habitat along river corridors has been inflicted (Waley, 2000). Many of these waterways are devoid of any rich biophysical features and thus unable to play an ecosystemic role at the urban and metropolitan level (Takahasi, op. cit.). Traditional uses of the water-shed such as boat transport, fishing or laundry have been disrupted and a greater distance made people and water apart in many river areas. From a socio-technical perspective, "the ethos of river planning became (and, to a large extent, remains) technocratic and engineering-driven, based around a centralized and hierarchical bureaucracy" (Waley, 2000, p. 202).

The policy for flood control is mainly based on the laying of heavy infrastructural works, as can be summarized in the following excerpt of TMG's Brochure of 1998 City Planning: "(…) based on a perspective of dealing with rainfall of 75 mm per hours, improvement and construction of protective embankments, underground rivers, adjustment reservoirs, diversion channels and sewers will be promoted to improve flood control safety." (TMG, 1998, p. 33). In his very critical appraisal of Japanese contemporary society, Alex Kerr (2002) points out the extreme measures taken as part of a 'subduing of nature' *modus operandi*. As the risks and threats to urban land posed by the Japanese challenging environment become higher, the response is to increase the level of artificialization and technological mediation of natural features. As Kerr argues, this trend seems to have produced a vicious cycle from which it is difficult to escape, with the breaking of the natural dynamism needed for regeneration and adaptation (e.g. the extensive concrete cladding of 75% of Japanese coastline).

In the past decades they have, however, been increasingly used as leisure areas, with quite popular walking paths, greenery and facilities for informal sport, playground and outdoor picnics. Recent public policy claims sustainable water use is being pursued through a change of network philosophy from 'flushing water down as fast as possible" to one of "maximising a limited supply of water" (Endo and Ota, ibid.). This paradigm is also



Tone River – Edogawa River diversion canal, north of Kashiwa Campus of Tokyo University (1880 map; 2013 aerial photograph; 2013 topography)
Sources: Google Maps and Cyberjapan Portal

present in the storm water drainage network, in which high levels of artificial cladding of riverbeds has resulted in unwanted increasing of runoff flooding at critical waterway junctions at low land. However, in this field, change will certainly be slow and costly as the level of riverbed artificialization in urban and metropolitan areas is nearly total, with highly restrained space for alternative solutions such as greenways and ecological restoration.

In the wake of many casualty-making floods and public protest in the face of large and 'hard' projects in the 1970's and 1980's, a revision to the *River Act* in 1997 acknowledged the need to pay further attention to the environmental issues of river control and management, including its biodiversity and ecological cycle. Public participation has also been introduced in the legal framework, aiming at a more sensible approach to local community expectations.

3 Fabric weaving Tokyo: patchworks and thresholds, flow and transience

"For a city that is routinely described as chaotic, Tokyo has a remarkably strong and simple structure"

(Popham, 1985, p.93)

View of Edo, 17th century (left screen). Source: http://www.rekihaku.ac.jp/english/gallery/edozu/index.html
[detail] Nihonbashi Bridge and Merchant shops, Merchant shops (bottom of second panel, left screen)
[detail] Daimiyo residence (top of third panel, left screen)

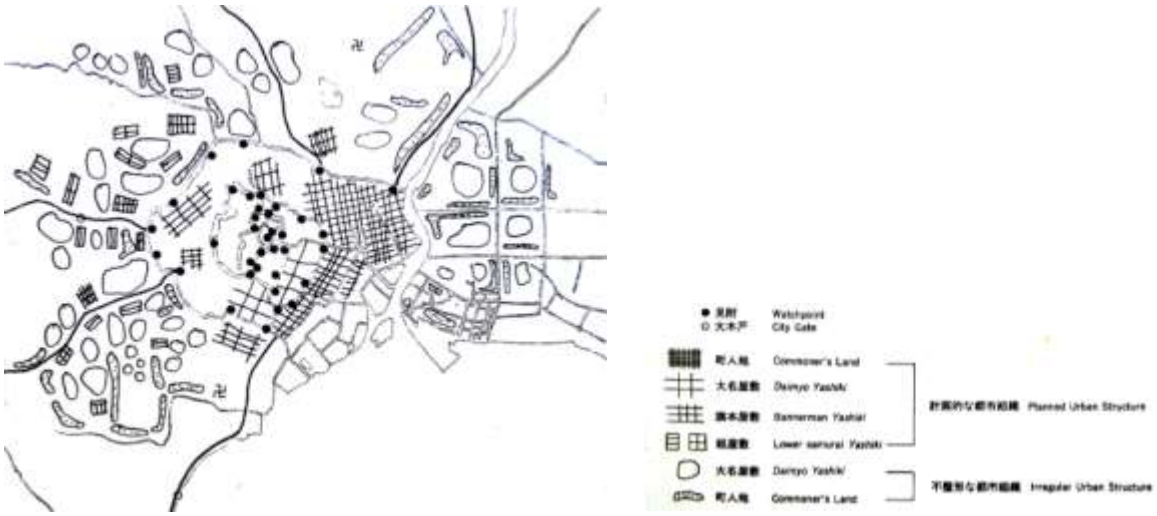
The shaping of Tokyo into the largest metropolis in the world in terms of population and economy has been the joint work of powerful social, economic, technological and cultural forces, over a diversified pattern of water and land. Flow is probably one of the most distinct characters that not only shaped the spatial fabric of the city, but also its phenomenological character and identity. Fabric weaving Tokyo is therefore a rich process by which material and immaterial threads intermingle to produce an apparently complex and beyond comprehension urban realm, though often made of rather simple rules, configurations and spatial products.

Tokyo's fabric can be understood through the converging forces of social, spatial and landscape partition, over a highly patchworked agricultural matrix. Networks and the possibility of movement and flow are combined with traces of Japanese anthropological and architectural culture to produce unique patterns of spatial development and living transience, especially along railroads and the complex plug-in structures that attach to them. Replication over a vast scale, driven by the sheer strength of post war economic drive, has delivered a megalopolis in which the only geographical features of such a scale to stand as common references are Mount Fuji and Tokyo's Bay.

3.1 Outlining the socio-spatial partition of Edo

Edo's limits were set by rivers to the east and by various gates along the main roads. These gates' role was mainly symbolic and administrative rather than defensive; they were nevertheless very important in shaping and polarising urban activities along the main roads converging in the city. Despite only having the *shogun* castle as a fortified walled area, Edo had a strongly hierarchized and partitioned urban space according to the social status of its dwellers. The rigid social differentiation had repercussion in the settlement structure through a number of spatial dividing devices, which subtly but effectively organized the city around the castle premises, but without the clear and rigid boundary of fortified walls as was common in European cities of that time.

Inner *daimyo* (hereditary vassals of the *shogun*), lower *daimyo* (non-hereditary lower ranking) and *samurai* estates were laid in spiral shaped pattern around Edo castle (Jinnai, 1987). Natural features, such as valleys and slopes, but also built structures, such as moats and gates, played an important role in making this spatial partition effective. More than dividing lines, gates were also important in establishing 'joints' between the various parts of the city. Its L and Z shaped spatial layout, not only helped to improve defence from attacker through deceiving and labyrinthic maze paths, but it also strengthened its role as rather thick and elaborate articulations between the socio-spatial layers in which city and society were organized. In spaces where division was mainly administrative and not social, as was the case between commoners' districts, simpler gates where placed along main front roads.



Scheme of Edo's socio-spatial partition. Source: Jinnai, 1987, p. 35

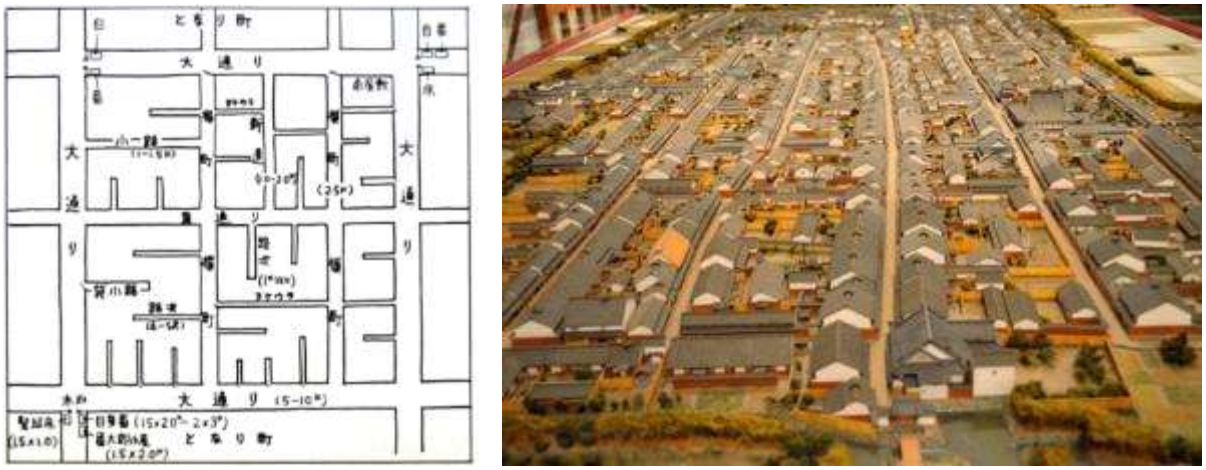
Urban Land Use Map of Edo, 1860. Source: study by Masai, 1973, in: *A hundred years of Tokyo city planning*, p. 5

Although one cannot read Edo as a simple concentric city due to its topographic and water characteristics, *samurai* districts tended to be sited at its outer layers, confining the commoner, artisan and merchant districts, not only for their protection, but also for close control (Sorensen, 2002). Urban activities were also clearly segregated in the *samurai* districts with little or no commercial or artisan presence. In the middle spaces in-between the hill tops and plains, small agricultural villages grew, taking advantage of available and water rich slopes and waterlines. They eventually became organically intermingled with the edges of *samurai* and *daiymo* premises, introducing a more mixed use environment along theses urban 'wrinkles'. Continuous land subdivision and the opportunity to serve the demanding needs of aristocrat way of life and administration business carried out in the nearby *daimyo* estates.

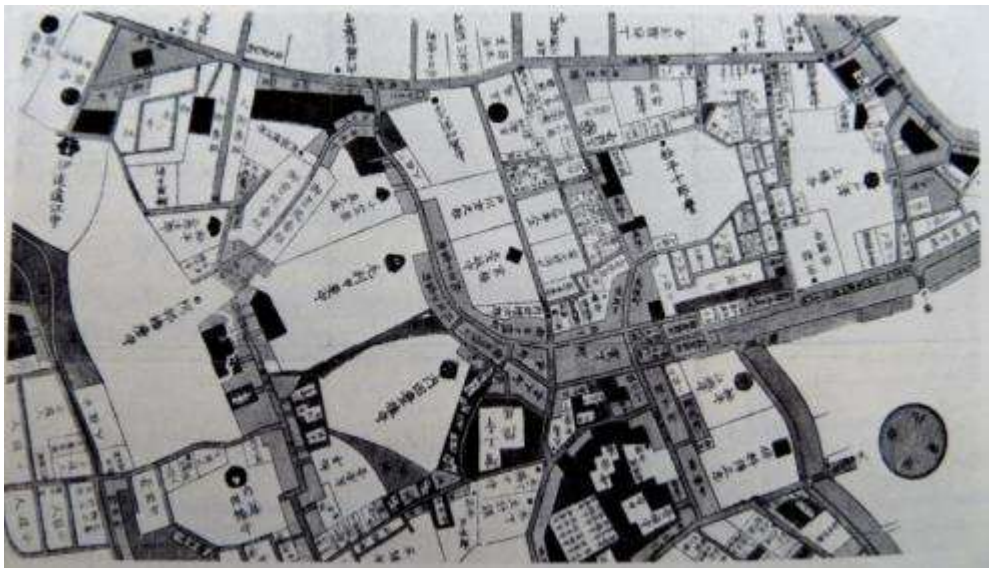
The government of city affairs mirrored the socio-political organization, with the *samurai* districts governed under a military-style rule and the commoner districts through a limited power delegation from the *shogun* to a local system of magistrates and elderly commoners. This form of delegation of some local government affairs such as poor-relief, gate staffing, waste collection, festival organization or maintenance of public safety, maintained tight political authority in the hands of aristocrat domain, and was seen more as a privilege than a righteous claim. In fact, such hierarchal ruling pyramid sprang downwards along influential merchantmen and lot and house owners. The urban block structure of *cho* had also a social meaning as a community and it was the lowest level of administration with tenants living in the backyard alleys and cramped houses being subject to the *cho* landlords and their agents. In the late 18th century there were about 1700 *cho* neighborhoods in Edo, for a commoner population of roughly 500.000 (Sorensen, 2002), meaning an average population of 300 in each one. They occupied less than a third of the city area with extremely high densities which could go as high as 58000 per square kilometer.

Each *cho* was sub-divided into long narrow lots facing the street, while keeping an inner central open space on which latrines, garbage deposit, a water well and a neighborhood shrine might be located. As urban growth continued throughout the 18th and 19th centuries however, most of these spaces were eventually built leaving only narrow dark alleys (*shinmichi*) as its trace. In his discussion of Tokugawa's urban legacy, Sorensen argues that this system of administration and government was decisive in not only in maintaining order but also "contributed to the weak development of any civic consciousness of the city as a political entity, such as developed in Europe and North America" (Sorensen, 2002:37). This topic will be discussed in more detail below, as it offers meaningful insight into Tokyo's urban planning realm.

Although the feudal socio-political system collapsed after 1868 Meiji Restoration, Edo's spatial partition continued to play a considerable role during the late 19th century's fast pace modernization. Yamanote continued to be a quiet and roomy residential area, housing the white collared bureaucracy that took shape in the wake of *samurai* family roots. Industrial development occurred mainly in *shitomashi* districts, taking advantage of good land and water communications, a thriving mercantile and artisan know-how and plenty of



The spatial layout of commoner districts. Source: Jinnai, 1987, p. 37
Model of the commoner districts' urban pattern.



The spatial layout of a *daimyo* estate in late Edo period. Source: Jinnai, 1987, p. 26

cheap labor. From late 19th until the 1970's, blue collar workers continued to settle in the districts to the east of Sumida River and around the bay industrial areas.

Nowadays, and unlike the clear divide of Edo period, Tokyo's socio-economical gaps are difficult to find in its spatial fabrics. Some factors can explain this rather ambiguous perception (Ohno and Dan, 2008, Davidson, 2013), in comparison to western cities where stratification in society is strongly mirrored in its residential location patterns. Firstly, recurrent large scale destruction left its marks in a profound reshaping of the socio-spatial patterns, allowing for greater mix as reconstruction was undertaken. Secondly, high inheritance taxation makes hard to keep property for many generations and the land is eventually subdivided and sold. In that process, social differences tend to be less clear. Thirdly, economic change associated to high levels of social mobility in the economic growth period and de-industrialization and intermingling between production and consumption since then eroded the traditional class divide between white and blue-collared workers. As a mainly tertiary metropolis, professional status is no longer so visible and rooted as part of a cultural and societal divide. Finally, state subsidies, public housing and huge investment in transport infrastructure, all contributed to a more balanced social structure (Dimmer and Klinkers, 2004).

Forms of socio-spatial divide and exclusion, such as gated-communities or ethnical segregated neighbourhoods, which are a common feature of many world cities, are difficult to find in Japan. The role of housing as a sign of social status is undervalued under Japanese cultural and economic frames. Its ephemerality, and use as a fast depreciating 'commodity' – not as much different as a car –, combined with the widely appreciated discreteness in individual behaviour is mirrored in a more undifferentiated and homogeneous urban fabric and architecture.

3.2 The fine-grained patchwork as a common ground between town and countryside

The reading of Tokyo's fabrics through a morphological lens must take into account the specificity of Japanese approach to land and to building. Building is seen as an ephemeral product, a commodity which rapidly loses its value as it ages. Land, on the other hand, is seen has holding a strong and persistent asset, both in terms of its real-estate value and as sign of social and family status (Ronald, 2008). The structural disconnection between building and land can also be traced in the materials and construction techniques (light wooden structures), in the elevation of internal spaces regarding the ground (the house is usually set at a higher level), and in the narrow spaces that are always left between the external walls and the lot limits. These gaps allow for horizontal movements in case of earthquake, but also make it easier to rebuild at any moment without harming the neighbouring buildings. Elevation from ground has a symbolical meaning (the mountains and the land as special spiritual place, that should not be disturbed), but also functional (ventilation) and pragmatic reasons, which include the possibility of literally move the entire structure if needed.

Formal juxtaposition and elusive boundaries. Photos by the author

Ueno/Asakua fabrics: 1883 / 2013. Source: 1:5000 map in Tokyo Central, 1883. Digitized by Historical Agro-Environment Browsing System, http://habs.dc.affrc.go.jp/ and Google Maps.

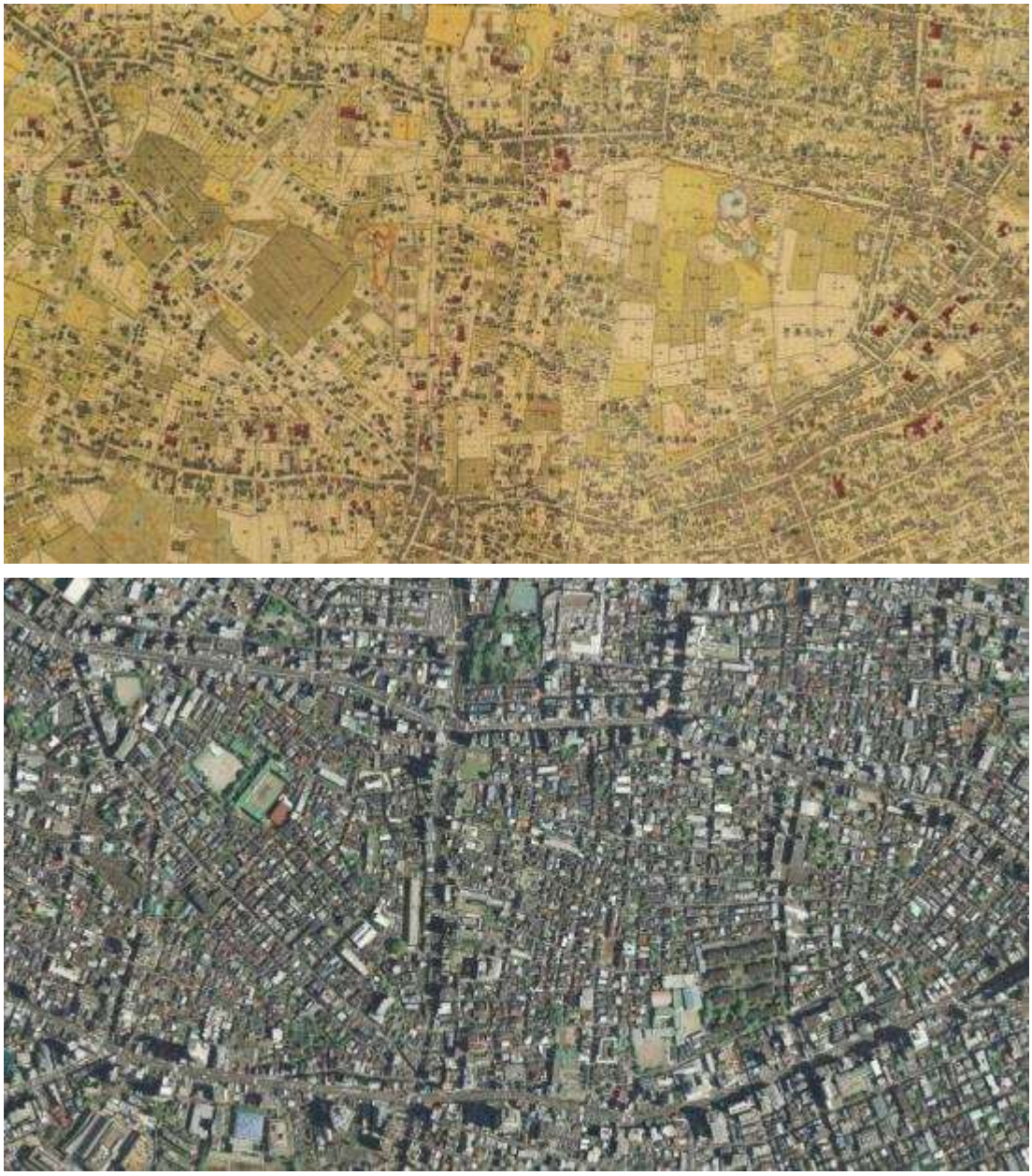
In contemporary urbanscape, this structural disconnection and permanent state of change can be seen in the physical substitution of built structures in every few years – a 30 years building is often considered as already being very old –, and also in the way how buildings stand on site and in relation to each other. As lots are never fully occupied by spatially and structurally independent buildings, the continuous lining along streets doesn't occur as in most Western cities. The idea of street and block as stable, geometrical and regularly laid urban elements are also strange to Japanese urban culture. Although areas such as Nihombashi or Kanda in downtown Tokyo may resemble conventional streets and block pattern, their genetic code is inherently different, working more as area based assemblages than perimeter bounded block structures.

Aside from main streets, usually former *kaido* highways or widened in the process of tram development in the first half of the 20th century, most streets have often retained a character of slightly wider alleys. Discretely opening to the main ones, these local streets lack sideways and any trace of building line. They stand as the shared space of tightly built, small-scale fabrics, a fine grained threshold between the outside realm and private space. People live and move around in a rather secluded realm from the bustling city spaces, faced with multiple traces of domesticity and casual left-overs from everyday life (bicycles, gardening tools, toys, umbrellas…). As Davidson puts it, in the tiny yards of residential areas "(…) a casual, open style prevails. The few items they typically contain*an automobile parked in a niche precisely fitting it, a storage shed, a clothesline, a garden with potted flowers and perhaps a small tree pruned into spherical topiary – a form a loose, prosaic ensemble" (Davidson, 2013, p. 205).

This fabric landscape is predominantly made of rather individual elements which seem to work within its own autonomous logic. Building height, plot use and architectural design seem to be quite indifferent to its neighbours, acting as multiple solo players in a largely free record. Although use mixing is a predominant feature of Japanese and Tokyo's urban areas, two distinguishable building residential types of building stand out in most urban areas: detached houses and multi-family 'condominiums'. The former replaced many of the old wooden houses, keeping with small size and low height, often including a small outer parking area. The later, have developed in gallery (shared outdoor corridors) typology, using plots of different sizes and made up of simple multiplying operations on a standard residential apartment. In both cases, the use of pre-fabrication technology and detailing, often absorbed into conventional carpenters' craftsmanship, catalogue design, and cheap industrialized construction materials, combine with a quite ephemeral building time-span and the rather inconspicuous social status of its owners, not wanting to 'stick-out' from the surrounding norms and neighbours (Davidson, 2013, p. 190).

Hierarchical dispositions, such as architectural configuration of 'main' door, facing the 'public' street are replaced by a flexible and detached frame, in which the extremely limited available space is taken to the best of its possibilities. Western cities are based on *linear* spaces for orientation and organization. They form networks of linear spaces (streets, facades, junctions of monumentality and reference). They tend to provide a structure of some interdependence and inflexibility (Sheldon, 1999). Japanese cities (along with its buildings

Streetscape in low-rise building fabrics. Photo by the author



Waseda fabrics: 1883 / 2013. Source: 1:5000 map in Tokyo Central, 1883. Digitized by Historical Agro-Environment Browsing System, http://habs.dc.affrc.go.jp/ and Google Maps.

architecture) are based on *area* references. They are looser, more independent and flexible. Each bounded plot or enclosed site has an invisible center (*oku*), allowing for introversion and autonomy in relation to its surroundings. There aren't demands for (harmonious) linear continuities along 'public' frontages (Sheldon, ibid.).

The concept of a 'facade' as a mediating device between public and private, acting both as a frontier and public display, as a screen on which individual expression is tempered with a collective sense of harmony, integration or dialogue, is something difficult to find in the Japanese city. Perspective, formal composition and objectified visual perception are replaced by the unfocused, fragmented and unstable texture of closely placed elements in the urban landscape. Gaps and thresholds, narrow in-between spaces and alleys produce an ambiguous overlaying of public and private. Small pots of greenery, bonsai scaled fences, and everyday traces of activity (bicycles, baby cars, shopping bags…), are seen within each lot premises, informally and 'shameless' displayed in its relationship to the public way, though kept in line with a vicinity sense of respect and discreteness by zealous homeowners and community volunteer associations.

In place of facades are instead a multiple array of layered boundaries, which are made visible in the gaps and interstices between buildings and open space. The spatial grain of this urban mosaic is therefore more complex than a simple divide from public and private elements, as is more common in western cultures. The implications of such variable boundaries to the shaping of Tokyo's metropolitan networks can also be addressed in the blurring of a coherent spatial device – for instance, a *street* – in which the multiple strata of public networks are framed and managed through metric partitions and codes. In Tokyo, the fine-grain of its urban fabric provides an alternative configuration to frame the multiple urban networks, working more on the basis of addition and co-existence – as can be seen in the open air power lines running over the common streets – than on a hierarchized spatial partition.

The urban fabric's morphogenesis must also take into account the long standing land parcelling patterns. As in many cities around the world, the rustic matrix has been a persistent morphological determinant of built spatial patterns, especially in areas which grew beyond the boundaries of initial settlement. As urbanization developed along extensive areas, well beyond Tokyo's 18th century limits, fragmented agricultural plots often remained in-between of rather dispersive and piecemeal residential subdivisions. In Japan, there isn't a language – and cultural – distinction between 'city' and 'country'. The city is an outgrowth of countryside. Countryside landscapes have been 'borrowed' to the city by visual representations (part of the city with the mountains as scenery) or in condensed physical representations (gardens, bonsai, shrines) (Sheldon, 1999).

Forms of land ownership had an important role in these highly fragmented and porous patterns of urban transformation. Many rural peasants who served under feudal domain turn into small land owners after World War II. However, land ownership was often dispersed with a person holding several lots apart between them. A strong tradition of rice agriculture is shared with its Asian neighbours, with profound impacts in land

Marunouchi district, Tokyo station and the Imperial Palace premises (1970's and 1910's) . Source: City Planning Institute of Japan, 1988, p. 49

Marunouchi district and Tokyo station (2013). Photos by the author

configuration and ownership patterns (Sorensen, 2000, citing Ginsberg, 1991), with family-centred production and very small and fragmented land ownership patterns. Cultural traditions and a strong tie to the land prevented the selling and aggregation of larger tracts of rustic land, making a coordinated and medium-scale urban scale very difficult. Instead, urbanization developed piece by piece, lacking proper infrastructure and facilities and maintaining the road and parcelling patterns of agriculture landscape.

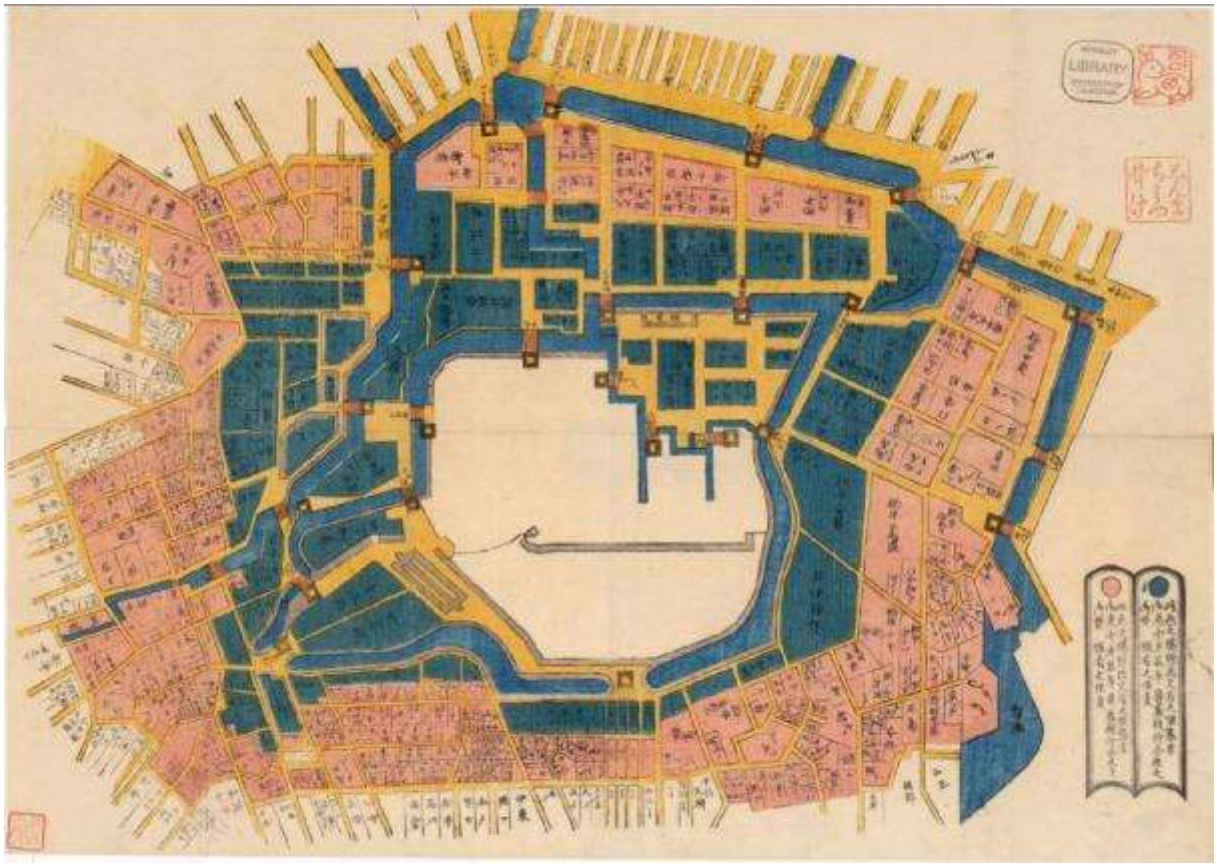
Additionally, small scale vegetable growing was kept in between new houses, shops and small industry spaces, partially due to lower taxation on cultivated land. Many land owners leased their property and collected rent, therefore disconnecting land ownership from building ownership. Building use was a third level which was often in the hands of a third party. This three-layered system (land ownership, building ownership and building tenant) is still found throughout Tokyo, making significant changes more difficult. Relatively contained schemes of redevelopment are therefore the most usual pattern, leaving only some larger parcels free for large-scale interventions (Suzuki, 2008).

The small scaled and fine-grained communities, known as *roji*, are increasingly being acknowledged as a field of interest for urban planning and design, for community participation and even for tourism and commercial revitalization (Schulz, 2010 and 2012), with regeneration and public involvement initiatives at preserving and improving its condition. Slow life, mixed-use, closeness between residential and workplaces, multi-generation, safe and peaceful environments are some of trends increasingly popularised as realms for *slow and healthy* life styles. In a way they represent a blurred boundary between central and peripheral urbanity, holding many of the advertised characteristics of suburban *garden-city* ideas, blended with the cosmopolitan and vibrant attraction of the big city.

3.3 The footprint of open space and the bounding of high profile districts

When looking to Tokyo's detailed map or aerial photograph, the fine-grained fabric that makes most of city's texture is interspersed by large tracts of green space: gardens, dense woodlands, sport facilities, cemeteries. It can also be seen the lines enveloping large residential estates of modernistic free-standing building design or university, hospital or hotel campuses. Aside from cemeteries, which were often interspersed in the middle of urban fabric with rather blurry boundaries, most of these areas are traces of old *daimyo* estates and Emperor's grounds in the Yamanote hills, which survived as spatially defined premises, although often occupied by various kinds of building and urban facilities. These spaces establish a clear contrast with its surroundings which denotes the presence of a stable morphological feature in Tokyo's urban transformation process.

Besides the exquisite gardens and woodlands of Yoyogi, Shinjuku Gyoen, Meiji-Jingu-Gaien, Hamarikyu, or Rikugien, one can find the footprints of those old estates in areas such as Hongo, Komaba, Ichigaya or



Map of the fabrics around Edo Castle. Shubiki kibiki yoseba no ishizue: zen. [ca. 1860]. Source: East Asian Library, University of California/Berkeley

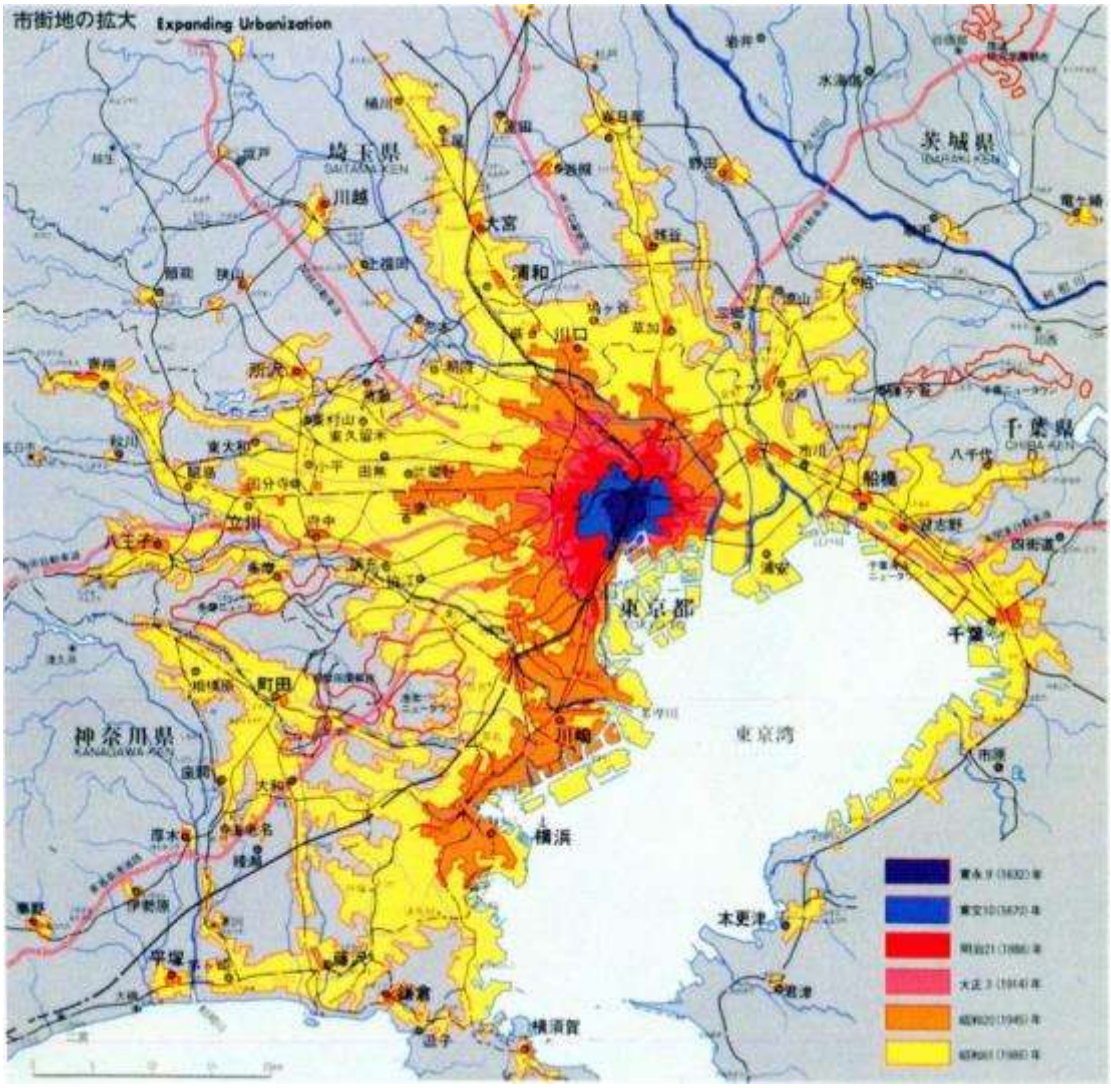
Hama-riku gardens and Shiodome office district. Photos by the author

Roppongi. Universities, hospitals and military campuses, mixed-use shopping and office complexes, or free-standing residential estates were built in these premises after the confiscation of *daimyo* property during the Meiji period. This process resembles the kind of change which occurred in Portuguese convents and monastery estates after the expelling if religious orders in the 1830's.

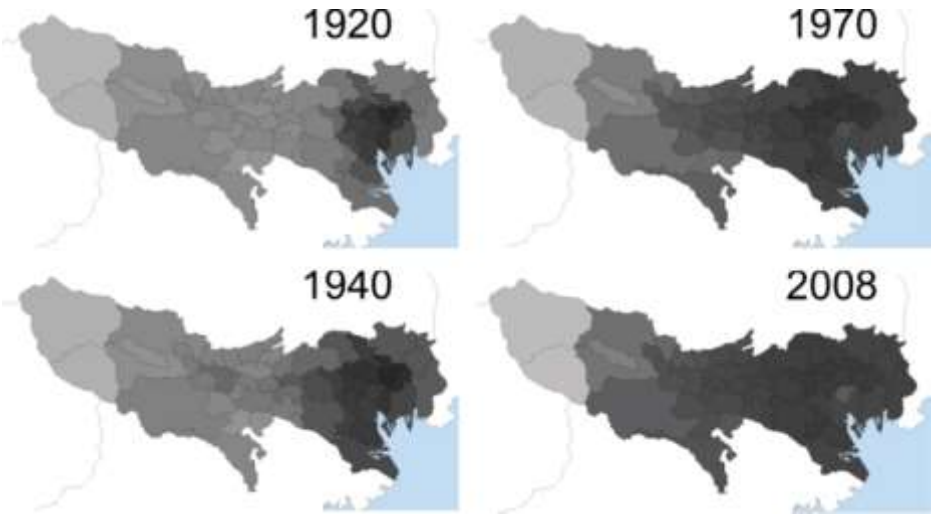
After Meiji restoration, the military premises in Marunouchi, to the east of the Imperial Palace, were decommissioned and bought in 1890 by Iwasaki Yataro, head of the Mitsubishi Corporation. This set in motion the large scale land development operation which turned Marunouchi into one of Tokyo's high profile office districts, boosted by the closing of Yamanote railway line loop around Tokyo station – the new central station and gateway to the city. The station and the first buildings were built according to western architectural style, showing a clear political and cultural commitment to portrait Japan as a rightful player in the international arena (Sorensen, 2002). Marunouchi is a clear example of the immanent relationship of open space in the making of modern Tokyo. Not only were the premises of the former military parade ground the footprint for one of Tokyo's foremost real-estate commercial developments, but it is also the standing dialogue with the Imperial Gardens that makes Marunouchi's distinct urban and architectural skyline. This kind of relationship can also be found with its own character and variations in the districts of Hibiya – the government buildings district, west of the Imperial Palace – and in the recently redeveloped railway yards in Shinagawa – where the Shiodome project outlining Hamarikyu Gardens, close to Tokyo's bay. Even West Shinjuku, the first large-scale high-rise district built in the late 1980's had a new park as one of its spatial features. Reciprocity between the vertical development of office, hotel and residential towers and the horizontal grounding of earthly green space seems to be a recurrent theme in contemporary urban development. It is also partly the result of an urban planning turn from the 1960's onwards into a system of floor area bonus and incentives for schemes where some form of public or open space was kept (Dimmer, 2012).

The establishment of universities was a key feature of Meiji policy, representing one of the most expressive aspects of the modernization efforts undertaken at the time. Being at the core of the new social and cultural elite, they played an important role in shaping the development of Tokyo's growing areas, especially in the traditionally favoured areas of Yamanote, such as Waseda, Komaba and Izumi. New and relocated facilities from central Tokyo were built in campuses along the concomitant development of private railways and burgeoning garden city themed suburbs. Military facilities were also markedly clear in the urban fabric, with its bounded grounds and pavilion buildings. They became especially important during the 20th century conflicts, its size and complexity increasing, following a policy of decentralization from vulnerable central sites. Large peripheral areas outside of Tokyo remained largely agricultural for a long time, later becoming privileged areas for special purpose development, as was the case of many sites in Kashiwa, 30 km northeast of Tokyo.

Quite different are the spaces of temples and shrines. Unlike former *daimyo* estates, these premises' presence in today's urban landscape has become rather diluted. With the exception of some large complexes of Meiji-ji, Zojo-ji or Asakusa temples, smaller ones and neighbourhood shrines have often been engulfed by surrounding



Evolution of Tokyo's urbanized area (1632-1986). Source: *A hundred years of Tokyo city planning*



Population (resident) density in Tokyo. Concentration in central wards in 1920's, expansion to west areas in the 1940's, continuing expansion and shrinking in inner-city wards in the 1970's, levelling densities and slight recovery in inner-city in 2008.
Source: http://www.tokyo.parallellt.se/2010/11/population-growth-maps.html

development, in total disregard of its scale and symbolism. A few features subside, however, as the sacred gates and approaching paths, many times the only element attracting attention from the passing stroller. Temples were placed having in mind the spiritual protection of Edo castle, following geomancy prescriptions – the oriental traditional science of directions. Kan-ei-ji and Zojo-ji temples were set to the north and south of the castle, acting as guardians of the 'devil's gate' and of the 'devil's rear gate' (Jinnai, 1987). Temple areas were important for leisure and coming together of commoners. In the case of Ueno, a park for public use was established next to a temple precinct in the late 19th century. However, the vegetation role was not entirely scenery-based but more as symbolical representation of sacred sites in the mountains, and as such, with a more limited use. On the other hand, they were drivers for commercial uses, on its premises and urban approaches (Sorensen, 2002).

3.4 From suburban axes to metropolitan policentricity

Outward growth in metropolitan Tokyo followed a spiralled pattern around the central districts, following the above mentioned historical pattern of Edo and the late 19th century development of railways. The Yamanote plateau was sought as the most privileged and prestigious area, with generous green space and historical traces of the *samurai* socio-spatial partition. Areas to the north and east remained rather undervalued and regarded mainly as industrial and manufacturing land. Suburban residential neighbourhoods around railways were firstly established to the west, of which Denenchofu and Tamagawadai stand as the most well-known. They were devised under the influence of *garden city* movements in Europe and the United States, and were combined with the development of reference institutions, such as private universities as part of a growing societal interest in education. However, and despite their formal and locational resemblance with the international references of garden city philosophy, they were little more than speculative schemes, lacking many of its social and regional balance concerns (Sorensen, 2001).

In fact, most of suburban growth occurred in radial configuration, following the railway lines, the natural lines drawn by rivers and ridges and the old highways routes between Japanese major cities. Although there was some planned decentralization plans during the 1930's and early 1940's, war effort directed its implementation to military and industrial land uses, instead of residential and commercial development (Sorensen, ibid.). After the war, the opportunity to recall earlier ideas for metropolitan decentralization led to the redevelopment of the inner-city sub-centres such as Shinjuku, Shibuya and Ikekbukuro along Yamanote line, as part of reconstruction effort. In the 1950's new strategies to limit growth were pursued with the proposal to develop new satellite cities at a distant location from Tokyo. Recalling pre-war planning from the 1930's, a buffer between Tokyo and its satellites was meant as a *green belt,* established by the *Tokyo Green Areas Plan* of 1939. The concept was well known to Japanese planners of the time. In fact, London's Abercrombie Plan of 1940 was highly influential and resonates in the various threads of post-war planning. However, and although some land

GREENFIELD EXPANSION

Ichigao, 1974 – 2013

LARGE-SCALE TRANSIT-ORIENTED MULTI-FUNCTIONAL DEVELOPMENT

Kashiwanoha, 1974 – 2007

NEW TOWN DEVELOPMENT

Chiba New Town: 1988 – 2013

GROWTH BY DENSIFICATION OVER RURAL PATCHWORK

Gamou: 1974 – 2007

was bought by the city in the 1930's to become parks and urban growth control, much of it was returned to its former owners or redistributed to small farmers after World War II, thus preventing full implementation of the belt.

It was not only after the early 1970's that a more effective level of policy implementation was reached regarding metropolitan planning. Since then, and continuing well into the 1990's, the concepts of a 'multi-polar urban structure', 'multi-centre city', 'new towns', 'sub-centres', 'satellite cities' and 'Business Core Cities' have been introduced in a number of planning documents and brought into live through a number of public and private led urban development operations. The over-concentration of Tokyo central area, booming land prices and infrastructure transportation congestion became unbearable and triggered huge investment in the metropolitan outer rings. The new towns of Tsukuba, Tama, Kohoku and Chiba are examples of this policy, offering large scale comprehensive planning to areas more than 30 km away from central Tokyo. Their layout clearly stands out of the continuous, extensive and small-grained spread of irregular parcelling that patchworks most of the territory.

This patchwork continued to be fabricated as a result of unstoppable demand for housing, rising land value, speculation and considerably generous subdivision legal framework. The strategy followed by authorities in adapting to metropolitan growth has shifted from the control restriction of *green belt* and *satellite city* promotion to the encouragement of specific business and multi-functional poles through the provision of heavy infrastructure and large scale urban development schemes.

The locational patterns of production areas also changed during this period, from an industrial development based on heavy chemical industries, in close relationship to the port infrastructures at Tokyo Bay, for most of the high-growth period (1950's and 60's), changing to electrical machinery, transport and food industries, with its related tertiary services such as finance, insurance and real-estate in the 1970's. Port proximity was no longer the main criteria, as more flexible just-in-time logistics allowed for a diversified range of accessibility choices. As Fujita (2003) argues, manufacturing industry's rapid changes from mass to flexible production played a central role in the Tokyo's urban transformations.

Since the 1990's, a new stage of economic development ensued with the rise of creative industries, such as media, film and entertainment. Strong urban *milieus* are the nest on which such industry grows, establishing new rationales for urban development, in which both centralization and de-centralization trends are seen occurring. Changes to smarter technologies in chemical industries and re-location from the Bay areas to the periphery or abroad, have led to de-industrialization and dissemination of brownfield land. Leading manufacturing, electronics and electric machinery, transport, information and communication, as well as logistics and transhipment facilities are being located in the periphery, next to trunk roads. Large shopping centres also developed close to trunk road junctions, while new large department stores and varied size retail shops opened close to suburban railway stations. Traditional shopping streets in peripheral areas have

LANDFILL DEVELOPMENT


Urayasu, 1974 – 2007

MIXED-USE REDEVELOPMENT OF FORMER INDUSTRIAL-INFRASTRUCTURAL SITES


Shinagawa: 1979 – 2007

MULTI-PURPOSE URBAN REDEVELOPMENT ASSOCIATED TO RIVER IMPROVEMENT


Minami-senju: 1974-2007

METROPOLITAN HUB ASSOCIATED TO SHINKANSEN STATION


Omiya: 1974-2007

however shown signs of declining vitality and attraction, unable to face competition from newer retail formats, car-based mobility and IT mediated individualized consuming possibilities.

Whether a result of planned metropolitan policies or a combination of stronger social and market forces, Tokyo's demographic geography has changed significantly during the second half of the century. Sharp population increase in areas surrounding central Tokyo is accompanied by shrinkage in the older core districts (Sorensen, 2001). Employment location patterns have also change but in diverse ways, with central Tokyo and regional centres clearly gaining business and advanced technology sector jobs, while former industrial areas around Tokyo Bay are declining. Residential development, common throughout Tokyo Metropolitan Area peripheries has been witnessing new focus on downtown, waterfront and former-brownfield areas. Recently, university and R&D activities continued the decentralization trend of the rapid growth period, while IT industries, entertainment and media have been looking for locations in already urbanized, redeveloped areas.

A rather continuous mosaic of urbanized land, with some prominent points of employment concentration, such as Hachioji, Shin Yokohama and Omiya, or Chiba's Makuhari Messe, Yokohama's Minato Mirai and Tokyo's Rainbow Town, support the idea that Tokyo has effectively developed into the polycentric structure envisaged in formal planning strategies throughout the second half of the 20th century. Nevertheless, the issue of fabric renewal and the increasing signs of shrinkage and fast ageing are also in line for changing metropolitan patterns in the next decades of the 21st century.

The large scale public housing construction led by the JHC – Japan Housing Corporation – in the fast growth period are facing rapid ageing and losing attraction as its original dwellers and their sons move out to better housing, leaving those buildings – often built with rather low quality and perishable materials for the sake of economy and fast construction – in very poor state. These estates followed standardized and free-standing layouts, many times with little regard for outer space amenities and landscape quality. Its location was more influence by land acquisition costs criteria than balanced urban structure goals, thus privileging urban fringe areas instead of well-connected inner districts.

The building of large housing estates was done in parallel with the widespread private development of detached housing areas, a product which became more popular to a commonly affluent tract of the population. Sorensen (2002) finds in the historical roots of *samurai* culture and spatial organization an explanation to the continuing and usual desire in Japanese society to eventually live in a detached house, a common trend with other western countries. For these developments, smaller land transformation operations were used, the most common being the Land Readjustment (LR), outlined in the next chapter. As Sorensen (2000), points out, the use of LR has been particularly evident in fringe areas of large metropolises in Japan. The increase of land value through urbanization and selling of real-estate lots, along with infrastructure provision in low-density and scattered areas, are seen as of interest both to the landowners (often agriculture land owners) and public authorities. This process became one of the most characteristic in shaping Tokyo's suburban lines of

Illustration of the Prosperity of Ginza, Tokyo's Brick Masonry / Illustration of a Shinbashi Railway Steam Locomotive. Painted by Utagawa Kuniteru II, 1873.
Source: http://www.library.metro.tokyo.jp/Portals/0/edo/tokyo_library/english/bunmeikaika/page2-1.html

Illustration of a Steam Locomotive on the Yatsuyamashita Shore, Tokyo. Painted by Umedō Kunimasa around 1871.
Source: http://www.library.metro.tokyo.jp/Portals/0/edo/tokyo_library/english/bunmeikaika/page2-1.html

development. Smaller 'mini-developments' and 'plot-by-plot' transformations were undertaken under the opportunities driven by the overlapping factors of accessibility, land price, housing demand and tax-relief strategies (Okata and Murayama, 2011).

Another factor of differentiation of urban growth forms in metropolitan Tokyo was the nature of railway companies and their strategy. Unlike its private counterparts, Japan Railways (JR) has been prohibited of engaging in real-estate development, thus contributing to somewhat differentiated development along Tokyo's metropolitan railway lines. Sorensen (2000) points out the varying distance between stations as an indicator, with private rail lines showing smaller distances as they tend to profit from station-centred urban development.

Besides Tokyo central area, Omiya and Yokohama have also benefited greatly as hub cities around *shinkansen* stations. They became polarizing centres of large areas around Tokyo, with various metropolitan railway and shuttle lines converging on them. Yokohama is considered as a metropolis on its own, despite maintaining close functional relationship with Tokyo. This is clear in the layout of a radial railway system converging on Yokohama, overlapping with that of Tokyo. The settlement structure in this 'overlapping' area is thus more diffused and reticulate. Particularly after the 1990's, with the sharp increase of car ownership, commuting patterns and settlement growth has been changing. As distance from Tokyo and Yokohama increases, the use of car-ridership reaches higher levels, as conventional transit systems tend to be inefficient in providing service to a more diverse mobility demand.

3.5 The infrastructure as a flow-shaped public space

Tokyo is often described as a city of contrasts, disorder, even chaos. Juxtaposition, cacophony, co-presence, overlaying are common words to describe the city. However, and as Popham (1985) claims, Tokyo seems to have at the same time a remarkably strong and simple structure. In fact, the absence of a totalizing order or 'entity', both at the spatial and conceptual levels, for the *city*, commonly leads to alternative interpretations, such as *city of villages*, a *collage* city or a *mosaic city* (Jinnai, 1987) in which Tokyo as a 'whole' is "something smaller than the sum of its parts" (Waley, 2006:367). Jinnai suggests that Tokyo's 'soft urban structure' is better perceived and understood by physical experience, calling up the five senses, and not so much as through a visual and mental process of conceptualizing the *whole* and its *parts* as in the Renaissance cities. As Gabriele Vorreiter observes, there is in Japanese a capacity to have "the seemingly contradictory elements of their culture co-exist in harmony" (Vorreiter, 1987, p. 43).

There is no Japanese word for 'public', as that holding the western meaning of a collectively defined status, either by owning, sharing, using, or moving through. There isn't also one for 'private'. Only from the 19th century did it appear as a western concept. Privacy was something difficult to maintain in the traditional

Festival of Hachiman Shrine at Fukagawa, 1911. Source: http://www.library.metro.tokyo.jp/portals/0/tokyo/chapter2/event17.html

Commercial street and commercial lanes along and under railway viaducts (Shinjuku, Ueno, Yurakucho). Photos by the author

architecture's paper walled rooms and shared alleys and courtyards in commoner districts (Hidaka and Tanaka, 2001). In Japan, the 'public/private' duality is translated as 'uchi/soto', in which 'uchi' stands for 'family' and 'soto' for what's 'outside'. 'Public' becomes therefore a negative concept, something outside of what is familiar and undefined. Henceforth, architecture as a *public art*, with increased social concerns as seen in West, isn't required to fulfil such role in Japanese culture. The strength of the individual plot and the rather utilitarian approach to public space can be better understood having this in mind (Sheldon, 1999).

In the midst of the low-rise fine-grained fabrics, a labyrinth pattern of narrow streets, alleys and gaps often persists in contrast with the more recent widened streets were shopping and medium-rise fire-proof building frontages have been built. When making an incursion to these back spaces, a contrasting world of quietness and domesticity surrounds us. In some areas, however, these 'back street' areas may offer the unexpected and the transgressive. They may well be the opportunity to temporarily escape the clock-minded and rigid social rules that keep such huge and diverse fabric of people, matter and information flowing so smoothly.

The labyrinth or maze metaphor is here appropriate as it suggests not only a spatial feature that often surprises the western visitor eye, but also the fascinating power of attraction of an off-limit realm, where love hotels, pachinko parlours, manga cafés, hostess bars, massage parlours, or illegal gambling may well take place. The tradition of the *sakariba* ('joyful places') as places where pleasure, game and easement from everyday life mixes with traces of religious and supernatural (Tardits, 1992), goes hand in hand with the transient nature of flow spaces, such as commuting stations and infrastructures. As Ohno (1992) states, they are places built not only on Tokyo's physical boundaries (near slopes, river crossings, or at the edge of urbanized areas), but also part of its socio-cultural 'cracks': places where the marginal, the outlaws, the outcast gathered, where the culturally irreverent sought news and ideas from abroad, where the artists, the theatres, the performers sparkled.

If the wide commercial street is the place in which vibrant and colourful signs compete to catch one's attention to the multi-story buildings where small and large shopping and even restaurants locate, in back and lower fabric discreteness is the common feature. As Tokyo's 'villages' become trendy and fashionable places new small shops occupy its inner fabrics, especially in the Yamanote hills where a flavour of the old *samurai* estates continues to trigger Tokyoites imagination. Fashion, design and bookstores stores, art galleries and creative hotspots intermingle with the wooden house and domestic surroundings that feel so apart from the bustling life of Shibuya or Shinjuku. In such a clashing landscape, one wonders how not to get lost… Spatial references for guidance, such as continuous sideways or tree alignments are rare sights in most of Tokyo's fabrics. The city centre – the Imperial Palace – is a hollow and secluded space, permanently generating a centrifugal force from it. In Barthes words "l'imaginaire se déploie circulairement, par détours et retours le long d'un sujet vide." (Barthes, 1970, p. 46). As he puts so well, orientation is only possible by walking through urban space, by recognizing its sights, by habit and experience. Written signs, small directional graphics and omnipresent neighbourhood maps are the common help to navigate through. With the smart phones and GPS technology,

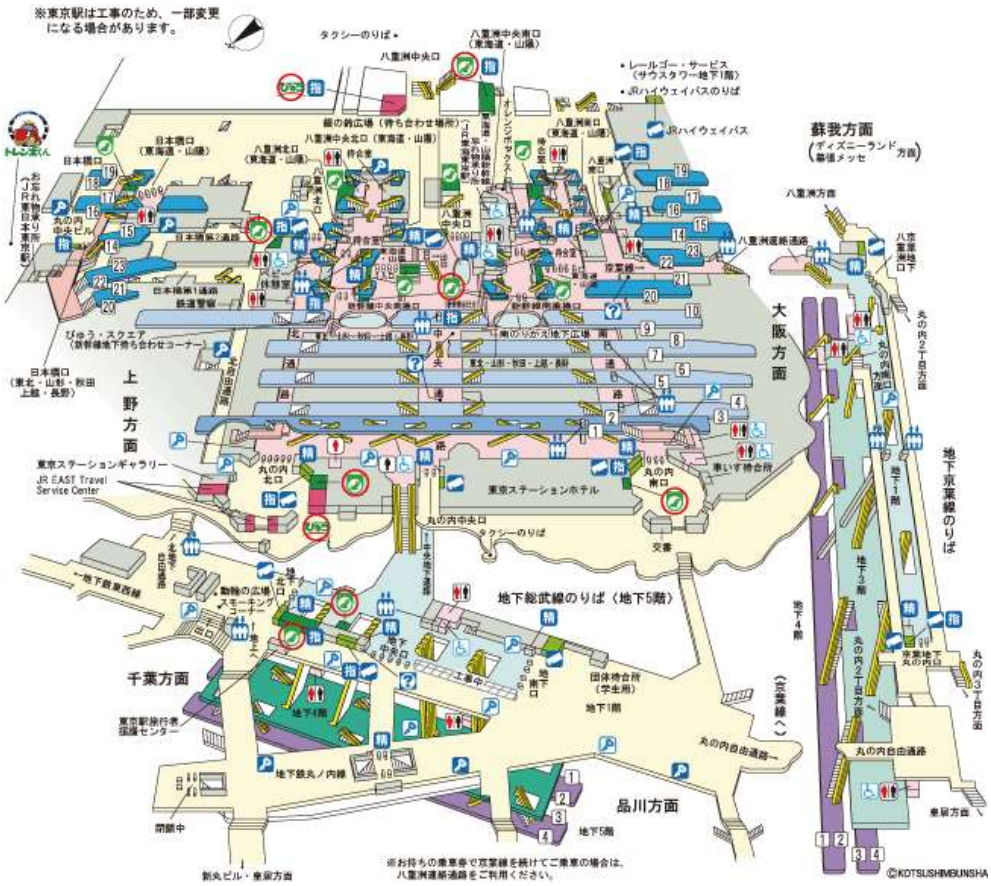


Diagram of Shibuya railroad and subway station. Source: JR East

Akihabara main street and passengers at Shinjuku station. Photos by the author

such apparent disorder becomes even less of a problem for Tokyoites, now fitted with individual, precise and on-demand time guiding tools. Instead of *representational space* – in Habermas terminology – Tokyo is better understood as the result of something closer to de Certeau's *practiced space*. As Hidaka and Tanaka (2001) suggest, instead of solid bounded by buildings, façades or alignments, Japanese public space is defined by the ephemeral events that take place in them, with its boundaries permeating between open and inner space, sometimes even including private houses – as the case of festivals during which people are allowed to watch from above the street at someone's window or balcony.

Flow is not only found in the people's movement, but also on the built fabric. Individual elements such as buildings are in a constant state of change and renewal, often shadowed by signs and advertising screens, the street scape is rather difficult to grasp and synthetize into a well outlined mental map. Streets seldom have names and addresses are made out of apparently random numbered blocks and buildings. The plot and whatever is built on it becomes more important and cared for than the road or street. The commercial streets – *shotengai* – are somewhat of an exception, often sharing some common features and identity. They usually run perpendicular to the wider roads through which car traffic flows, giving access to the core of local residential neighbourhoods. As Popham suggests, they serve as "the mediating space between the roaring, tenlane city and that soft yolk, the community's kernel (…)" (Popham, 1985, p. 48). In many cases, these streets are covered and feature common furnishings for lighting and advertisement. They become a fluid threshold between the hard surfaces of medium and high-rising road fronts and the small scale fabrics, in which movement and atmosphere is suspended from the outside.

While Ashihara's (1989) acknowledges that most streets are built resting solely on functional criteria, he also identify the Japanese culture's accomplishments in the making of scenic and local flavoured routes, such as the Tokaido and Nikko highways where the historical *daymio* processions to Edo added a ritualized sense of travelling. Adding to the spatial features that once made roads one of the Japanese landscape treasures, the ephemeral flow through them was also as important and can still be acknowledged as a fundamental aspect of Tokyo's public space character.

Naturally, being best known for its sophisticated transport system, Tokyo's experience of fluidity is ubiquitous in its multiple rail and subway. The nomadic experience of common Tokyoites on their way from home to work and back at night can also be said to shape a specific form of public space. The extension of the megalopolis and the high real-estate prices work together to bring the middle-class residential house to a small sized space for part-time living (Ashihara, 1989). 'Bed-towns' are the names given to the suburban areas where many working people spend little more than the sleeping hours and Sundays. In such a space and way of living, the meaning and practices associated to home are rather restricted to the 'bedroom'. Social relationships, such as meeting friends and sharing meals often take place outside, in restaurants, parks or entertainment areas. IN Ashihara's words, "the city becomes a mammoth cluster os 'bedrooms' interspersed with 'family rooms' (parks), 'parlors' (office buildings), 'entryways' (airports, harbors), and the like" (Ashihara, 1989, p. 45).

According to Studio Gruber (2013), 43% of Tokyoites live alone, often in single bedroom/studio apartments in condominium buildings (‘mansions’). Tokyo’s common lifestyle of many salarymen, ryhthmed by the train schedules with long hours of commuting, subject to extended working hours and with rather limited relational space around one’s own home, creates the opportunity – and is hampered – by a ubiquitous presence of specific ‘spatial products’ that allow for a convenient living ‘on the move’. These nomads have a wide variety of micro-infrastructures which allow them to perform the not only the basic daily needs of hygiene, sleep and food but also the more *sophisticated* realms of social interaction and decompression. “The dissolution of one’s own four walls” (Studio Gruber, 2013) is rearranged through another kind of shared space, blurred between public and private: from the capsule hotels to the online smart phones which dissociate oneself from the commuting crowd with whom is sharing the train.

4 Becoming Tokyo: spatial culture, urban planning and challenging visions

"Cities in the West may give greater priority to form than does Tokyo, but with its concern for content Tokyo thrives according to an order hidden within its chaos." (Ashihara, 1989, p. 63)

The Imperial Palace's walls and moats. Photos by the author

Temples and shrines and their approaching paths: Meiji-ji, Zojo-ji, Senso-ji. Photos by the author

Temple walls in Ochanomizu; Nezu museum and garden. Photos by the author

4.1 Depth and envelopment, inner and outer-ness, ephemerality and transience

The seminal essay of Fumihiko Maki (1979) regarding the Japanese concept of *oku* offers important insight to this discussion. Although it plays a fundamental role in space and place making, it is quite different from the concept of *centre* so common in many Western and Eastern cultures, from Ancient Rome to China. Instead of a notion of centre as a hierarchical, geometrical and symbolic reference to and from which space and vision converge and extend, the concept of *oku* can be grasped as the inner-most core of a multi-layered and enveloped spatial, psychological or spiritual entity. It is often disclosed only walking through an approach or path charged with meaning and reverence. It implies the presence of *depth* when converging towards it, making it inaccessible and hidden from a distance. *Distance*, or the *impression* of depth, is important in enveloping *oku*. To achieve it, darkness plays a key role, in what can be seen as a contrasting feature in comparison to other cultures' 'enlightened' reference spaces. Different levels of transparency and translucid surfaces are obtained by the clever use of materials, light and natural elements such as vegetation. Layers and thresholds are combined and sequentially established in order to provide spatial and/or spiritual feeling of being innermost, deep and least accessible.

In rendering his argument clearer, Maki uses the onion as a metaphor. He also resorts to a language analysis in which the *oku* is a component for a word or concept: *okuyuki* (depth), *okuguchi* (rear entrance), *okuyama* (recess of a mountain), *okuden* (hidden secrets of an art), *okunoin* (inner court), *okugata* (wife of an aristocrat or nobleman). Maki looks for a dialectical relationship between *oku* and the concept of *envelopment*, which he stands in opposition to the *center-demarcation* duality present in other cultures. Enveloping or wrapping can be understood as the meaningful framing of a site resorting to subtle, flexible and often inconspicuous elements. Something Maki states as a 'passive' process more than the 'active' bounding through clear and fixed elements, such as city walls.

The sacred meaning Japanese lend to the natural features, and especially to *land*, is important to understand the concept as they are often used is this process: small hills, trees and stones, water, fog and clouds, are a constant not only in Japanese landscape but also in its artistic production, such as painting. Gardens, for instance, were extremely important in the architectural establishment of Edo estates. Sophisticated landscaping built small scale mimics of Japanese and Chinese revered natural elements and sceneries. Shrines and temples were enveloped by exuberant vegetation. Within the spiritual and culturally frame of Shintoism and Buddhism, together with the country's seismic and volcanic activity, life and things are seen as temporary manifestations in a continuous process of renewal. Having wood as the main traditional building material, the propensity for temporary rebuilding is very high, as it offers only light protection, rapidly deteriorates or faces destruction from natural hazard. Impermanence stands, therefore, as a fundamental characteristic in Japanese architecture and urban form and evolution. As the buildings themselves were rather fragile and impermanent, often destroyed by fire, earthquake or even by the ritualized disassembling and reconstruction (as in Ise shrine, rebuilt every 20 years), gardens became the longest-lasting elements in man-made Japan. Gates and vegetation

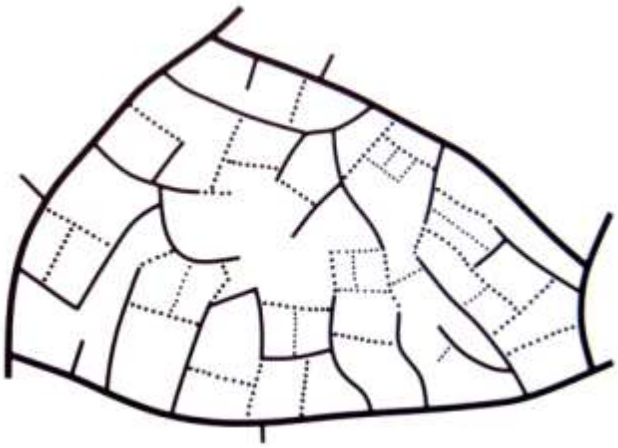
Nightscape in Tokyo. Photos by the author

belts around old *samurai* and *daimyo* estates, for instance, have endured throughout the years, cataclysms and city-wide destruction. As such, they frame a site and become *monuments* themselves. Not in the rhetorical sense common to city walls or palace fences with their ceremonial and axial gates and doors, but in a discrete and 'levitating' condition – as a reminder and celebration of time and impermanence.

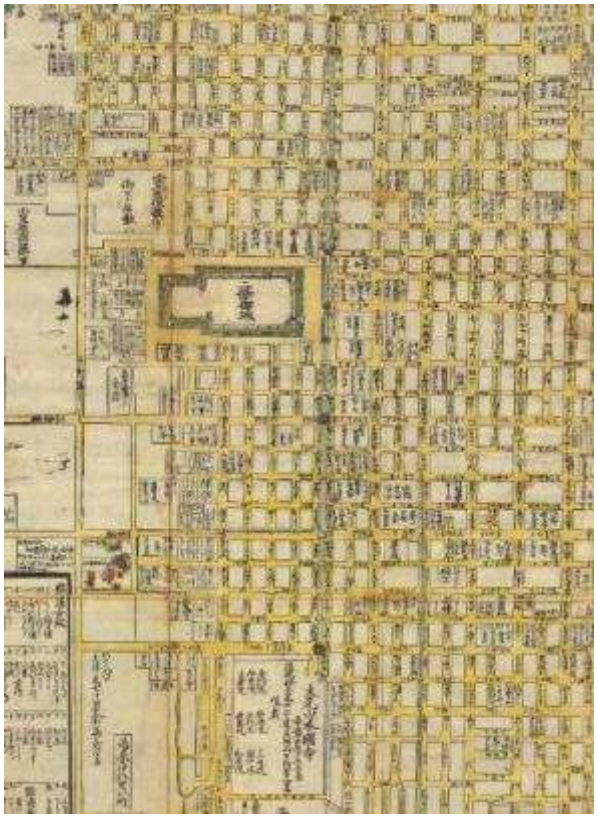
As Hidetoshi Ohno states in his discussion on the place of boundaries in Tokyo's urban and socio-cultural making, "the garden was not just for appreciation, but it was a functional, indispensable opening that helped make living space the central space and provided breezes and sunlight. But it is essential to remember that, by surrounding a building with nature, one's territory was considered complete. In other words, to the Japanese, a household without a garden is naked and incomplete." (Ohno, 1992a, p. 75). Even today, in a metropolitan landscape where large residential plots are almost impossible to find, detached houses and the boundaries of condominium apartment buildings, always have some sort of cared greenery, no matter how small and confined. As the feudal lord gardens borrowed the sacred mountains and lakes to their design, so it happens with Tokyo's contemporary urban fabrics, where its tiny gaps become fragile traces of a garden-like cosmos.

A clear resonance with Maki's argument for the *oku* and its enveloping as key drivers of Japanese place-making can be traced in Ohno's argument for a transversal meaning of boundaries across scales: from the architectural typologies of traditional house, to the establishment of a 'household' space through bounding green elements, and further to the urban pattern in which topography, open spaces and vegetation become its most prominent and persistent features. Again, the making of meaningful space through a complex, dense, and multi-layered system of thresholds or boundaries is seen as a distinct trace of Japan. In his essay on Tokyo, Ohno traces the architectural fundamentals of traditional Japanese houses to find the importance of a central space, surrounded by a peripheral boundary, which no matter its depth and configuration, is charged with functional but also symbolic meaning.

When looking at other levels of space-making, such boundaries become clearer as structural elements of urban landscapes. Passing from public to private spaces can be sensed in different ways and through different bounding layers. With the exception of western-like shaped districts such as Ginza with its prominent *Matsuya*, *Mitsukoshi* or *Printemps* department stores, or Marunouchi with its crystal solid CBD office skyline, the common feature in Tokyo however is the rather thick threshold between the outside and inside, between the public and private realms. Even in those exceptions, when walking through the underground levels of passageways and subway station tunnels, the sharper boundaries that are recognizable at the street level are again blurred as direct connections plug the buildings' basements into the underground network. Depth and thickness become truly three-dimensional entities when dissecting Tokyo's complex structure of access ways, public space and building structures.



Language diagram illustrating the concept of *oku.* Source: Maki, 1979, p. 53
Common urban layout, with main streets enclosing an area only accessible through ever thinner and dead-end alleys. Source: Maki, 1979, p. 53



Kyoto [fragment]. Shinsen zoho Kyo oezu. 1696. Source: East Asian Library, University of California/Berkeley
Edo [fragment]. Zukan komoku / gako Ishikawa-shi Toshiyuki. 1689. Source: East Asian Library, University of California/Berkeley

4.2 Tracing the meaning of city in Japanese culture

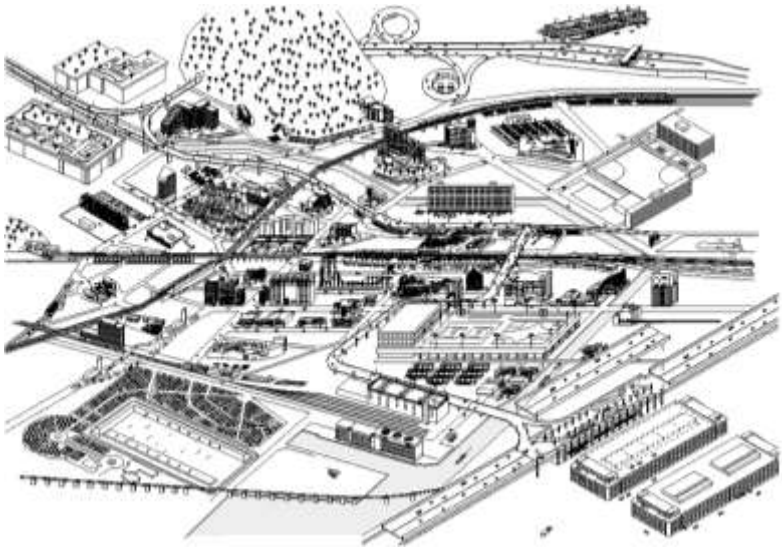
As stated earlier, the structural disconnection between building and land common to Japanese architecture and urban form means that the idea of the city as a whole becomes a rather unattainable concept. In fact, the various levels of coherence that one may find in European urban fabrics, and especially theorized and bridged with rational thinking and visual perspective after the Renaissance, are impossible to trace in the Japanese city.

Although the first forms of planned settlement in Japan can be traced back to Chinese roots – as Kyoto and Nara exemplify through its gridded pattern –, its development became quite unique and diverse from those initial influences. Unlike many cities in the world, not only western but also Chinese or Korean, Tokyo doesn't have large and symbolical plazas or comparable open spaces. As Ohno and Dan (2008) argue, this is a quite unique trace mirroring a relatively indifferent attitude of Japanese people regarding the need to stand out and create urban spaces to express community and political consciousness. The issue of public space must therefore be discussed under adjusted lens to the uniquely Japanese cultural frame. Otherwise, it will fall short of its specificities and result in prejudiced western-minded interpretation. In fact, the concept of 'public space' is itself quite different from the European's or American's, which share a rather common cultural ground.

As Worrall (2013) mentions, the usual word in Japanese for public space is *kôkyô*, which etymologically combines the ideas of 'official' and 'together' or 'same', pointing to a conceptualization in which 'government authority' or 'state power' play an important role. As mentioned by Dimmer (2012), in a reference to the work of Yoshida Shinichi, *kôkyô* has its roots in feudal time's word for the 'superior authority' resting with the emperor, shogun and feudal lords. The Latin etymology of *publicus* in many European languages, and its connotation with rather autonomous and freed manifestations beyond social, political or group control, is therefore quite distinct from the Japanese one. The closest idea seems to be that one of 'commons', tracing back the old village tradition for collectively managing common woodlands and water resources.

As previously discussed, Japanese cities lack the highly symbolical and spatially prominent squares and plazas of many cities in other cultures around the world. Jinnai (1995) sheds light on the lively, self-organized and small-scale 'back-street' culture that can be found in the rather reclusive and hidden streets and alleys behind widened road frontages, instead of the representational and open manifestations of meeting and celebrating in converging and accessible spaces in western societies.

The very idea of the city as a political 'entity', a common body with a bounded identity, government structure and socio-cultural envelopment, is quite strange to Japan. As Sorensen (2002) states, the pyramidal and hierarchized social system makes authority relationships very clear. However, they relied not so much on a centripetal convergence as the source of guidance and provision in what city-making was concerned, but based instead on decentralization of responsibilities to local levels. Mutual control and overseeing was dominant at between and *at* the various levels. In other words, city government as a political, administrative and self-



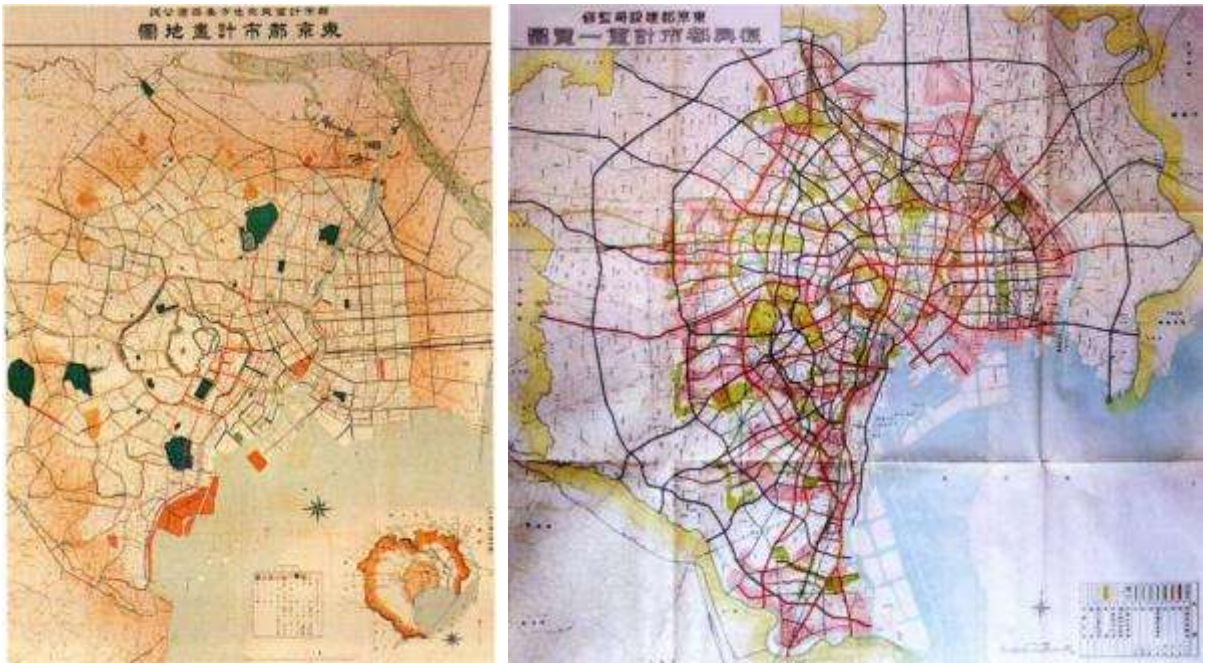
Made in Tokyo. Illustration by Atelier Bow Wow. Source: Kaijima et al, 2001

Shiohama and Kitadoda districts. Source: Bing Maps

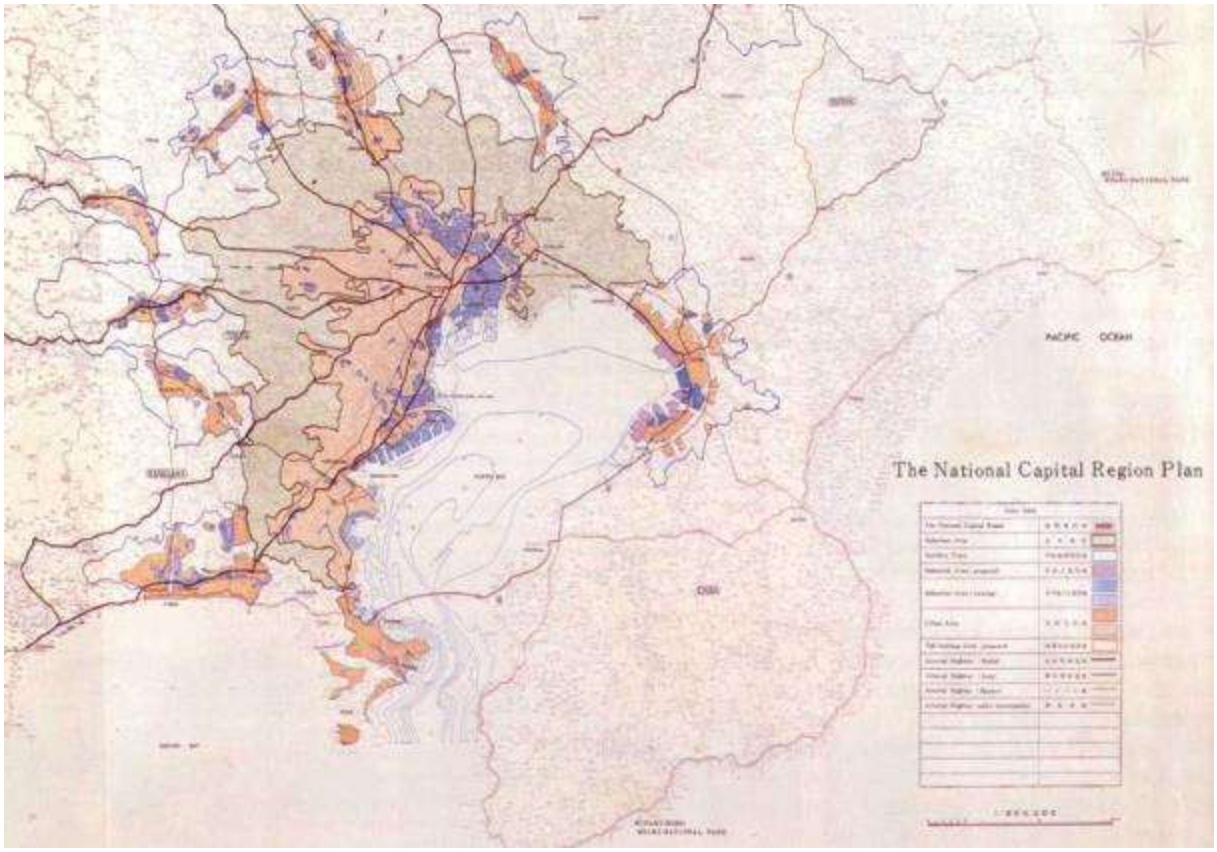
governing entity didn't exist in the historical foundations of Japan's Tokagawa era (Sorensen, 2002). Cities were, and to a certain degree still are, a sort of administrative abstraction essentially concerned with technical and bureaucratic procedures. Probably the closest sphere at which solidarity and identity can be traced more clearly is at the level of local neighbourhoods, where an atmosphere of a village is still sensed, either in the central wards of Tokyo or on its outlying ones.

Residential neighbourhoods have been the stage ground from which some civic activism and forms of community association emerged since the 1960's. Japanese relatively weak 'civil society' has been acknowledged by several authors (Sorensen, 2002, Davidson, 2013). A rather strict societal and political code of conduct has been embedded in Japanese culture since its long lasting feudal roots, and has indeed shaped urban space, namely in the commoner classes' forms of socio-spatial control in *shitamashi* areas of Edo, as earlier discussed. Residential areas have been the focus of quite effective and self-reliable level of socio-political organization; a level at which many of basic urban services (garbage collection and cleaning, lighting, road and park maintenance…) are managed, often by local forms of organization. Indeed, it is common practice in Japan that any household becomes a member of its neighbourhood association (*chonaikai*). The acknowledged friendliness, safety and cleanliness of Japanese cities and neighbourhoods are largely a product of this social system of communitarian responsibility, despite some criticism towards its inflexibility when it comes to *really* integrate 'strangers' in its realm. Small details in deference and etiquette, participation in voluntary activities, and appropriate moral behaviour are often under strict scrutiny under this realm of "friendly authoritarian" vicinity (Davidson, 2013).

Recent changes with significance to the understanding Japanese city-making can be found in a rising civil awareness and mobilization concerned with multi-level concerns over the urban environment. These changes can also be important in addressing the socio-political frame over which the role of networks, their planning and future development can take place. If one considers the *city* from the perspective of its infrastructural networks, Japan's long lasting divide between the local communities responsibility's for basic services provision and the government's (mostly at national level) action through large public works. This divide has been a fruitful realm for recent research and academic debate in Japan, namely in the changing role voluntary and local organizations are taking in the overall urban planning and implementation process. The centralized bureaucracy inherited from Meiji period has been many times met with distrust from citizens for who complaint of its single-mindedness and inflexibility towards their demands, rights and expectations (Sorensen, 2002).



Tokyo City Plan, 1921. Source: Source: *A hundred years of Tokyo city planning*
Ishikawa Hideaki's 1946 plan for Tokyo. Source: Mami et al, 2011, p. 24



The First National Capital Regional Development Plan of 1966. Source: City Planning Institute of Japan, 1988, p. 45

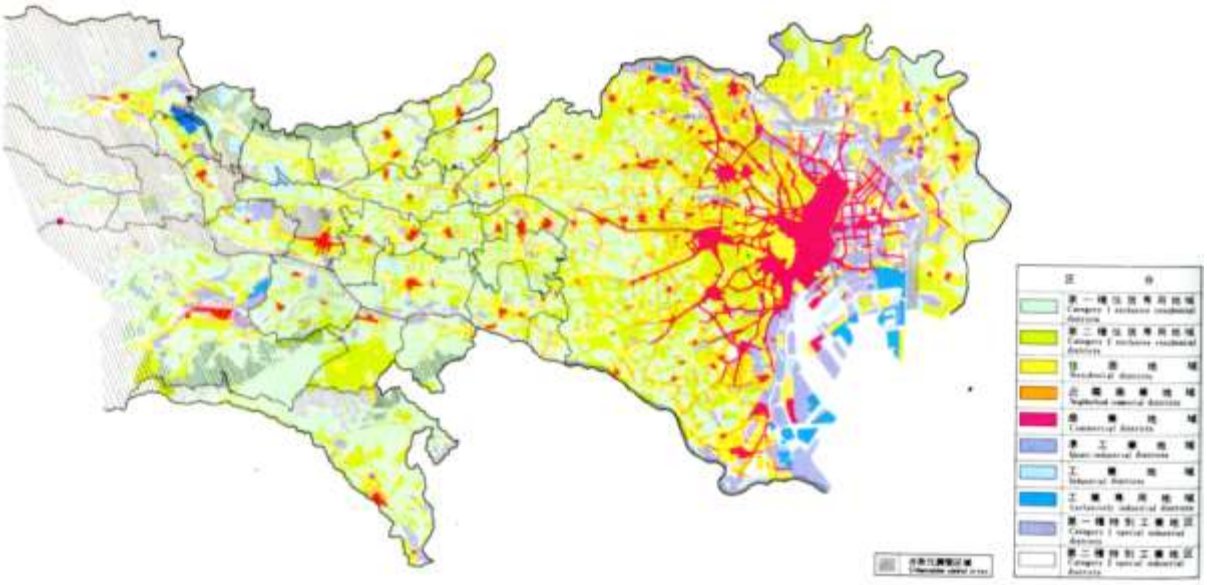
4.3 An overview of Japanese urban planning framework

Tokyo is a city in which construction and destruction are as important in the understanding of its evolution over time. Fires and earthquakes were far more effective in (re)setting the conditions to think about what city to build for the future, than any planning efforts undertaken by the government. In 1872, Japan's new capital city was struck by a big fire which destroyed most of the Ginza and surrounding merchant districts. Red-brick fire resistant buildings bearing western-styled facades were defined as the model to follow in reconstruction, making the district known as *Ginza Brick Town*.

In the early 1880's there were the first attempts at drafting a comprehensive large scale plan for Tokyo, in the wake of the Meiji restoration political agenda of modernization. The first one was conceived under the authority of the Home Ministry and the Tokyo's Governor Matsuda Michiyuki, through a 'Haussmann' inspired proposal to widen main streets, but with greater focus on central area and port economic development. Implementation faced many obstacles and was never carried out. The second one was undertaken by the Ministry of Foreign Affairs which also had a peculiar though limited role in shaping Tokyo, holding a small architecture bureau in charge of urban planning. This unique jurisdiction was linked to the political will of building a prestigious face for Japan in the international arena, in which western powers dominated. The negotiation of Japan's position in this arena was critical as the country had been forced to sign unequal treaties during the 1850's and 1860's. The Foreign Ministry's architecture bureau was committed to shape Tokyo as western-style metropolis (Shouichi, 2008, Sorensen, 2002), through the drafting of a city-wide plan with wide and long boulevards and through the development of majestic stone government buildings rivalling those of European and American capitals. With the failure of diplomatic negotiations in 1880's, the grand plan and the bureau were dismissed. Its wake was limited to the reshaping of Hibiya district around the National Diet building, but it left the door open to the location of Tokyo Central Station, later built as part of Marunouchi development in the 1890's.

The third and most enduring planning scheme was known as the *Town City Improvement Ordinance*, aiming at the development of infrastructure, parks and urban facilities, but with limited financial resources allocated. Its main legacy was a new fire-resistance code and the setting of guidelines for the future structure of the metropolis, which was implemented in redeveloped areas after fire the 1872 fire. It was approved in 1888 and became the main guiding tool for infrastructure development throughout the next 30 years (Sorensen, 2002) with considerable investment in water supply, tram lines and sewer projects. As Sorensen (op. cit) argues, Meiji period urban planning was primarily concerned with infrastructure projects rather than building regulation. This can be explained by the need to modernize the city over pre-modern fabrics, which required a project-oriented approach, whereas building regulation would fit best at controlling suburban development.

The *Taisho* period (1912-1926) is considered to be a major turning point after the Meiji restoration, characterized by greater cultural and political awareness and mobilization along with social and economic



Urban Promotion Areas (with land use zoning) and Urbanization Control Areas. Source: *A hundred years of Tokyo city planning*

□ can be built ■ usually cannot be built

Examples of buildings	Category I exclusively low-rise residential zone	Category II exclusively low-rise residential zone	Category I mid/high-rise oriented residential zone	Category II mid/high-rise oriented residential zone	Category I residential zone	Category II residential zone	Quasi-residential zone	Neighborhood commercial zone	Commercial zone	Quasi-industrial zone	Industrial zone	Exclusively industrial zone	Area with no land use zone designation (Urban Area as stated)
Houses, House with other small scale function (store, office, etc.)												■	
Kindergartens, Schools (Elementary, Junior High, Senior High)											■	■	
Shrines, Temples, Churches, Clinics													
Hospitals, Universities	■	■									■	■	
Stores (mainly selling dairy commodities) / Restaurants with floor space of 150m² max. on the first or second floor (excluding ⑨)	■											D	
Stores/Restaurants with floor space of 500m² max. on the first or second floor (excluding ⑨)	■	■										D	
Stores/Restaurants not specified above (excluding ⑨)	■	■	■	A	B							■	
Offices, etc. not specified above	■	■	■	A	B								
Hotels, Inns	■	■	■	■	B						■	■	
Karaoke boxes (excluding ⑨)	■	■	■	■	■						■	■	
Theaters, Movie theaters (excluding ⑨)	■	■	■	■	■	■	C				■	■	
⑨ Theaters, Movie theaters, Stores, Restaurants, Amusement facilities and so on, with more than 10,000m² of floor area	■	■	■	■	■	■	■				■	■	■
Bathhouses with private rooms	■	■	■	■	■	■	■	■		■	■	■	■
Independent garage with floor space of 300m² max. on the first or second floor	■	■											
Warehouse of warehousing company, Independent garage of other types than specified above	■	■	■	■	■	■							
Auto repair shop	■	■	■	■	E	E	F	G	G				
Factory with some possibility of danger or environmental degradation	■	■	■	■	■	■	■	■	■				
Factory with strong possibility of danger or environmental degradation	■	■	■	■	■	■	■	■	■	■			

Note A : Must not be built on the third floor or higher. Must not exceed a floor area of 1,500m².
B : Must not exceed a floor area of 3,000m².
C : Audience seating floor area must not exceed 200m².
D : Stores and restaurants must not be built
E : Floor area must not exceed 50m².
F : Floor area must not exceed 150m².
G : Floor area must not exceed 300m².

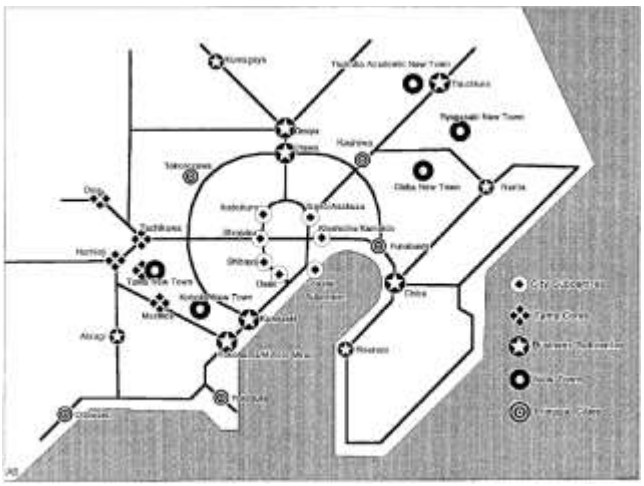
Permitted building use according to Land Use Zoning. Source: Urban Land Use and Planning System in Japan (MLIT, 2003)

democratization. Local neighbourhood associations flourished and played an important role in the decentralization of local affairs, such as welfare, urban garbage collection and even-street-lighting (Sorensen, 2002), being associated in a sort of 'co-option' by local governments. The Meiji time *Town City Improvement Ordinance* was an important background for the inception of modern and nation-wide urban planning system. The technical sophistication matured out of foreign influences in urban planning and technological advances, combined with the strong political and administrative impetus of Goto Shimpei to comprehensively renew the national planning system and frame it under an expansive State approach combining public works, social welfare and urban development. Goto's long career in Government and state administration from colonial times included the post of Home Minister in 1916 and 1923 and Tokyo's Mayor in 1920. Under his influence, legislation such as the *City Planning Law* and the *Building Standards Law* of 1919, initially enforced only in Tokyo, Osaka, Kyoto, Kobe, Yokohama and Nagoya, and extended to the rest of the country in 1933, introduced a simple zoning system and some guidelines for building use, height and floor area ratios. This system was meant to control urban development throughout the fast growing metropolises, and not only in the redevelopment and improvement plans of past times.

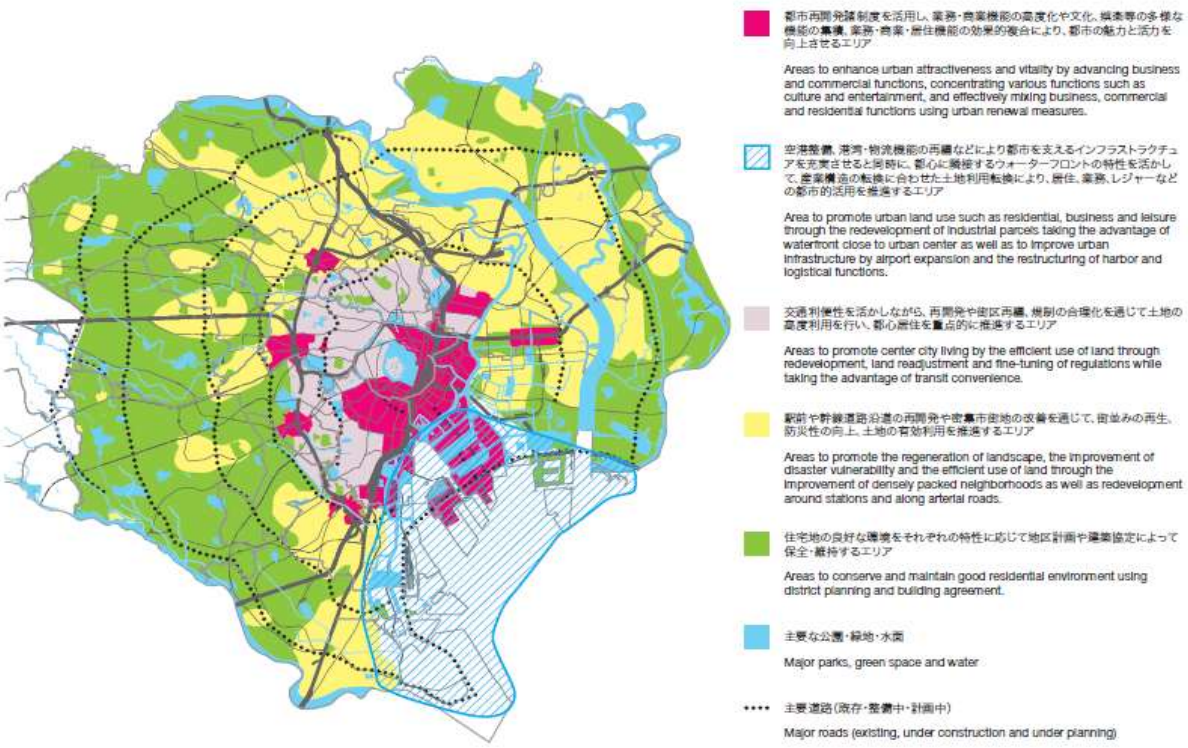
The 1923 Kanto Earthquake had also profound impacts on the way how city planning and its reconstruction were shaped henceforth. 1923 Earthquake Reconstruction Plan was very ambitious. Hierarquized and widened street networks, building lines and distinctly designed bridges bear influence from contemporary European town planning concepts. However, and given the financial limitations, government action began to limit itself only to the essential infrastructure required for economic and military expansion. As the winds of Japan's foreign policy turned to military conflict, eventually leading to the Pacific War and World War II, greater governmental centralization and bureaucratic authority were established in all areas, including urban planning. The social and political opening of early Taisho years was superseded by the dictates of an increasing priority allocated to military and defence concerns, in which quality of life issues such as environmental, public space and urban local facilities fell short of government agenda.

With the total destruction inflicted on most Japanese cities during WWII, Kyoto being the remarkable exception, post-war policy agenda was entirely devoted to reconstruction, economic growth and development, opening the door to largely free private initiative in what housing and urban development was concerned. In fact, previous Japanese tradition of focusing on projects to provide basic infrastructure such as ports, water supply, hydroelectric power and serviced industrial land continued, with limited attention paid to social infrastructure such as sewerage, local roads, and parks (Sorensen, 2000).

Nevertheless, ambitious planning efforts continued with one of the foremost being Ishikawa Hideaki's 1946 plan for Tokyo, in which the previous green belt concept of the 1930's is taken one level up, bringing a much stronger green structure to Tokyo's central areas and breaking its urban fabrics into autonomous units. This rather idealistic ambition was met with little political authority, contrasting private interests, strongly rooted property rights, and an unstoppable movement to rebuilding in disregard of any attempt to comprehensively



Third long-term plan for the Tokyo Metropolis, 1991. Source: Tokyo Metropolitan Government in: Sorensen, 2001



Masterplan for Development of Tokyo Metropolis, 2004. Source: Endo and Ota, 2005

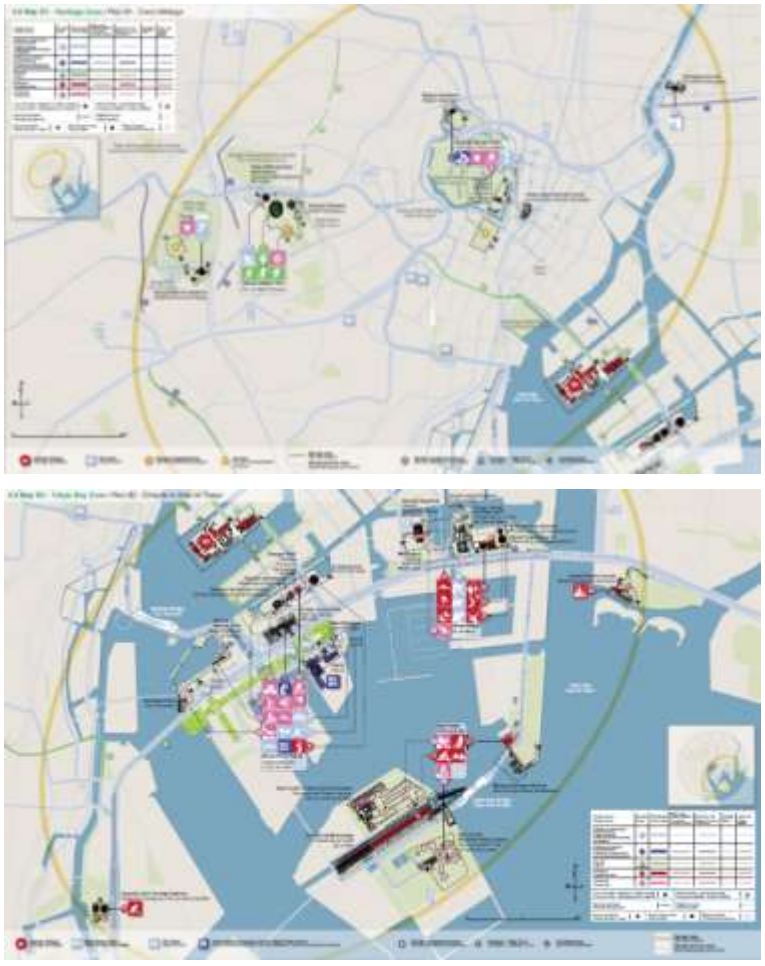
reframing the established city structure. The return to a stronger State commitment to large scale and balanced approach to urban planning only took shape in the late 1950's. Again, and just like the end of 19th century, urban infrastructure provision was fell completely behind the fast and massive population growth, triggered by demographic boom and rural exodus to large cities. Congestion, overcrowding, extremely poor housing conditions and environmental disruption made their way again into the political agenda, claiming for greater control through urban planning.

Public housing development was introduced in large scale with the establishment of Japan Housing Corporation in 1955, its aim focusing on cheap and massive housing supply to accommodate industrial workers. Within this agenda, housing was seen as *infrastructure* to support economic development, and therefore concentrated in dense, high-rise multi-family housing estates or new towns associated to industrial areas, and often in green fields where the land cost was lower. There wasn't an overall policy for housing development in what urban and environmental quality and living conditions was concerned. Residential areas were often developed both by public and private initiative at fringe areas, where zoning permissions were more permissive and land prices lower. Yet, this also meant that these areas were able to be looked by many kinds of industrial facilities, since the zoning system established since the late 1910's was mainly directed at preventing housing development in heavy industry areas. Even today, it is quite common to see side by side a myriad of different land uses, including small and medium size industry in the middle of detached house fabrics and agricultural patches.

In 1958, a National Capital Region Development Plan was introduced, in which the *green belt* idea was maintained as a growth control buffer, but complemented with the designation of new satellite towns around it and industrial and university decentralization measures. However, the plan being only advisory, together with local pro-growth policies and legal shortcut involving rural land subdivision prevented the sound implementation of the green belt (Sorensen, 2002). A Second National Capital Region Development Plan was established in 1968, in which the greenbelt concept was eliminated, while maintaining satellite town strategy.

1968 is always a key date for an important revision of Japanese urban planning legal framework, with the passing of the *New City Planning Law*. It introduced reinforced mechanisms aimed at controlling and preventing urban sprawl by dividing urban areas into *Urbanisation Promotion Areas* (UPA) and *Urbanisation Control Area*s (UCA), thereby creating an urban development boundary or perimeter (*senbiki*). A strengthened zoning system, the requirement for private developers to guarantee proper infrastructure in their operations, improvements in public participation process and decentralization of planning powers to local authorities were also part of this legal agenda. This system was largely aimed at preventing the problems arising from the previous *laissez-faire* framework which allowed for continuous subdivision, scattering and sprawling without any provision of basic urban amenities and infrastructure or consideration for land use and environmental balance. The idea of compact and staged development was clearly stated as the 1968 law's main goal. However, numerous exemptions and loopholes allowed for continuous subdivision and sprawl (Sorensen,

Network of Water and Green. Source: Tokyo Metropolitan Government, 2011b



Tokyo Olympics 2020 masterplan: the two venue areas – Heritage Zone and Tokyo Bay Zone. Source: Tokyo 2020 Olympics Candidate City Application

2002), particularly with increasing use of very small developments, falling below the legal 0,1 ha threshold above which stronger control mechanisms were in effect.

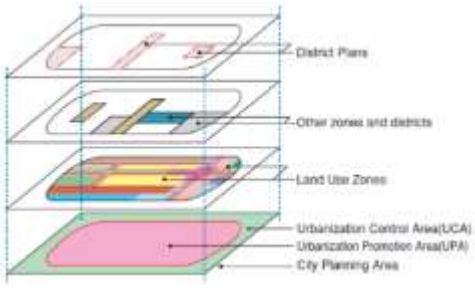
One of the most important shapers of Japanese city scape is the architectural building code regarding its height, diagonal section and shadow restrictions. Conceived in order to guarantee minimum lighting and ventilation to the adjacent street, this code is structured in a way not dissimilar to the New York's zoning restriction system of the early 20th century. In the Japanese case, however, it has been often used as the shaper of a maximum building envelop, which can be easily plotted by computer software (Nakamura, 1992). The characteristic diagonal plane façades of Tokyo street scape is the nothing else than the materialization of such three-dimensional geometric envelope filled to its limits in order to maximize floor area ratio allowances. In 1963 urban regulations limiting building height were abolished opening the door to high-rise development. With this change, radical increase in floor ratio and even higher densities were widely allowed, bringing considerable change to Tokyo's skyline and townscape.

Greater detail and comprehensive urban design was introduced through *District Planning* system in 1980, by which building, public space and road system are defined at greater scale. The system also introduces resident's consultation and improved balance between land holders rights (TMG, 1998). Its effective implementation was faced with an overall trend towards de-regulation and greater freedom in private-led development, with greater flexibility and elimination of existing zoning restrictions. Criticism has been pointed out, however, since under the overall weakened planning system, District Planning has allowed for rather discretionary outcomes, resulting more from the negotiation powers of the planning authority, sometimes with loss for the public interest (Sorensen, 2002, p. 280).

The Third Comprehensive National Capital Region Development Plan of 1977 was aimed at dealing with the impact of a growing service-oriented economy in Tokyo, in a context in which the move from manufacturing and the 1970's oil crisis had had a profound role in reshaping its production geography. This plan proposed a multi-polar structure for Tokyo metropolitan region, in which four major new 'Business Nodes' or 'Business Core Cities' (Urawa/Omiya, Makuhari/Chiba, Kawasaki/Yokohama, Tsuchiura/Tsukuba New Town' ring around and support self-sufficient urban zones. Additionally 7 sub-centres (Shibuya, Shinjuku, Ikebukuru, Ueno/Asakusa, Hinshicho/Kameido, Osaki, Waterfront/Rainbow Town) and 5 Core Cities in Tama Area (Ome, Hachioji, Machida, Tachikawa and Tama New Town) were established besides Central Tokyo. This concept of policentricity has, in fact, persisted through quite some time, with the Fourth and Fifth Comprehensive National Capital Region Development Plan of 1986 and 1999, respectively, maintained it as an overall spatial strategy (Sorensen, 2001).

The development of metropolitan Tokyo must also be regarded within the legal framework of Land Readjustment (LR) operations. Its roots come from the early 20th century German system and although initially aimed at agricultural land consolidation and irrigation projects, it became widely used for urban development.

Scheme of basic zoning principle: UPA (Urban Promotion Area) and UCA (Urbanization Control Area).
Source: Urban Land Use and Planning System in Japan (MLIT, 2003)



Basic structure of land use planning system in Japan. Source: Urban Land Use and Planning System in Japan (MLIT, 2003)

Restrictions on Building Shape in Land Use Zones

【Slant plane Restrictions】

The restrictions limit building heights in proportion to the distance from the other side of the boundaries of the roads they face, or from the adjacent site boundaries. It ensures adequate space for light and ventilation between buildings or on roads.

* This Slant Plane Restrictions do not apply to buildings which can secure levels of lighting and ventilation equivalent to or higher than those under this restriction.

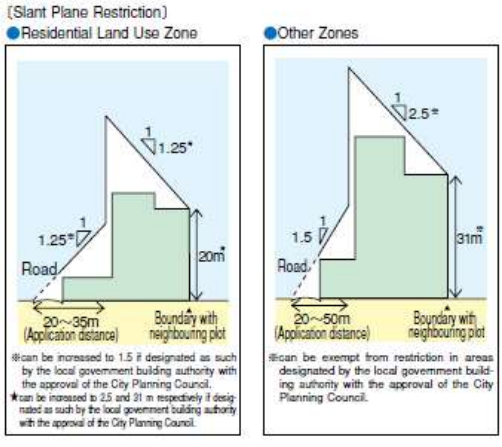
【Restriction on floor-area ratio according to the width of the adjoining road】

The maximum floor-area ratio of a building site which has a road in front less than 12m wide, shall not exceed the value obtained by multiplying the width of the road in meters by a certain ratio (for residential Land Use Zones, this ratio is 0.4*, for other zones, it is 0.6*).

* A factor of 0.6 for residential Land Use Zones and 0.4 or 0.8 for other Land Use Zones can be adopted in those zones where such factors are designated by the local government building authority with the approval of the City Planning Council.

【Shadow Restrictions】

These limit the height of buildings so as to ensure sufficient sunlight in residential Land Use Zones, etc. The minimum number of hours per day that the shadows of building sites fall outside the area are specified by bylaws of the local governments according to the Building Standard Law.



Building code concerning vertical configuration. Source: Urban Land Use and Planning System in Japan (MLIT, 2003)

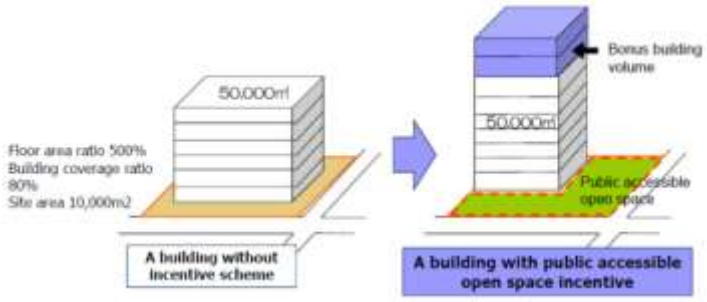
"LR is a method whereby a group of landowners can join forces to develop or redevelop land. In essence, LR is a process whereby ownership of scattered and irregular plots of agricultural land is pooled, roads and main infrastructure are built, and the land is then subdivided into urban plots. Each landowner must contribute a portion of their previous land holding (usually about 30% of the total) to provide space for roads, parks and other public space, and for reserve land. The reserve land is sold at the end of the project to pay the costs of planning, administration and construction." (Sorensen, 2000, p. 219)

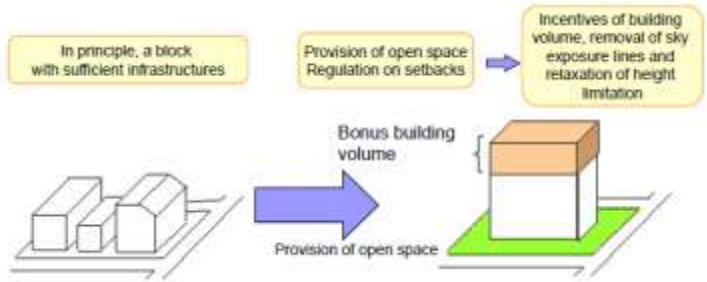
LR simplicity and flexibility has allowed for its use in urbanization of formerly scattered agricultural plots, but also in urban renewal, transit-oriented retail development, new town building and public housing projects. National government subsidies were important in fostering LR projects, as they financed some higher level infrastructure, such as arterial road construction, a cost shouldn't be the burden of local landowners alone. Although it may be set by public authorities, the most common LR are initiated by associating private landowners. Difficulty in promoting public-led urban and infrastructure development often arises from high-costs associated to expropriation, making the private LR attractive to local authorities.

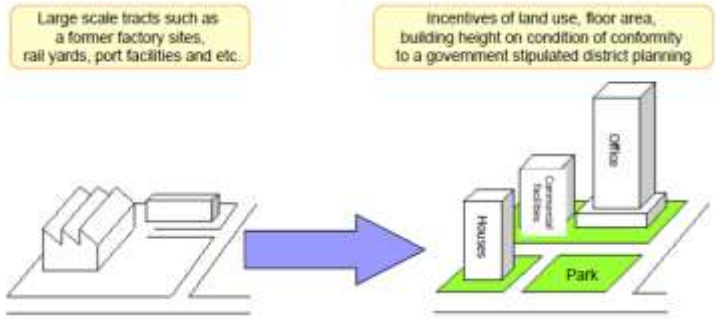
In the wake of the two oil crisis and the following economic recession, Prime Minister Nakasone's government established a policy named 'urban renaissance' begins in 1986. It followed a neo-liberal agenda of economic development using large-scale urban projects as drivers, with clear resemblances with the principles behind London's Canary Wharf or Baltimore's waterfront development. State or public-owned land was sold to private developers – i.e. many Japan Rail yards and military facilities – and building regulations eased, in return for mixed-use private led redevelopment schemes. Ark Hills project, developed by the Mistui Corporation conglomerate, pioneered such agenda and soon became a model for many others that followed (Shima et al., 2007). Tokyo Bay's waterfront and landfills were targeted as the core for such development but many of the then programmed projects were to face postponement or cancellation with the burst of the 'bubble economy'. Dimmer and Klinkers (2004) draw on the work of H. Aoki, *Japanese Style Planning for a Lively City* (2004), to synthesise four types of urban redevelopment projects in Tokyo:

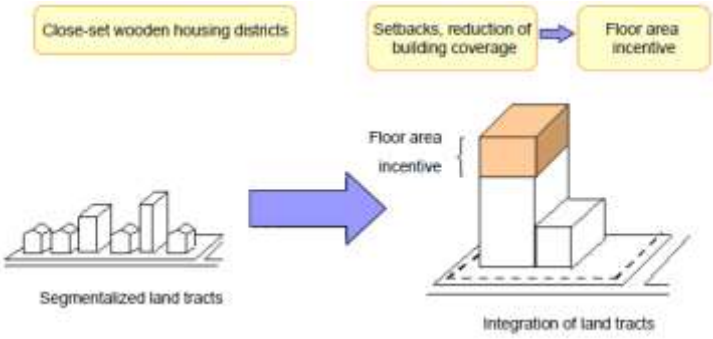
1. incremental renewal by replacing existing outdated and unprofitable buildings on-site (Marunouchi)
2. land-use conversion of former brownfield sites (Shiodome, Ebisu, Shinjuku)
3. large-scale redevelopment scheme, which turns underutilised or overly dense areas with inferior building stock and few public facilities into efficient, rational and profitable districts (Ark Hills, Roppongi Hills)
4. vast majority of punctiform small-scale redevelopments, either through sub-division with one-family houses, or by plot merging into medium-sized apartment buildings.

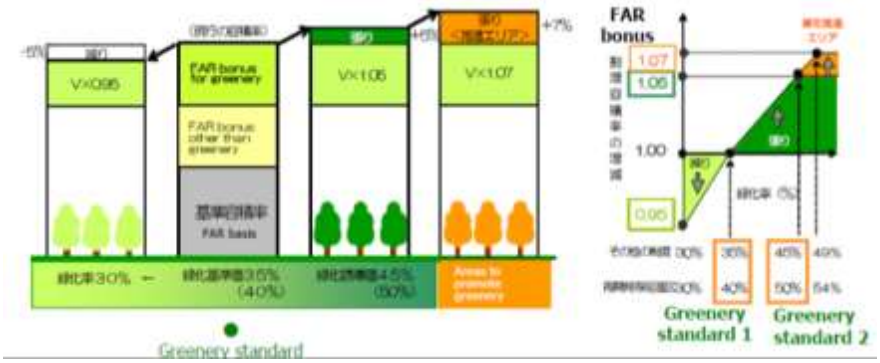
In the words of Yoshinobu Ashihara, "unlike the long-term urban planning projects that have been undertaken in Western countries, city building in Japan has proceeded in a rather makeshift manner, changing course midway in accordance with immediate demands and new developments." (Ashihara, 1989, p. 60). The evolution of Japanese urban policy since post-war has been characterized by a demise of public administration











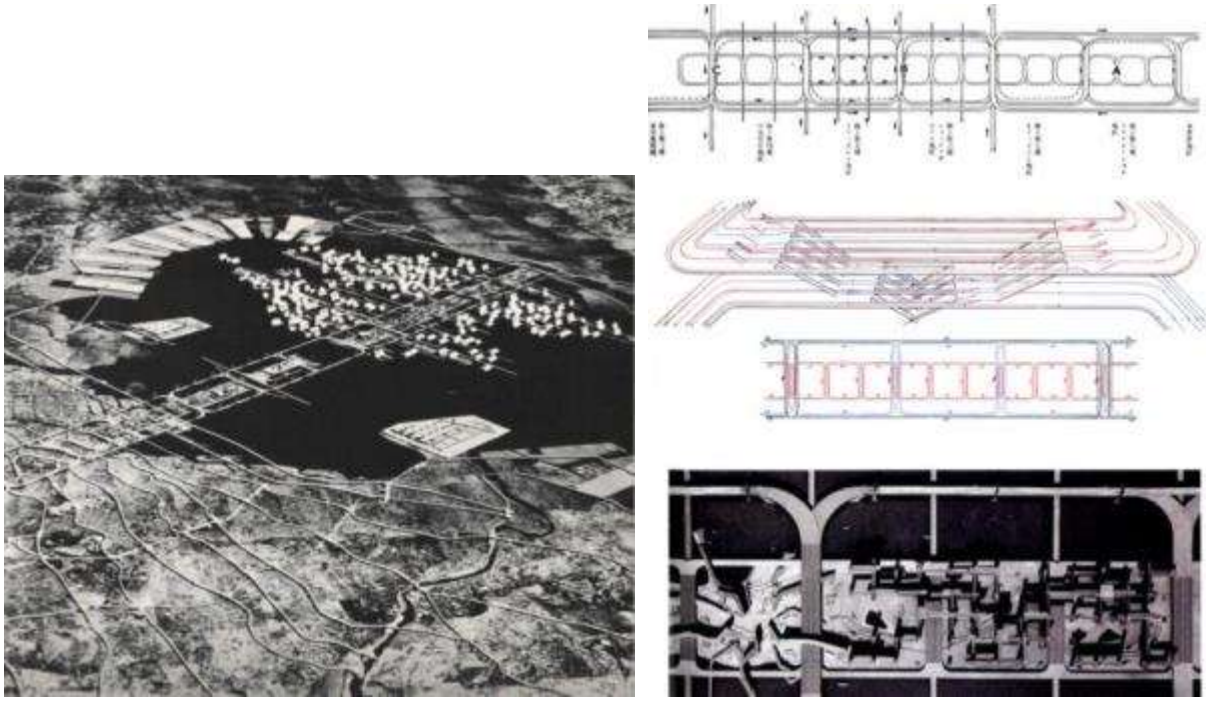
Bonus schemes associated to the provision of urban planning goals.
Source: Urban Development in Tokyo. Available at http://www.asianhumannet.org/db/datas/9_transport/udt_reference2_en.pdf

power in urban planning, previously a strong arm of the country's central government. This has been accomplished through a withdrawal of government from actively planning, developing and controlling urban development, leaving it mostly to the private sector. On the other hand, this withdrawal was accompanied by a process of decentralization to local governments, with greater involvement of communities and local partners. However, the fast growth economy, de-regulation in planning and the tandem 'bubble' events, produced an highly unequal and socially splintered metropolis, in which housing conditions for those who didn't owned land or property were rapidly deteriorated at the end of the 20th century.

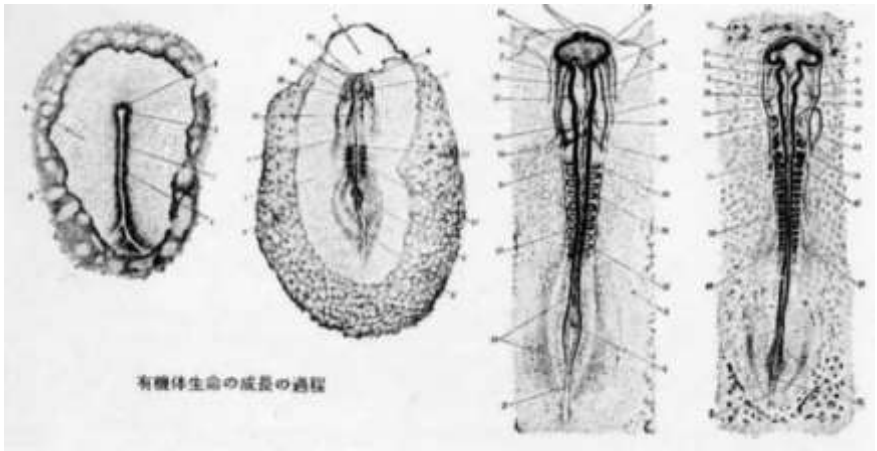
Again, the British example of Richard Roger's conceptual brand seems to have drawn attention of Japanese policy-makers as a new generation of 'Urban Renaissance' agenda is resumed in the early 2000's, this time with a wider scope of aims and issues to be dealt: environmental improvement, disaster prevention, heritage conservation. Since 2004 the government departments stemming from the 1950's Japan Housing Corporation were restructured into a new *Urban Renaissance Agency*, aimed at pursuing a new development model. The designation of *urban renaissance urgent districts* is targeted at important mobility hubs, transit-oriented development, brownfield recovery and renewal and areas with important heritage landmarks. It allows for greater flexibility in building restrictions such as height, sun exposure set-backs and floor-area ratio, aimed at promoting high intensity and mixed-use developments, often associated to improved infrastructure and urban amenities. Comprehensive urban design is seen as the tool from which to legitimize the overall gain in building area, in addition to a system of bonuses aimed at fostering public space creation, greenery provision and low carbon building footprint. This system is often associated to the bundling of formerly fragment land plots into larger units, making particularly suited to large scale development schemes. In Tokyo, eight *urban renaissance districts* were designated, its location around Yamanote line main hubs (Shinjuku, Shibuya, Osaki, Tokyo Station/Yarakucho, Akihabara/Kanda), the southwest arch of Roppongi/Akasaka/Shimbashi and the Bay waterfront landfills.

4.4 Metabolism: Tokyo as a laboratory for metropolitan visions

The interplay between scarce territorial resources and great demographic and economic pressure towards growth has been critical in defining Japanese architectural and urban development agenda in the 20th century. Going beyond the rather cautious and restrained initiatives of government planning bureaucracy discussed in the previous section, the work of renowned Japanese architects such as Kenzo Tange, Kisho Kurukawa and Arata Isosaki has been embedded with an overall commitment to the design and foundational restructuring of modern life in cities. Their work matured for a long time, rooting itself in the complex transition of Japanese modernization in the early 20th century and coming to a climax of sophistication and international recognition and acclamation in the post-war and rapid growth decades and of the 1960's and 1970's through the Movement known as *Metabolism* (Mami et al, 2011).



Plan for Tokyo, Tango Lab, 1960. Source: Mami et al, 2011, p. 66
Structure of Civic Axis and Cyclical Transportation System; Office District; Part of Plan for Tokyo, Tango Lab, 1960. Source: Mami et al, 2011, p. 67



The Process of vertebrae's growth. Part of Plan for Tokyo, Tango Lab, 1960. Source: Mami et al, 2011, p. 63

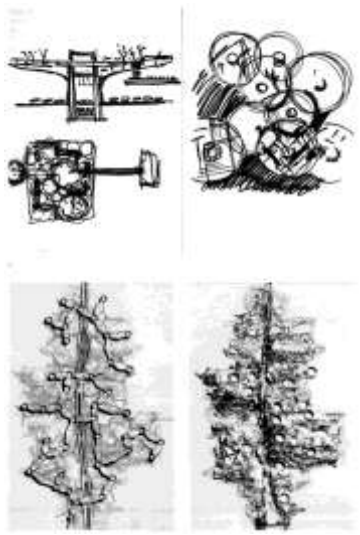
As Yatsuka (2001) and Hajime (2011) argue, some of the Movement's most meaningful roots can be traced in the early decades of the 20th century, under the aegis of Shinpei Goto, a prominent figure in the national bureaucracy. After the turn of the century he had been assigned with responsibilities in the colonial development of Taiwan and Manchuria, where he took an active role in fostering technically advanced urban planning and large scale railway development. Known for a technocratic belief in rational planning and infrastructure-based approach to economic development, he became Tokyo's Mayor in the early 1920's, later facing the challenge of city reconstruction after 1923 Earthquake. Much of his thinking and rationale had a strong influence in various threads of later generations of architects and urban planners, among them many of the central figures of *Metabolism* but also of people who have a key role in shaping Japan's territory into the highly developed country it became. It is the case Shinji Sogo, who became responsible of city reconstruction under Goto's administration and was appointed chairman of Japan National Railway after World War II, being the father of the iconic *Shinkansen* high-speed railway lines.

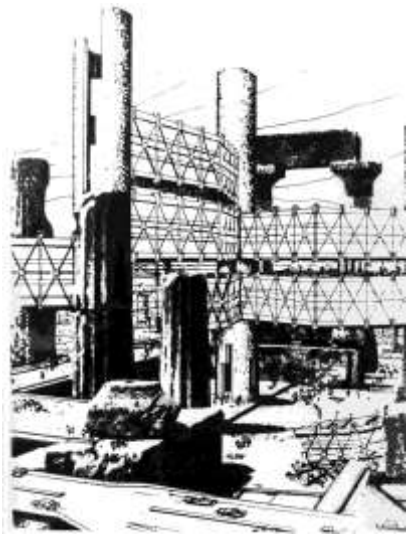
In line with the wide acknowledgment of *Shinkansen* as one of the foremost examples of Japanese engineering endeavours with the capacity to reorganize the entire country's urban system, *Metabolists* argued for an adapting metropolitan spatial organization based on mega-structural elements capable of supporting changing forms of settlement and urban activity. Complex mega-infrastructures were employed to frame a new kind of three dimensional spatial structures and to channel the flow of people and goods at various levels. The idea of continuous reshaping and adaption was central to Metabolist discourse, acknowledging that a new kind of city would be need to face the outstanding challenges of rapid, massive and extensive urban growth. Change was seen as an embedded condition of urban development, not only as the recent memory of war destruction reminded, but also as something that could be traced from ancient times with continuous cycles of destruction and rebuilding.

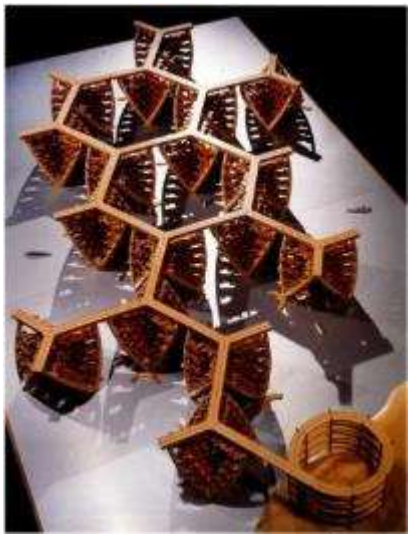
Most of the movement's designs, however, were shaped in highly hierarchical configurations. The metaphor of the *tree* was particularly suited to describe many of Tange's, Kurokawa's or Isozaki's projects, in which a strong central dominating element would branch out to increasingly smaller units, which would be given greater autonomy and possibility to change over time. The functional rationale of modern urbanism and architecture was clearly a strong background. On the other hand, this belief in a centralized and hierarquized system depicted much of Japanese tradition in urban planning, administration and government structure, authority and social structure.

One of the most celebrated projects, Kenzo Tange's 1960 Plan for Tokyo Bay was structured on a clearly outlined hierarchical axis, along which massive transportation and settlement structures took shape. Highway, railroad and mono-rail were superimposed on the main linear structure that connected central Tokyo with the Boso peninsula, across the Bay. Having the Imperial Palace at its centre, two parallel lines were the axial main frame establishing not only a territorial armature between land and water – replicating the Edo's Yamanote/Shitamashi duality – but giving a symbolic and historical meaning to the planned growth.

Proposal for Tokyo Bay. Otaka Masato, Okumura Keiichi, 1959. Source: Mami et al, 2011, p. 27
Shinjuku Terminal Redevelopment Plan, Otaka Masato, Maki Fumihiko, 1960. Source: Mami et al, 2011, p. 57







Shinjuku Project: City in the Air. Isozaki Arata, 1960. Source: Mami et al, 2011, p. 692-93
Floating City, Kasumigaura. Kurokawa Kisho, 1961. Source: Mami et al, 2011, p. 97

Tange's proposal was ahead of his time, and was very clever in predicting that Tokyo would grow towards the Bay. His project for large scale landfilling has been accomplished to some extent over time. Moreover, as he became involved in national urban prospective studies for Japan, he extended his idea of axial restructuring of Tokyo to the entire country as the backbone for spatial and urban development. This gesture, Yatsuka (2001) argues, has been accomplished in the *Shinkansen* rail network that links the main Japanese cities. Moreover, the notion of information society was already embedded in the idea behind his spatial proposals, with citizens who would move and bond freely through 'information channels' (Hajime, 2011).

Tange credited some regional planning experiences such as TVA in the United States as valuable for Japan future development (Yatsuka, 2001), giving credit to the wide-scope concerns and issues – spanning from the living environment of mankind to the production and landscape organization of entire regions –that were at the core of his proposals. In this regard, *Metabolism* represented a highly coherent and self-aware vanguard at its time, reaching various disciplinary fields and concerning itself with critical and updated issues of its time, technical, social and political in nature. However, as Pernice (2007) argues, Tokyo Bay's urban utopias differed substantially from many of European or American one's, as they didn't portrayed alternative social and economic orders. *Metabolist* utopian thinking was clearly embedded with the Japanese capitalist order model, working as mechanical devices to bring industrial rationality to the urban realm.

Although the more formal and eye catching proposals of *metabolists* were hardly materialized in the way they designed them, many of its themes were actually developed through other processes and became widespread spatial and urban products. Prefabrication, modularity and easy replaceability of parts in a big structure have made their way through in contemporary Japanese. Having transportation networks as the spinal mainframes of daily life and urban structure, small scale individual units are easily plugged-in as demand and convenience require. Of course, the way how the actual connection works and is designed in contemporary Japanese cities seems to be rather fragile and architecturally numb. This mediation between units (buildings) and an overall frame (infrastructure), or the lack of it, seen in the haphazard road and suburban patchworks, is probably the level at which Japanese urban realm and *Metabolism* ideas are most apart.

In a morphological perspective, the level at which such mediation occurs is the land parcelling. Even though industrialized house building, sophisticated mobility devices, and personalized technologies of communication recall the optimistic proposals of that time, the processes of land parcelling, subdivision and property management didn't evolve significantly in the past decades – not only in Japan but all over the world. Even in the ephemeral and rapidly changing metropolises of Japan, land assets continue to play a crucial role. The architectural expressionism of *Metabolist* laboratories seems to have jumped over that level making a direct short-circuit between infrastructure and superstructure. Present day Tokyo's landscape is probably the result of a collective laboratorial experience, actively minded with shared rationales of networked efficiency, reliability and mass production. It may be the case that further visions and tests are required at the middle



Nakagin Capsule Tower (K. Kurokawa), Shizuoka Newspaper Company Building (K. Tange), Fuji TV Headquarters (K. Tange). Photos by the author

levels of this process – those concerned with the mediation between the whole and the parts, in which the ground, its land patterns and the way how urban fabric is extensively weaved over it has a leading role.

On the other hand, contemporary relevance of Japan's *Metabolist* thinking extends to the very core of the relationship between architecture, urban planning and societal development. It is in the disciplinary realm of architecture and spatial place-making that many of current global issues, such the environmental and political trade-offs in the difficult balance between growing human needs and rapidly exhausting natural resources, can be addressed.

5 Perspectives for a transitional metropolitan development

"The 20th Century world, which has increased its material production through excessive 'exploitation', must shrink once in order to move forward towards a sustainable equilibrium point." (Ohno, 2012, p. 5)

Levee along Edogawa River. Photo by the author

5.1 Changing grounds: the limits of network paradigms in Japanese cities

Japanese post war reconstruction policies and the ones followed in the rapid growth period were mainly aimed at providing desperately needed housing at the fastest and economical ways as possible, while boosting the country's industrial output and economic growth. Loose legislation regarding urban development control, together with extremely high concentration of people and industry in space-scarce metropolises and large cities, quickly resulted in serious environmental problems in the 1970's. Industrial pollution, land and water contamination, CO2 and NO2 emissions, untreated industrial and urban waste and waste water, and land use conflict reached unimaginable levels, with serious repercussions in public health. As Sorensen (2000) argues, this "environmental crisis" was also experienced through deteriorating living conditions of haphazard development in fast growing metropolises.

Environmental issues were but the first of the signs that such kind of development was reaching its limits and become increasingly socially inadmissible. The next sign came in with the oil crises of the 1970's making Japan's critical dependence on imported fossil sources of energy a clear risk and burden to the country's development. The early 1990's saw the burst of the 'bubble economy' speculative growth based in overinflated asset values, splintering Japan's miracle growth with a long term debt and low or no-growth trend, which is still being sensed after two decades. Finally, many of the political responses to these environmental and economic clashes were channelled to massive public works and infrastructure projects, seen as effective drivers of economic recovery, in an offspring of Keynesian perspectives.

The weight of the construction industry in the economy, holding about 20% of the country's GDP, is seen as a major driver behind the political commitment to the promotion of large scale projects in Tokyo and other major cities, such as the cross-bay bridge and tunnel, the finishing of the metropolitan motorway network, and large water supply and drainage infrastructure facilities. However, much of this investment has returned lower benefits than expected and resulted in growing debt costs suffocation to national and local governments (Sorensen, 2002, Kerr, 2002). Limits to growth are also gaining expression in fiscal unbalance and often redundant and oversized investment still shaped by the legacy of the asset dependent capital flows of the 'bubble economy'. At its peak, growth in land prices reached 35% a year (Suzuki, 2008), and infrastructure development had a key role in fuelling them, through intertwined financial schemes based on asset-guaranteed loans.

Stemming out of the 'bubble economy' burst, there has been a return of population to the central Tokyo's districts, leaving many suburban areas in distress and decay, especially those developed in the rapid growth decades of the 1960's and 1970's. In these sprawling areas, the cost of infrastructure provision is increasing while the tax basis faces continuing erosion due to depopulation and rising proportion of retired people. Moreover, the rather permissive codes governing these suburban areas' original development, meant they offered poor urban networks and social infrastructure, making it even more difficult to find alternatives to

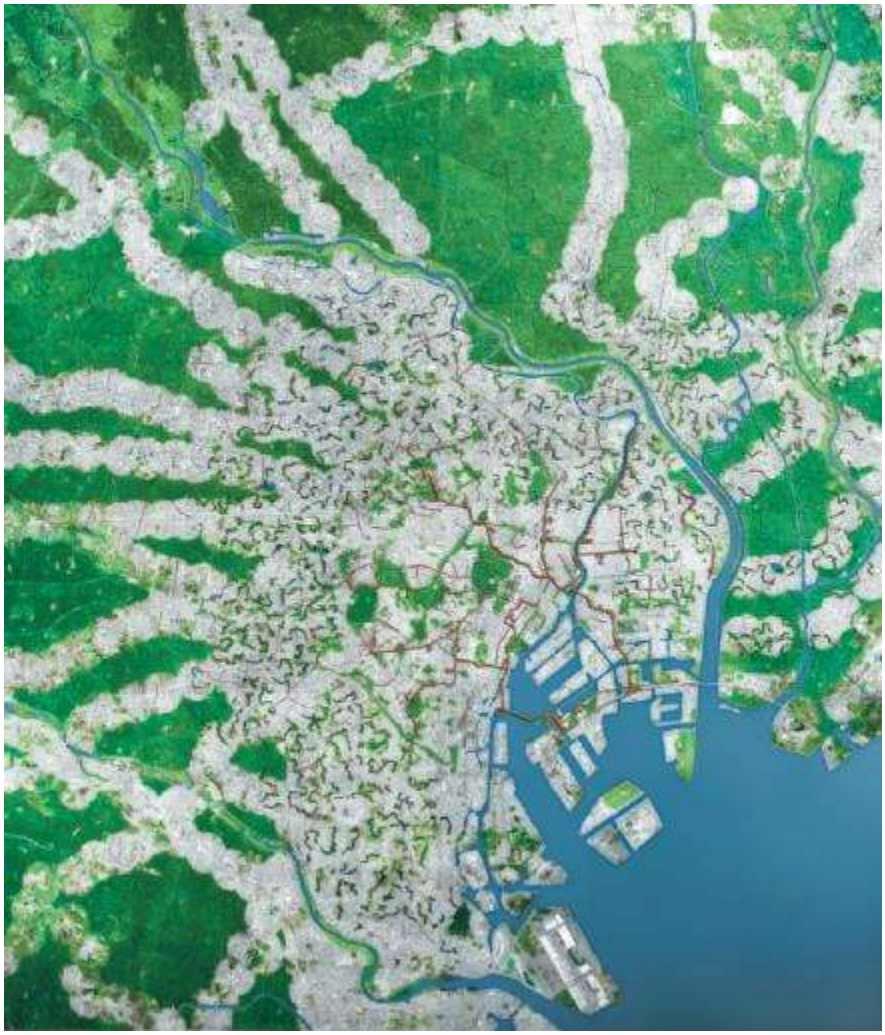
Shinjuku by night. Photo by the author

today's social needs. Many of these areas are also facing the effects of rising dependency on car travel, as public transportation becomes increasingly unsustainable. On the other hand, areas set out for new development, such as the Bay landfills, faced considerable delay, postponement or even cancelling of its initial projects.

In the meantime, however, in recent years several projects have come to be completed, such as Shiodome in Shinagawa, the Marunouchi district and Roppongi mixed use redevelopments, or the Tsukuba Express line, between Akihabara in central Tokyo and Tsukuba city. A common trend between Tokyo and other Japanese metropolises, the 'return to the city' is occurring at the expense of declining peripheral areas and distant metropolitan smaller centres (Schulz, 2010). Residential, commercial and leisure areas are coming back to inner city districts, many in waterfront mixed-use development (Shiodome, River City 21 in Tsukishima, or Minato Mirai in Yokohama), are concentrating high-rise residential gentrifiers, replacing older small and low-rise fabrics and its local population and sense of place. Other signs of change are witnessed in the overall improvement of the global urban environmental quality, particularly with a sharp decrease in industrial and transportation air pollution, water contamination and urban noise. Much of these improvements can be traced back to profound changes in the production profile of metropolitan Tokyo, with the decline of polluting heavy industrial sites, but also to widely adopted emission control devices for cars and effective ban on diesel engines.

Current socio-economic models of production, consumption and urbanization are facing a turning point. The nature of these models is based in a dual 'exploitation': of natural resources and in between people and regions over the globe. In both cases, exploitation is proving to be reaching – or having already gone beyond – its limits to sustain long term quality of life and environmental equilibrium. Indefinitely growing economies are clearly becoming a past paradigm as the limits of exploitation and the limited trade-offs between capital reproduction and social redistribution in neo-liberal economies are showing to be incapable of sustainable its momentum on a long term basis.

On the wake if this change, trends towards individualization and the paradigm of a 'lonely society' (Ohno, 2012) are gaining more and more expression, as life expectancy increases and the socio-technological frame of today's modernity allows for greater personal autonomy and freedom from family, community or tradition bonds. Personal technology – for example, mobile IT, smart phone, and smart cards – play a new role as a highly decentralized and individually customized infrastructure, which can have a profound impact on the way social relationships, urban spatial frame, and socio-technical governance of collective networks evolve in the near future.



Fibercity conceptual outlook for Tokyo. Source: Ohno, 2006, p. 2

5.2 The contribution of Fibercity theory and design

Fibercity is the conceptual umbrella under which Prof. Hidetoshi Ohno and his team have developed design and research approaches to urban planning in the context of shrinking and ageing metropolises in Japan. This work has been mainly carried out through Ohno Laboratory at the University of Tokyo, bringing together the wide and diverse contributions of academic staff and students, as well as professional practitioners and institutional partners, both Japanese and from overseas. *Fibercity* is, therefore, a continuous process of theory and design making, fuelled by the reciprocal contributions of architectural design, theoretical discussion and public dissemination through appealing images, in an overall speculative approach towards a model of future urban development. Having made its first public appearance in 2005 at the World Sustainable Building Conference at Tokyo, *Fibercity* has been presented in its evolving versions in a number of publications and exhibitions, of which special numbers of *Schinkechiku* and *JA* (vol. 63), as well as events such as *Shrinking City & Fibercity @ Akihabara* with Philip Oswald in 2007 stand out. Recent research has allowed to discuss *Fibercity* concept at the level of small and medium-sized cities, with a focus in Nagaoka city, widening its scale and scope to meet an overall urban agenda in Japan and abroad.

Shrinking and ageing trends are the societal trends over which *Fibercity* grounds its discussion and proposals. Although specifically critical in Japan, these trends find commonalities with many western countries, especially in the developed economies of Europe. On the other hand, it deals with the global environmental issues of resource scarcity and the unbalances and limitations associated to the current socio-economic models of production, consumption and urbanization. In other words, *Fibercity* is working on the needed visions beyond the global 'limits of growth' have been reached.

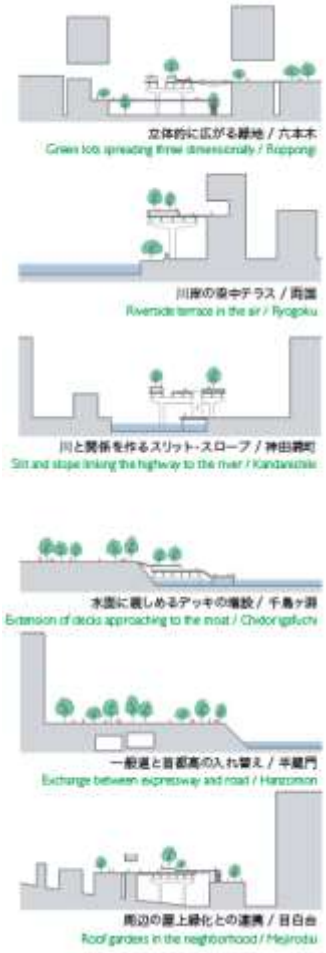
Research conducted by Hidetoshi Ohno since the 1990's holds important background to spatial elements with greater potential in the contemporary Asian metropolises. Hong Kong's analysis (Ohno, 1992b), for instance, highlights the importance of 'segment-lines' as morphological and flow-based structures, which explain the city's unique development along the narrow confinement between the Bay and the steep mountain range to the south. The idea of linear elements, capable of establishing continuous access through porous and permeable forms of urban fabric, is retained as a key concept in the *Fibercity* conceptualization. This potential in linear development is in fact central in the very definition of *Fibercity* by its authors: "Fibercity is a planning theory that tries to control urban space by operating urban factors with 'linear' qualities." (Ohno, 2012) That potential has been acknowledged in its multiple threads of research at various scales and territorial contexts, such as *Tokyo Crossings* – the conspicuous market streets converging on both sides of railroad stations and *Tokyo Ring Project* – the potential of Yamanote Line to congregate and relate urban surroundings of its main transportation hubs.

The complex nature of boundaries and thresholds in Japanese space, revealed through architectural typological analysis (Ohno, 1979) and urban research (Ohno, 1992b) has shed light on the potential of interfacing along the

Model for Green Finger. Source: Ohno, 2006, p. 14

Model for *Green Partition*. Source: Ohno, 2006, p. 19

Model and sections for *Green Finger*. Source: Ohno, 2006, p. 14, 26



edges and borders of multiple urban fabrics. The fluidity of linear spaces can be combined with various degrees of spatial permeability in overcoming disjunctive ruptures of modern city-making models, such as zoning, functional or public-private segregation. The flows of exchange are seen as the drivers behind cities' vitality, charm and appeal, whether it be exchange of goods, information or culture.

Decentralization of infrastructure provision is also considered to be a field for further assessment, as the centralized nature of modern networked systems is often unsuited and difficult to secure in shrinking territories. In this respect, the use of new technologies, with their greater flexibility and attachment to individual needs, operation and management, is seen as opening new possibilities to overcome shortcomings of older decentralized systems while maintaining the overall quality standards achieved by modern infrastructures. In addition to the decentralization issue, *Fibercity* theory highlights the importance of redundancy as a quality of reliable and resilient systems to accommodate change, diversity of choice or unexpected disruption. In a decentralized system, or in a highly reticulated network configuration, such as Tokyo's railroads and subways, multiplicity of choices allow for different travel patterns and alternative routes in case of failure of a single element.

Throughout its inception and development, *Fibercity* has worked around some key concepts, each one addressing specific and critical issues of contemporary and changing urban living (Ohno, 2004 and 2012):

- *Editing* city elements – with its long history of destruction and rebuilding, Japan embraced the *tabula rasa* standpoint when it came to planning and making its built environment, seeing 'newness' as a quality in itself and often disregarding older cultural and material traces. Instead of this continuous process of renewal by deletion and development by addition, which is itself grounded in the belief of continuous and unlimited growth, the idea of *editing* is seen as better suited to the current context, in which existing elements can be supplemented or improved with little readjustment, through combination with other systems and networks and optimization with new technologies.
- Perspectives on *compactness* – the criticalities of compactness must be discussed from various standpoints. The widely disseminated perspective of *compact vs. sprawl* duality is seen as requiring assessment, with the acknowledgment of a prospective gain in efficiency in resource use and time consumption in compact city models, but with little known effects in often unaccounted costs (financial, social and environmental) such as demolition operations and withdrawal of multiple urban and social services from out skirting regions.
- The city as *fabric* – the use of the textile metaphor to describe and foresee cities and their spatial and social organization is the logic result of combining the linear, porous, redundant and interwoven elements that make the city as a tightly knit entity. *Fibercity* theory places the metaphor of *fabric* in opposition to that of *machine* – the celebrated modernistic ideal of functionality, manufacturing-based production and Fordist socio-economical organization. Fabric, by contrast, is seen as holding valuable qualities needed for envisioning the future of cities, being both resistant and soft, adaptable and identifiable, multiple in its possibilities and made of simple thread elements.

Networks, patchwork, buildings. Ookayama. Photo by the author

Having started with a focus in Tokyo, five spatial and programmatic strategies were also envisioned in *Fibercity/Tokyo 2050* vision, having various linear structures – *fibers* – as complex devices to restructure and improve its metropolitan fabrics:

- The *Green Fingers* – The use of the vast and well-connected railroad network to frame a linear compact spatial reorganization around train stations, reducing the cost and extension of sprawling urbanization and taking advantage of optimized accessibility to metropolitan public transportation networks.
- The *Green Partition* – The use of vacant land within Tokyo's urban fabrics to lay a small scale, but well-connected and porous network of green space, improving the living space of its dwellers while providing fire break partitions in critical old-wooden houses districts.
- The *Green Web* – The restructuring of the various tracts of the Metropolitan Expressway that cross through central Tokyo, turning it into a continuous and multi-functional public space, carrying new infrastructure (i.e. district heating) and providing resilient and effective disaster relief emergency accesses.
- The *Blue Necklace* – Reinstating the underused and shadowed canal network in central Tokyo as a backbone for water transportation and public realm qualification.
- The *Urban Wrinkles* – The improvement and highlighting of discrete cultural and landscape features, often hidden in many neighbourhoods in the middle of the city, resorting to small interventions, boosting local attractiveness, character and livelihood.

Regarding the issue of the ageing society, with growing difficulty in maintaining infrastructure and basic urban services, such as transportation, *Fibercity* research has also developed three strategies dealing with alternative, more decentralized and recombined solutions to maintain quality networks in shrinking urban areas, such as Japan's small and medium or some older metropolitan suburbs.

- The *Orange Web* – A comprehensive requalification of bus networks, introducing better adapted, flexible, convenient and attractive features. This proposal includes changes in the spatial integration in the city (street section, bus/railroad interfaces, bus stops), in the signage and guidance elements (maps, portable information technologies), in the vehicles (fee collection, size and adjustment to narrow street's) and in the route hierarchy and adaptability (BRT main lines combined with local on-demand services).
- The *Orange Tables* – The provision of community based restaurants in areas from where food shops and affordable restaurants are withdrawing, leaving only distant car-accessible supermarkets and shopping malls as the only source for food. *Orange Tables* are locally managed places where elderly people or those who don't have a car can enjoy meals at a reasonable cost and sustain their social links, while providing new forms of self or part-time employment and strengthen shrinking economies.

- The *Orange Rounds* – A system of portable amenities providing services to de-populating communities that go below the minimum threshold to sustain fixed services. Portable services could include health, administrative, postal, cultural or commercial activities, guaranteeing a regular and rotating schedule on a given territory.

Fibercity can be said to be an optimistic and progressive approach that combines the best of different worlds. It acknowledges the great contribution of modern thinking, technological development and democratic mobility and information exchange, of which linear infrastructures stand out as probably the most ubiquitous landmarks, with the awareness and sensibility to the small scale and conspicuous – though often overlooked by grand visions –, signs of everyday life. On the other hand, it has established relevant links with current research and political agenda regarding climatic change, resilience in the face of natural disasters and CO2 emission reduction in urban environment.

5.3 A conceptual and comparative framework: *Post-networked city* and *Fibercity*

The rise of networks and large technical systems as the drivers and backbones for urban and national development during the 19th and 20th century has been a realm for critical assessment from different fields of research, planning and design. Building on the wide literature concerning the 'networked' paradigm of societal and technological development (Hughes, 1983, Dupuy, 1991, Offner, 1996, Castells, 1996, Herce, Magrinyà, Miró, 2004, Dupuy and Offner, 2005), new perspective shade light on the changing context, strategies and configurations of contemporary urban development. The seminal work by Graham and Marvin (2001) and new contributions by Coutard and Rutherford (several works, 2008, 2010, 2011) combine the aspects of environmental sustainability, socio-political dialectics and system governance, economic and market dynamics and technological innovations.

The limits of the conventional network

Change in conventional systems development, hitherto characterized by rational-technocratic, centralized approaches, has come in the face of a number of boundaries beyond which, sustained growth and operation seem to pose greater loss than benefit. The perceived *limits* of networked infrastructures are identified by Coutard (2010) as being related: a) to the 'invention' of *urban waste*, b) to the shifting from linear flow paradigms to the concept of closed cycle urban metabolism, and c) to the greater awareness and public contest regarding environmental issues and conflicts.

Coutard continues by addressing the macro-processes that undermine the domain of large scale and centralised network systems and the emergence of alternative socio-technical configurations, with variable degrees of (de-)centralization:

New Yurikamome line. Photo by the author

- the rapid development of information and communication technology, which allow for a more distributed pattern of functional layout and control (e.g. the *smart grids* in energy systems);
- the economic liberalization reforms, fostering competition, by engaging new actors and service providers and through network unbundling;
- a spatial mutation in the provision of urban infrastructure, changing from conventional laying of networks (energy, water, transport...) in line with urban growth (either as part of the urban development process or in a retrofitting process) to a pattern of local, increasingly self-sufficient, small networks at the scale of the building or the urban block (e.g. the 'éco-quartiers').

The transition of cities and nations to a post-industrial economy is accompanied by changing demographic patterns in which ageing and population shrinkage become topic concerns for mature developed countries, especially in Western Europe and Japan. Socio-political constructions associated to the global movement towards capitalist model are re-shaping the traditional role of state in the market, with trends towards increasing liberalization, privatization of hitherto public networks and over-national control through large financial conglomerates. Local economies and their socio-political regulation frames are therefore reshaped under forms of *glocal* integration, in which continuous flows of control, feed-back and adjustment between local and global levels take place. This criticism as also pointed out to the uneven, elusive and highly distributed condition which undermines (western) concept of the fabric of the city as a continuous, democratic and redistributive realm. Acknowledging a fundamental transition in the 'networked' paradigms of modern society, Coutard and Rutherford (2011), propose the concept of *post-networked cities* as an overarching field for debate and criticism.

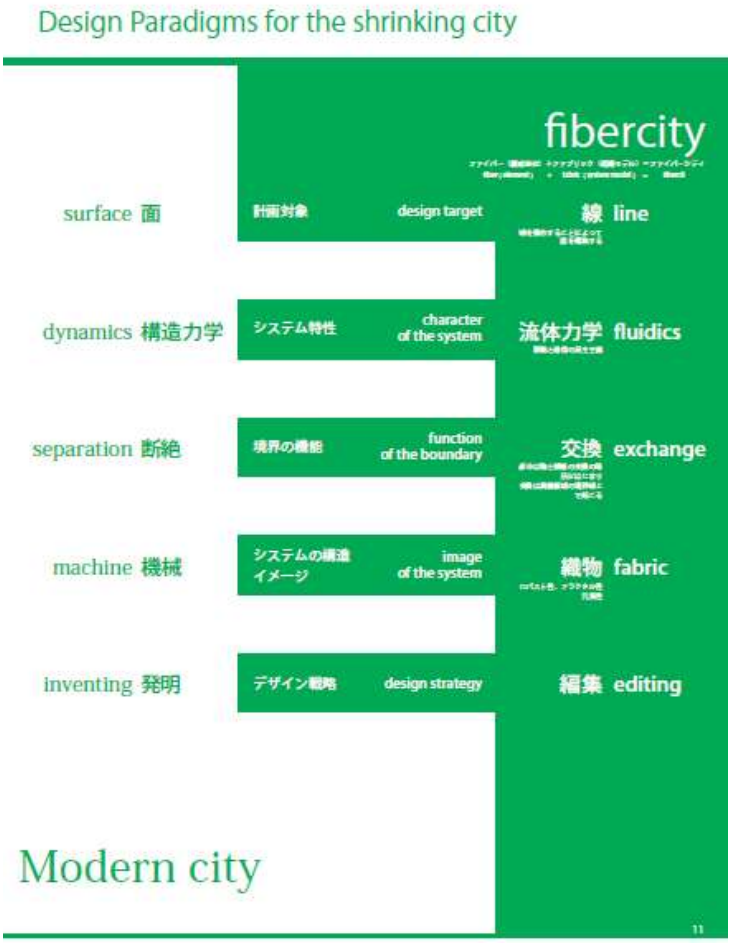
Changing market and technical configurations: from massified to commoditized service

The development stage of infrastructure services is often taking off from the growth and homogeneous service patterns that have shaped much of modern urbanization. They look for optimization and address specific gaps in the service, become more specialized, differentiated and innovative. Articulation between various networks foster synergies in a context of greater competition between traditionally monopolistic operators. New configurations tailored to prioritise high-end customers, such as premium services, congestion by-passes or market segmentation, are often resulting in infrastructural divides, with splintering and exclusionary effects on social and spatial fabrics.

A virtualization of consumption patterns through internet, e-commerce and customer-tailored marketing blur the conventional spatial hierarchies of trade and shopping, bringing to each one's house or smart phone the global array of choice. However, new spatial geographies emerge as the logistics required to make that virtualized marketplace work. An example is the physical support for internet and communication servers which has exponentially increased in size and power demand, bringing new environmental concerns over the IT network future.

Network	*(Sustainable) urban ecosystem*
Solidarity, unification	Autonomy, autonomisation
Engineering, mechanics, technical systems, cybernetics	Ecology, organic systems, ecosystems
Imperviousness, flow, kinetics; flow model (hydraulics)	Porosity, stock, slowness; stock model (non-renewable resources)
Linear metabolism: Extraction > supply > evacuation	Circular metabolism: Recycling, reuse, retrieval
Decoupling between local resource availability and use	(Re)coupling between local resource availability and use
Long cycle, loop opening	Short cycle, loop (re)closing
Approach based on supply or creating/satisfying demand	Demand management approach
Technical-economic model of large system expansion: economies of scale, scope, variety; club effects; lower transaction costs	Ecological model for the conservation or protection of resources and ecosystems
Unlimited consumption; perpetual growth of urbanisation, material wealth, and use of urban services	Moderate or bounded consumption, abstemiousness, dissociation of growth from development, degrowth
Irreversibility, "momentum", inflexibility	Reversibility, adaptability
Sector-based and sequential management	Cross-sector and integrated management
Large-scale equipment, centrally managed	Small-scale, unitary equipment, dispersed, decentralised management

Changing paradigms in infrastructural networks. Source: Coutard (2010)



Fibercity's vision on design paradigms for the shrinking city. Source: Ohno, 2006

Challenges and cross-sections: 'Post-networked cities' and 'Fibercity'

Within the wider context of *post-networked cities*, the concept of 'sustainable eco-cycle' (Coutard, 2010), made out of alternative infrastructural configurations – composite, decentralized, and working in resource-minded cycle metabolism – stands as a fresh and challenging framework. Its development comes hand-in-hand with increasingly individualized lifestyles and information-based decision making which stand beyond standardized utility provision. As such, the provision of networks is becoming largely a non-deterministic process. Its inception and design as backbones of city-making is a challenging field in the socio-political and socio-spatial agendas. Current urban crisis, scarcity and economic stagnation are raising a new awareness in maintaining and guaranteeing equitable levels of service, but also in developing creative responses (Iossifova, 2013). On the fields of urban planning and urban governance, innovative tools for analysis and decoding are required, not only within the disciplinary boundaries of urban morphology but also in its trans-disciplinary bridges with landscape and spatial design (Allen, 2010).

It is the case of the conceptual and design resonances between the concept of *post-networked city* and the vision of *Fibercity* – the former providing a wider and cross-disciplinary perspective, the later bridging the urban planning theory with creative design solutions for contemporary cities and metropolises. Three threads of transition can be identified in both approaches:

- The transition of network *cycles*
- The transition of network *configurations*
- The transition of network *steering*

The transition of *cycles* can be identified in the post-network approach in the changes from technical systems based on the long loop linear flows (mechanics, hydraulics, decoupling between resource and use) to ones based on organic, eco-systemic and closed cycle metabolism (through recycling, reusing and stocking). The same transition can be traced in *Fibercity*'s challenge to improve the fluidic character of systems, with design focus on linear spatial structures, instead of surface bounded ones.

Changes in network *configurations* from solidary, unified, large scaled and centrally managed systems to more autonomous, small-scaled, dispersed and ecologically-minded solutions are acknowledged by the post-network perspective. In *Fibercity*'s model, that thread of change is identified in the claim for capacity for system and spatial boundaries to work as devices for exchange, instead as dividing and separating limits. The modern rationale of the machine is replaced by *Fibercity*'s concern with the 'fabric' as holding greater potential for resilient and distributed configurations.

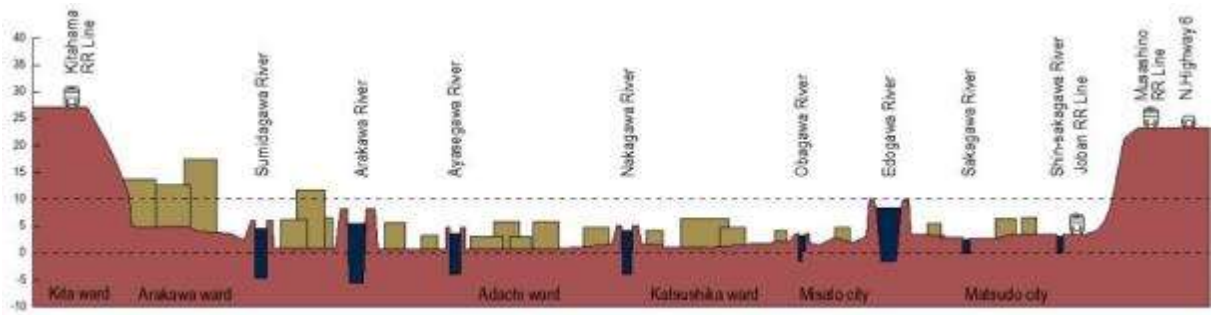
Transitions in the network *steering* apparatus (planning, design, management, accountability) are also acknowledged by the post-network perspective in pinpointing strategies to lower demand and consumption

Tokyo nightscape from *Skytree*. Photo by the author

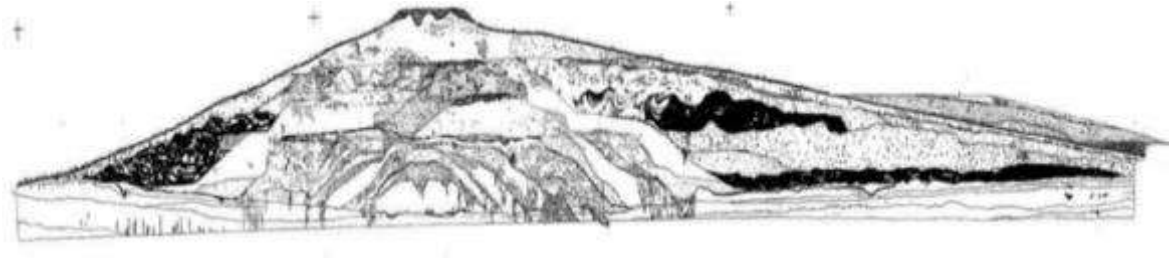
profiles, through cross-sector integration and overcoming of conventional growth-development rationales. *Fibercity* strategies focus on change from the primacy of 'invention', meaning creation and overlapping of ever new and adding systems, to humble but smart 'editing' concepts, working with existing conditions and considering its unexploited potential for future development.

6 Beyond the networked metropolis: tracing changes and innovation

"Cities are complex systems in their geographies of consumption and of waste-production and this complexity also makes them crucial to the production of solutions." (Sassen, 2009, p. 51)



Section through eastern Tokyo's low lands. Source: Adapted from Masahiro, 2009



Section through levee, showing the different strata and times of construction. Source: Atsumi, 2009

Diagram section of super-levee. Source: http://www.mlit.go.jp/river/trash_box/paper/pdf_english/23.pdf

Conventional levee in Unga River. Photo by the author
Super-levee in Edogawa river. Source: www.thepolisblog.org/2009/11/levee-town-super.html

6.1 Grounding infrastructure: shaping land and water into a resilient landscape

Tokyo has had throughout its history a strong spatial, economic and cultural relationship with its rivers and waterways. However, and despite many floods occurring in the past, it was not only before the early 20th century, when a one of the largest floods broke through the city's downtown areas in 1910, that the close proximity with water began to be seen more as a hazardous condition requiring resolved action for protection. As a response, the Arakawa River Improvement Scheme was developed between 1910 and 1930, with the extensive building of flood control embankments and levees and the opening of a second large river diverting water from Sumida River to a new 500 meter wide channel named Arakawa. Since then virtually all rivers and streams in Tokyo have been channelled and surrounded by levees. In the face of climate change with rising sea levels and increased prone to heavy and concentrated rainfall, reduced water storage capacity due to extensive urbanization and faster runoff speed and volume is posing considerable threat to the existing protection systems. Moreover, environmental concerns regarding the absence of ecological condition alongside the river system are demanding new approaches to the issue.

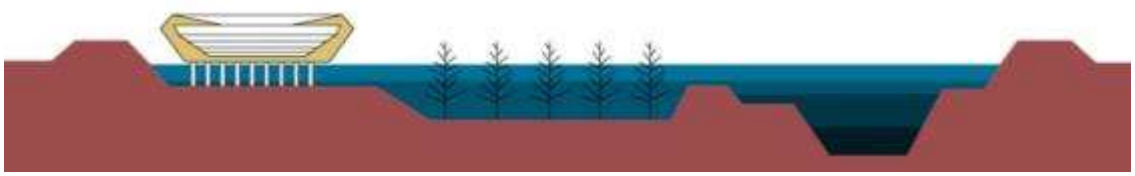
However, and unlike other international cases such as New York's *Rising Currents* proposal for a naturally growing protective system implemented on its shores, Tokyo's strategies seem to continue a long-standing tradition of large scale engineering works to increase protection. It continues to rely on a *hard* defensive strategy instead of rather *soft* and disseminated solutions, working *with* natural processes. Nevertheless, and within this frame, some solutions bring points of innovation for further discussion.

The super-levee strategy

When traveling eastwards from Tokyo, train travellers cross several bridges over rivers. They have the chance to witness a fast moving section of the low lands that make most of Tokyo's eastern wards. A common and rather disturbing scene they will see is the constraining of rivers through large levee structures with many of the adjoining residential fabrics sited under the water level. In fact, about 28 km^2 of Tokyo are below sea level. This scenario is not uncommon in other parts of world, but it becomes a critical issue when considering that most of this area is densely and extensively urbanized and the specifically hazardous hydrogeological and climate characteristics of Tokyo (short and fast running rivers, risk of typhoon and earthquake damage, alluvial plains prone to liquefaction).

Recent research is considering the benefits of the *super-levees* as an alternative to the conventional levee structures. Unlike the conventional structures, where a simple barrier (concrete wall or soil barrier) is made between the watershed and the adjoining land, the super-levee extends the width of the barrier considerably in a proportion that may reach 30 times the height of the barrier. The land behind the conventional levee is filled with new soil, better prepared for resisting liquefaction and earthquake, and a soft slope is made downwards away from the river. A larger width increases resistance to point breaks in the levee, but the major

Yokohama Stadium detention basin. Aerial and schematics. Source: http://www.mlit.go.jp/river/trash_box/paper/pdf_english/23.pdf



Yokohama Stadium flood detention reservoir. Adapted from http://www.mlit.go.jp/river/trash_box/paper/pdf_english/23.pdf

innovation rests in the possibility of having building and various uses over the levee's back side. With such possibility, large scale urban (re)development may be implemented as part of a combined scheme of river engineering infrastructure, real estate development, open space provision and community facilities improvement. Some tracts of Sumida, Edogawa, Arakawa and Tama rivers have already been reshaped to accommodate this new type of flood protection, with further extension being considered by Japan's Ministry of Land, Infrastructure, Transport and Tourism and Tokyo Metropolitan Government (Masahiro, 2009).

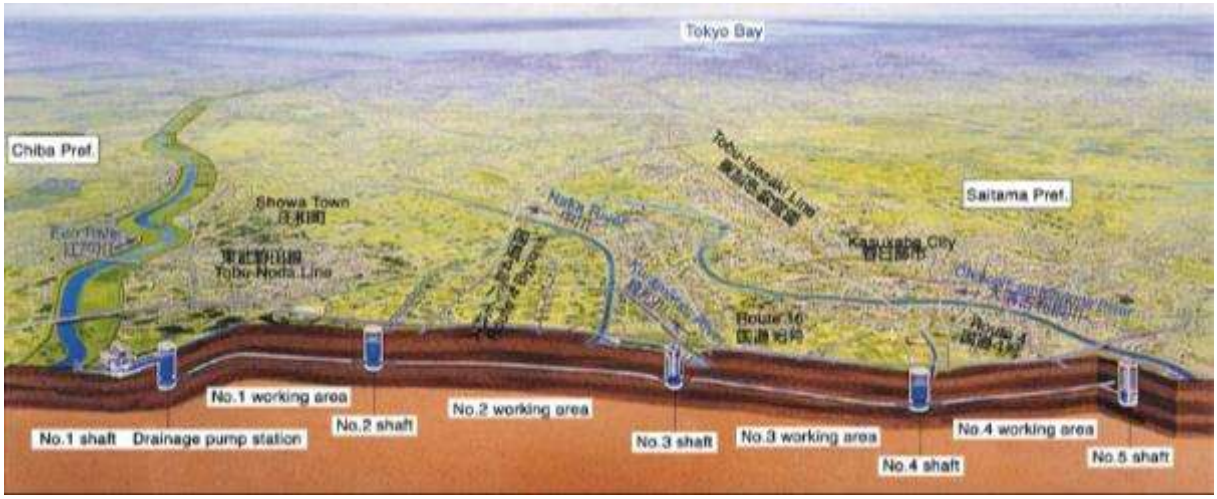
In terms of a post-network debate, the system is clearly stemming out of the heavy, hard and centrally planned approach to infrastructure development. However, when considered within the specific Japanese urban development model, it raises interesting possibilities, such as the greater involvement of private funding for construction of maintenance of these infrastructures and the stronger presence of urban landscape issues in its design. Controversial issues are also raised due to its extremely high construction cost, soil transformation and disruption of local communities.

Storm water reservoirs

Another strategy for coping with flood and storm water is the setting of storing facilities aimed at retarding river peak flows. Dams, reservoirs, retarding basins and river diversion channels are widely used world-wide, but the scale they attain in Tokyo and the kind of multiple uses that some of them allow is worth of consideration.

Tokyo is noteworthy for the use of especially large and multi-functional storm water retarding basins. One of such examples is the site for the International Stadium in Yokohama, next to the Tsurumi River, southeast of Tokyo. The stadium is enveloped by a large retarding basin approximately 1,8 by 1,0 km in size. A number of other sport, leisure and park facilities are integrated in the basins premises, as well as some built facilities. The stadium and all buildings are flood-proof, standing on pilotis, as are all the road and pedestrian paths in and around the complex. The basin is designed to be used by sections, using various flood cells. In case of smaller floods, only some cells are used, allowing for better maintenance and adequate use of the basin.

On a different record, Kanda River/Loop Road n. 7 Underground Regulating Reservoir, Tokyo's largest, is made of a 4,5 km long and 12,5 m diameter tunnel running perpendicular to the line of Kanda, Zenpukuji and Myoshojui rivers. Buried at depths from 34 to 43 meters, it follows the path of Loop Road n. 7, west of Shinjuku. Its intakes allow the diversion of excess water from lower basin areas while keeping a balance between the different rivers it intersects. While the use of this kind of engineering solution seems disproportionately demanding in terms of cost and technological dependence, it must be considered under local circumstances where riverside banks are often compromised by dense urbanization and land acquisition costs makes other space consuming strategies less feasible. On the other hand, the system is also used at rather peripheral areas, where urban settlement constraints are much less evident. It is the case of the



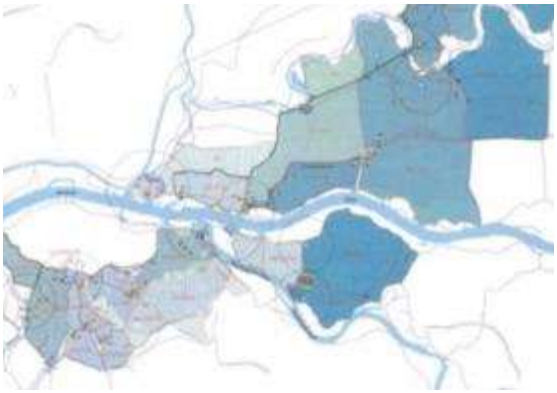
Discharge tunnel of Naka and Ayase Rivers to Edogawa River. Source: http://www.mlit.go.jp/river/trash_box/paper/pdf_english/23.pdf

Metropolitan Area Outer Underground Discharge Channel – Edogawa. Source: Bing Maps

Tunnel and tank of the Metropolitan Area Outer Underground Discharge Channel.
Source: http://www.ktr.mlit.go.jp/edogawa/gaikaku/intro/02shuyou/shu-03.html

Metropolitan Outer Underground Discharge Channel, running 6 km from Kasukabe to Showa Town, intersecting Ohotoshi-no-Furotone, Sachimatsu, Kuramatsu, Naka and Edo Rivers, at a distance of approximately 30 km northeast of Tokyo. This infrastructure is the largest of its kind in the world. In this case, the purpose is to divert excess water of Kanto plain rivers and channel it to the larger and wider Edo River, preventing a 200 year return flooding in low lands of Kanto plains before it reaches Tokyo Bay's surrounding cities. Five silos take and store the water from each river, which is then channelled by gravity to a large storage tank next to Edogawa, from which powerful stations pump it out.

The cathedral-like storage tank is used as tourist attraction in the dry seasons, and has been portrayed in several movie and advertisement scenes. Many of these facilities are also covered by sport fields, making them prone to other forms of use and relevant to their communities. One can say that in an unexpected way, Japanese culture is taking its own stance when it comes to sheer Infrastructure. Additionally, the use of these reservoirs and water tunnels introduces a high level of technological sophistication, allowing real-time and simultaneous management of several river basins. They are equipped with monitoring devices and communication networks linked to administration services, disaster relief forces and the public information networks. With the use of IT technology, mobile smart phones and real-time displays for water level and warning information, the river management system becomes a multi-layered infrastructural landscape, in which both hard and soft systems, whether centrally managed or distributed and individualized are interlinked.



> Dutch defence waterline

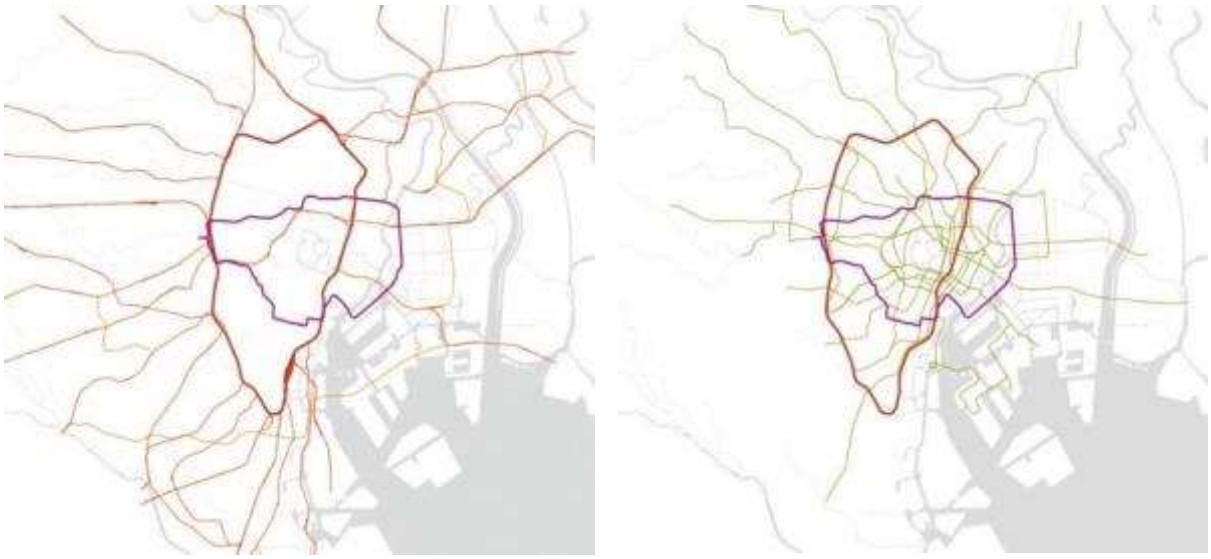
Built in the 17th century as a large-scale defence device, it allowed, should it be used, to isolate Holland from the rest of the continent. It worked with the complex water control techniques that made the Netherlands reclamation of land possible, but in a reverse way by flooding a wide area east of Amsterdam and the main cities in Netherlands. The system was recently rediscovered as an astounding accomplishment of engineering and a unique landscape heritage, with its numerous fortifications, water pumps, dams, ditches and outpost towns.

> Chicago's elevated ground and Michigan Canal

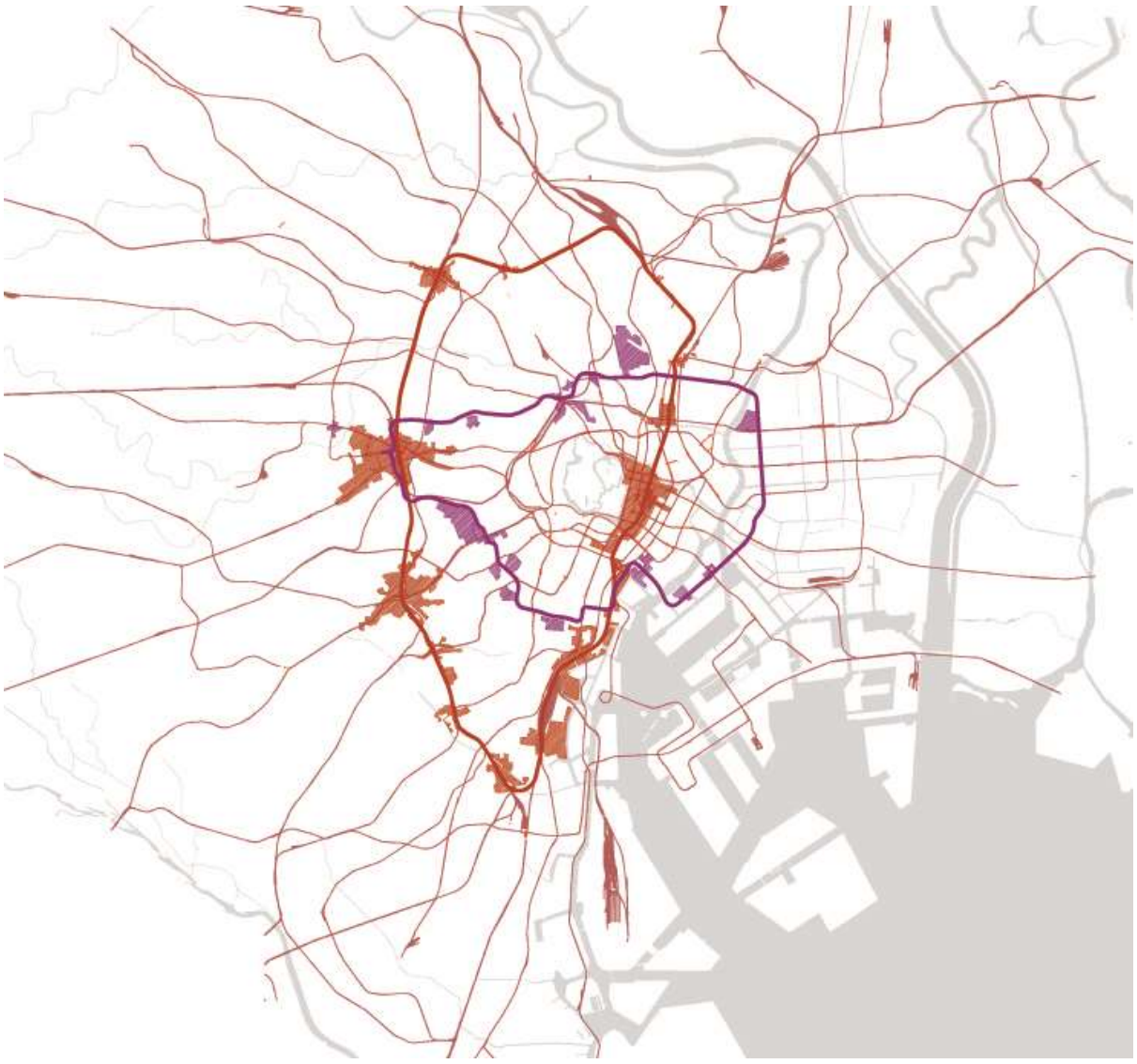
Chicago is well known for its skyscrapers and elevated loop trains running through its gridded downtown. However, in its genesis as a prosperous commercial hub, lies the establishment of a canal link between Lake Michigan and the Mississippi basin, allowing for direct water traffic between the Atlantic, the Great Lakes and the Gulf of Mexico, while draining wastewater away from the city. The canal banks at downtown become attractive promenades, bounded by several levels of artificial slabs aimed at hiding through traffic and parking spaces. Chicago's ground is now a bridging the continental and the local scales of landscape.

> Lisbon's Rossio Station and São Roque hill

The western slope of Lisbon's downtown valley has been shaped over the centuries as a complex system of terraces associated first to formal gardens of aristocratic palaces, then to the layering of several infrastructure networks. One of the oldest is the terrace over which São Pedro de Alcântara belvedere was built, initially aimed at storing underneath a large reservoir for the water supplied by the city's 18th century aqueduct. At the end of the 19th century, Lisbon's central station was built on the lower part, as the ending point of a 2,6 km long tunnel and one funicular and an elevator introduced mechanical connections to the upper areas. Landformed ground, infrastructure and public space have become an entangled construction hidden beneath the hills' stone paved streets.



Yamanote and Oedo lines in the context of Tokyo's railroad (left) and subway (right) networks. Drawings by the author



High-density areas around Yamanote and Oedo Lines. Drawing by the author

6.2 Metropolitan interfaces: the Yamanote and Oedo Lines as ring multi-scalar devices

Despite Tokyo's highly decentralised and multi-nodal metropolitan structure, it retains a clear centripetal attraction when it comes to commuting. Most train and subway lines converge towards the central area bounded by the Yamanote line, shaping the unique transportation and retail hubs along its main stations. As already mentioned, Yamanote's loop configuration has been a meaningful feature of Tokyo's spatial structure, together with the eminently 'hollow' premises of Imperial Palace.

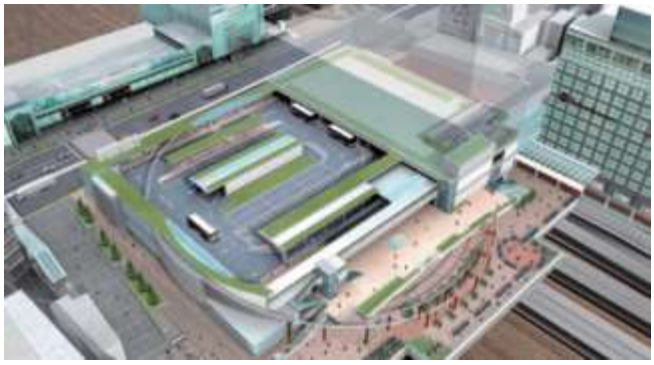
One can still feel the traces of the radial road structure, together with the concentrical patterns of the Yamanote line and of the 1960's city motorways. In a certain way, a radio-concentrical pattern is fairly distinguishable in the midst of the extensive and now highly reticulate railroad structure. However, this radio-concentricity gains complexity by the interaction with other loop or ring structures, such as the Inner and Central Circular Routes and *Gaikan* and *Ken-O Expressways*, the Musachino railway line and the Oedo subway line. These lines help not only to increase network effects, by crossing many other lines, but also to improve multi-scale articulations at various areas. Its ring/loop configuration allows for clear identification and intelligibility and provides a strong reference for moving across Tokyo's extensive urbanscape. It also enhances the network's adaptability to multi-directional demand and helps to lessen centre/periphery hierarchical patterns.

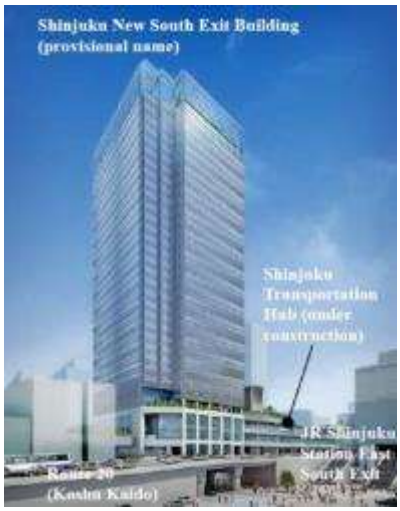
Beyond simple intersections between lines, the Yamanote, Oedo and Musachino Lines have an important role as *metropolitan interfaces*. Or in other words: they help to mediate the driving force of centrality with the discrete but socially meaningful everyday fabrics; they establish new fields of attraction and qualification to formerly peripheral areas; they provide a rather continuous backbone to structure the 'lost' patches of the *global city* and make them part of a better balanced city.

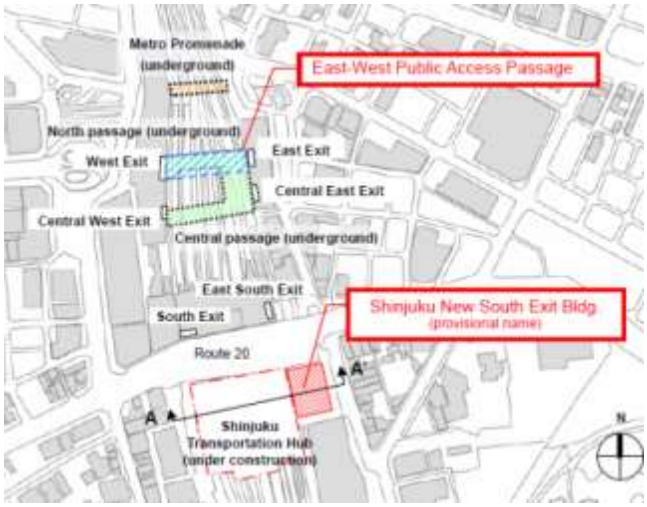
Taking Yamanote and Oedo Lines as references, specific contribution to this form of metropolitan interfacing can be outlined. Each line has its own character, layout and potential. Resorting to some examples of stations along each of the three lines, a brief discussion on their role is developed.

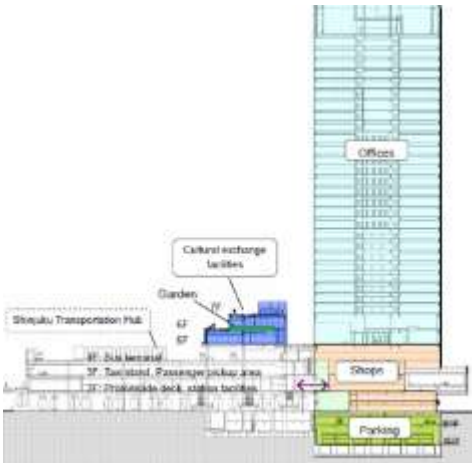
The Yamanote Line

Yamanote Line has been the backbone of Tokyo's necklace of urban and economic poles. Its configuration has evolved overtime into a stream of parallel lines serving different kinds of train, from local commuters to fast and through services and, in its eastern section, the *Shinkansen* trains. The acknowledgment of a sub-centre multipolar structure by Tokyo's urban planning in the 1950's has reinforced its capacity to attract private and public investment towards some of its major hubs such as Shinjuku, Shibuya and Tokyo Station. These hybrid station-retail-urban architectural conglomerates are in a constant process of evolution, adapting to changing infrastructural needs (new lines, transfer connections) and to real-estate market trends. Each one of these









Shinjuku Station South Exit redevelopment project by JR East. Source: http://www.jreast.co.jp/e/press/2012/pdf/20120902.pdf

hubs has its own character and history, shaped by its immediate surroundings, by its position in the overall metropolitan network, and by the various players' and stakeholders' strategies and agendas.

Shinjuku

Shinjuku's initial development was mainly associated to the JR, Keikyu and Keio commuter lines reaching the western areas of Tokyo. As such it became the site for many retail and department stores. However, since the reclamation of the former Yodobashi water purification plant as the grounds for a new office district in the 1960's, Shinjuku emerged as the first planned high-rise district in Tokyo, claiming unprecedented centrality. The long established identity of the Shitamashi (downtown areas) as the heart of Tokyo was clearly overtaken when Tokyo Metropolitan Government headquarters moved to West Shinjuku in 1997, thus confirming it as a new and full-fledged metropolitan centre.

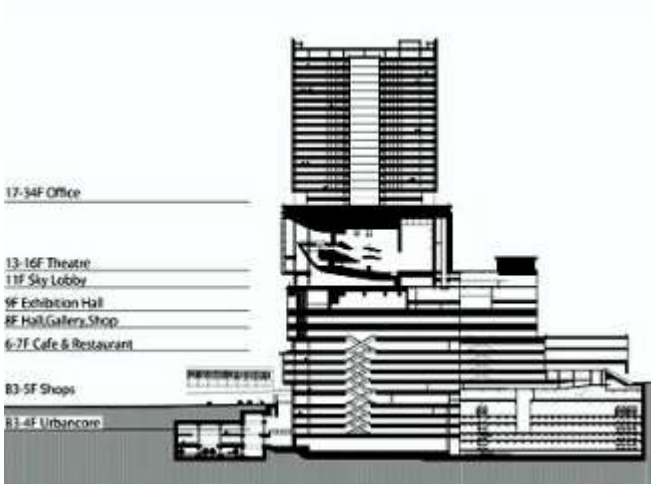
Notwithstanding Shinjuku's development as the busiest train station in the world and the core of a CBD district, traces of small scale and lively streets and alleys were kept in its surroundings, especially in its eastern side. A long-standing tradition of leisure and entertainment premises has combined with the late working *salary men* tradition, to produce a 24 hour cycle of urban vitality. East-west movement is therefore critical, especially at the evening hours, when west office buildings empty thousands of white-collars to the eastern restaurants and bars, shopping areas, *pachinko* and pleasure parlours.

Since the late 1980's, ancillary track facilities have been decommissioned to give way for further commercial and real-estate development around the station, and recent development included the covering of air-right spaces above the tracks to increase retailing floor area and facilitate movement within the station itself. New development is currently aimed at improving these connections between both sides of Shinjuku station, with widened passageways and gateways and better barrier-free access. East side surrounding fabrics are also undergoing change as private developers rebuild over older structures.

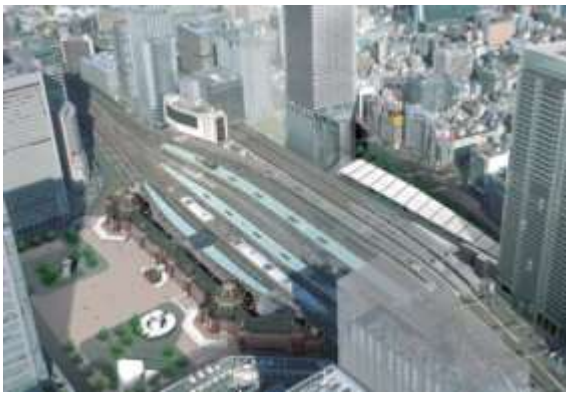
Shibuya

Shibuya is seen as one of Tokyo's favourite youth rendezvous points and a place where the flow of people crossing the station square has become a must for every visitor. It is the centre of a trendy quarter where fashion, music, video, design and other creative industries and cultural expressions meet to produce one of Tokyo's best known showcases. However, its development over time, made by piece-by-piece adding and replacement of no less than six train stations, eight lines and the busiest bus station in Tokyo, resulted in rather frail public space amenities and confusing and ineffective flow scheme for such busy transport hub.

Like Shinjuku, Shibuya has been designated as an Urban Renaissance Emergency Development Area in 2005, opening privileged conditions for large-scale redevelopment. Multiple private and public stakeholders and



Urban planning proposal for areas surrounding Shibuya Station. Source:Tokyu Corporation et al. (2013)
Section through station and *Hikarie* mixed-use tower. Source: http://www.worldbuildingsdirectory.com/project.cfm?id=4390. Photo by the author



Pedestrian links around Tokyo station and Marounouchi district and project preview. Source: Dimmer and Klinkers, 2004; JR East Annual Report 2011.
Tokyo station east exit and Marunouchi streetscape. Photos by the author

extensive consultation are required to enact such process which has already started with the completion of one of its parts but is scheduled to finish only in 2030. The overall operation is actually comprised of several individual patches combined under a comprehensive approach, since many of the areas to restructure are owned and operated by different stakeholders – namely the various train and subway operators and private conglomerates (JR, Tokyo Metro, Tokyu Corporation), and the right-owning interests of demolished buildings.

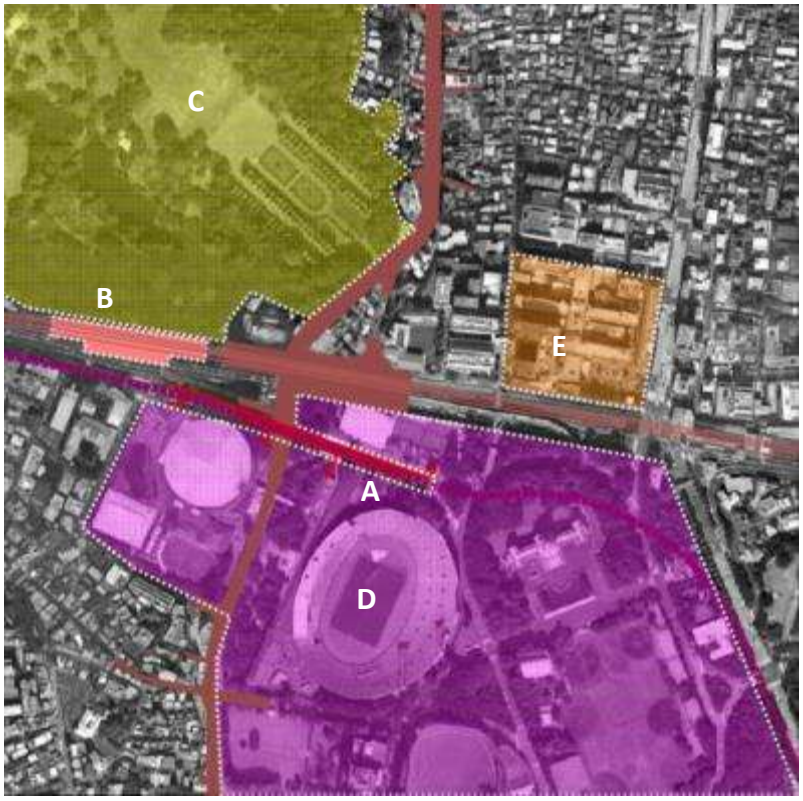
The completed part of the scheme (Shibuya *Hikarie*) comprises the burying of one train station and the connection to the subway network, releasing surface space for new development. A sophisticated section design by Tadao Ando allows for a generous spatial enveloping of transport and new mixes-use buildings, with natural light and ventilation. Being in a valley with steep slopes, connection across different topographical levels and the relationship to the channelled river running through has also been considered and integrated into the overall design. Additionally, and in line with the Japanese specifically demanding policies regarding emergency preparedness, dedicated energy supply is designed to maintain power supply in case of emergency events, guaranteeing minimum operation standards, shelter and provision for people stranded in the city.

Tokyo Station

The evolution of Tokyo station area must be seen vis-à-vis with the Marunouchi district development strategies. Its symbolical location close to the Imperial Palace, together with its prominent profile as a 'western-style' urban setting (since its inception), has driven recent development of Tokyo station into a rather unique patch of Tokyo's urban landscape. In the aftermath of World War II, its prestigious role as a CBD and in close relationship with the fashionable Ginza district gave way to a series of rather splintered and dull building and infrastructural developments. The station itself was rebuilt only to a smaller size of its original apparatus and the surrounding open spaces became increasingly unfriendly as car traffic increased considerably.

Since the early 2000's, a major redevelopment scheme has been undergoing aiming at improving the area's attraction and convenience, while conveying an image as Tokyo's reinvented and glamorous showcase to the world. Two levels of intervention can be highlighted: the reinforcement of the area's connectivity with the metropolitan transport network; and the urban redevelopment around the station and in Marunouchi district. At the level of infrastructure connectivity, it has a prominent role being the terminal station for the *Shinkansen* network in east Japan, holding direct links with Tokyo's two main airports. However, there are several plans to improve its connection potential with the extension of several commuter railroad and subway lines currently ending in other stations along Yamanote Line (Tsukuba Express and Joban Line, for example). This trend, still under assessment, would focus on Tokyo station all the major metropolitan transportation axes, challenging Yamanote's necklace as the dominant feature of Tokyo networks.

At the level of urban redevelopment, two schemes converge to enhance Tokyo's station role as an attractive and cosmopolitan hub: the Marunouchi district's renovation and the Yeasu side redevelopment. Marunouchi



A – Kukuritsu Kyogijo station (Oedo line)
B – Sendagaya station (Chuo line)
C – Shinjuku Gyoen Park
D – Olympic stadium precint
E – Keiogijukudai Hospital

Kukuritsu Kyogijo station (Leisure and sport grounds). Drawing by author

A – Wakamatsuwada station (Oedo line)
B – Japan's Statistical Bureau HQ
C – National Centre for Global Health and Medicine
D – Tokyo Neurological Centre

Wakamatsuwada station area (Central administration and social facilities). Drawing by author

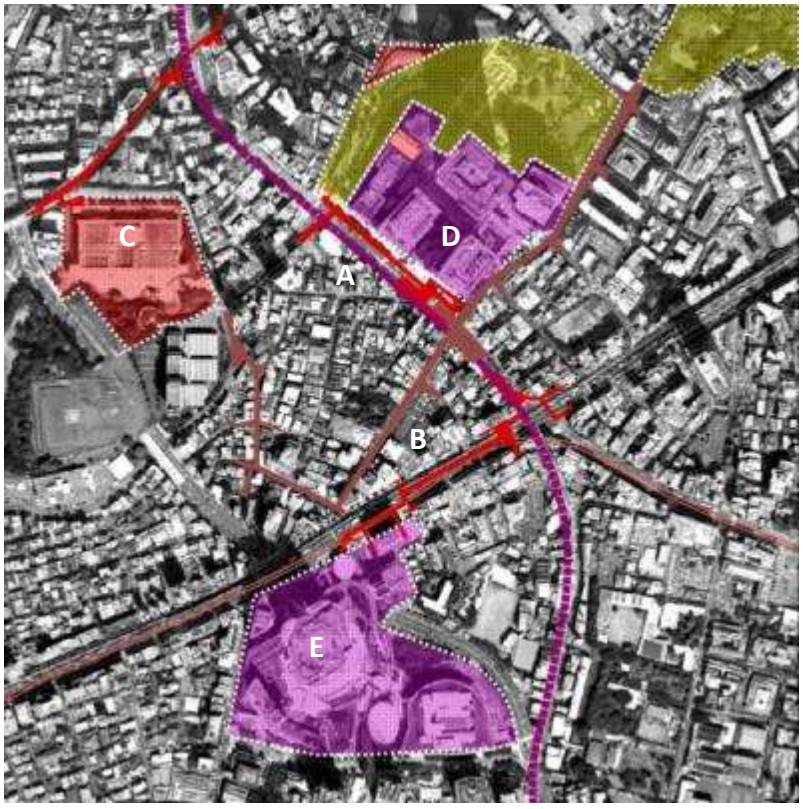
scheme introduces a coherent design frame for high-rise buildings, while maintaining a common frame of lower floors concerning scale, façade design and relationship with street space (Dimmer and Klinker, 2004, Kaise, 2010). A pedestrian plaza in front of the station establishes a visual and flow axis towards the Imperial Palace. This allows to trace back some of the district's historical scale, while allowing for high-rise development. The Yeasu side scheme is also driven by townscape considerations regarding Tokyo's station visual background and relationship with Nihombashi and Ginza districts. The former station-retail building of the 1950's is replaced with two new towers to each side of the station, thereby clearing the visual axis over the station. New pedestrian and mixed-used passages between both sides are also a central feature of the scheme. In fact, when considering the underground passageways beneath Tokyo station's surroundings, one can clearly see that it has become an extensive gridded system of connecting stations, including five subway lines and nine stations with Otemachi, Nihombashi, Higashiginza and Hibiya at its edges.

The Oedo Line

The Oedo subway line is clearly a new opportunity for the development of hitherto poorly accessible and integrated areas of Tokyo. Its metropolitan potential derives from the possibility of establishing loop routes, which are very interesting in increasing the flexibility and networking effects of the overall system.

While Yamanote has a long established role of driving major commercial and office complexes around its major hub stations, Oedo line can play a different role in fostering smaller scale integration and connectivity along many inner city low-rise districts such as Akabanebashi, Ushigomeyanagicho or Ishiwara. Mostly, it can foster new mobility patterns in areas which were dependent on radial railroad or subway lines, allowing for cross-connections and better distribution on the network. New and fashionable mixed-use real-estate developments in Roppongi, often combined with art and performance facilities are also living from Oedo line's increased connectivity. Despite smaller in comparison to the massive department stores along Yamanote hubs, they offer a different business and commercial typology with highly designed (private) open spaces, in which a mixed-use experience becomes an attractor. Direct connections through underground galleries to subway stations are, nevertheless maintained, extending a sophisticated design to the surrounding lines.

These high-rise mixed used development sites are seen as islands of relaxation and entertainment through fashionable consumer-minded sceneries. They stand closely tied to the transit system and its spaces through underground and skywalks, while offering a commoditized and rather ascetic public space, often multiplied through multiple levels, as in Roppongi Hills or Tokyo Midtown. On the other hand, Oedo Line allows the framing of a loop route of touristic and cultural spots based on streamlined subway connections (Tokyo Tower, Hama-Rikyu Gardens, Tsukiji Market, Edo-Tokyo Museum, Ueno).



A – Wakamatsuwada station (Oedo line)
B – Roppongi station (Hibiya line)
C – National Art Centre
D – Tokyo Midtown
E – Roppongi Hills

Roppongi (Cultural triangle and mixed-use developments). Drawing by author

Kukuritsu Kyogijo

The area around Kukuritsu Kyogijo station features important leisure and sport grounds of metropolitan and local interest, although they appear extremely clashed by linear infrastructures that block potential links between them. To the south of the station lies the Olympic Park built for the 1964 Games and the venue for the main stadium of upcoming 2020 Olympics. To the north, Shinjuku Gyoen Park, formerly part of a *daimyo* estate and later designated as an Imperial Garden, is one of Tokyo's largest and most popular parks. In the middle, the Metropolitan Expressway and the Chuo railroad line set a sharp boundary between both sides. The introduction of Oedo Line can be seen as an opportunity to develop spatial and functional interfacing in the surroundings, with potential links to Sendagaya railway station and new entries to Shinjuku Gyoen Park and the Olympic facilities.

Wakamatsuwada

Located in a poorly serviced area regarding public transportation, Wakamatsuwada station area has become better integrated with connections to Shinjuku and Iidabashi, through Oedo Line. Far from the high-profile districts, it has however a significant concentration of central administration and social facilities, such as Japan's Statistical Bureau Headquarters, Tokyo Neurological Center and the National Center for Global Health and Medicine. These facilities play an important metropolitan role and require adequate transportation. On the other hand, Wakamatsuwada stands within the dense and low-rise fabric designated by Tokyo's Metropolitan Masterplan (2004) for promoting 'centre city living by the efficient use of land through redevelopment, land readjustment and fine-tuning of regulations while taking the advantage of transit convenience'. Paths converging on the subway stations may well become potential framing lines for such redevelopment, considering the various scales, activities and demands of predominantly residential neighbourhoods and metropolitan scale facilities.

Roppongi

Roppongi is one of Tokyo's main cultural and entertainment quarters, with a long-standing reputation for night-life and trendy spots. Post-war American military facilities followed by numerous embassies offered an international flavour to Roppongi, as an extension of the diplomatic district of Akasaka. High-end businesses and residents were attracted through mixed-use developments (Ark Hills, Roppongi Hills, Tokyo Midtown, Izumi Garden) associated to new cultural venues (National Art Center, Mori and Suntory Museums, Design Sight). Some of these developments were carried over former state owned facilities (Midtown, for ex., was a site of Japan's Defence Agency), combining numerous partners and activities into highly diversified complexes.

The passing of Oedo Line through Roppongi has entailed privileged connection to Shinjuku and Ginza, overcoming a long-standing short of convenient transportation in the area.

> Vienna Ringstrasse

The 19th century ring boulevard was built to replace the old city walls, while shaping the new open space as a complex sequence of public space, public buildings and transport lines. A linear centre and an urban and infrastructural landscape bridge the city's old fabric with the expanding metropolis. Otto Wagner's carefully designed entrances to the rail stations stand well when in dialogue with the neo-classical composition of the state buildings that define Ringstrasse's spatial frame.

> Paris Périphérique

Once a line of fortified boulevards as in Vienna, Paris too had them turned down for making space for easy movement and greened areas. From the 1950's to the 1970's it became the site for the Paris Périphérique – a metropolitan encircling the city and known for its heavy traffic, nuisance and congestion. Recently it became a field for speculation and research on its future potential as a reference for the metropolitan landscape, a practiced place by the flowing people that use it on a daily basis, and a driver of urban regeneration along its path.

> Lisbon's Ring Railroad Line

Firstly built on the city's outskirts to allow the connection between Lisbon's three main radial railroad lines and a connection between eastern and western port and industrial facilities, the Ring line has been absorbed by the 20th century urban growth. Despite crossing the central districts and increasingly gaining importance for the metropolitan railway system, it keeps a frail spatial relationship with its urban surroundings. Current city planning envisions the Ring Line as the backbone of a belt of centralities aimed at improving its urban integration while taking advantage of its outstanding connectivity.

6.3 Beyond heavy networks: closing gaps, connecting vicinity and everyday's life

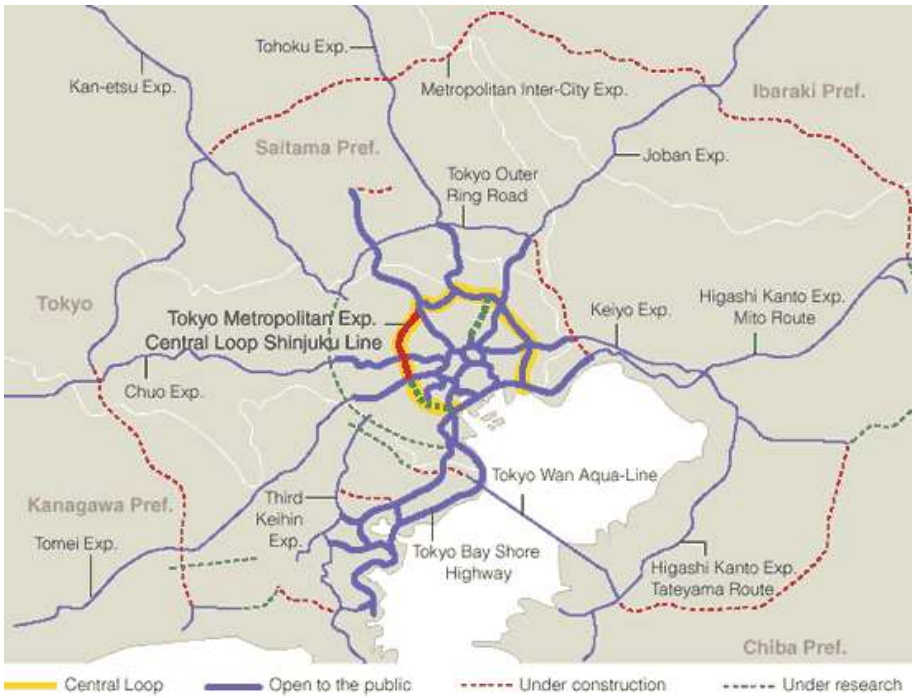
Tokyo's metabolism rests on a vast and tightly knit infrastructural array of different networks, from transport to energy, water and communication. They have been laid down into a highly reticulate pattern, which allows greater flexibility and resilience in case of congestion, disruption or programmed shutting down. The example of the train network is, perhaps, the best one. These network's highly sophisticated management and operation ensure the smooth running of daily life in a remarkably way inconspicuous and often shaded from one's sights. Their hidden synchronisms not only require a strong and centrally controlled operational apparatus, but also a predominantly pyramidal organization structure. In fact, the importance of a stable organization and hierarchy is regularly publicised in institutional presentations and websites, testifying to its embedded social importance. Yet, and despite such keenness on more formal organization frames, Japan has also pioneered highly adaptive processes of production and logistics, for which the Toyota model stands as a well-known reference. In a way, resemblances between Japanese cities and post-Fordist corporate organization can be traced, both depending on networks and just-in-time access to goods and services. The import of foreign products, business and commodities have been adapted and streamlined to meet specifically Japanese demands, sometimes through innovative approaches to networked systems (Yahagi and Kar, 2009).

However, Tokyo's extension is still faced with persisting critical shortcomings when it comes to some its network performance. It is the case of the electricity and motorway networks. Both cases show how continuing and long-term efforts are still required to close its gaps and allow for interconnected and grid-like patterns. A short overview of its criticalities aims at pointing out the need to leverage the discourse and need of 'post-networked' paradigm shifts towards 'softer' realms of infrastructure provision with the acknowledgement of the continuing need to introduce improvements to the 'heavy' apparatus, in order to take full potential of its network potential.

Gaps and critical shortcomings in Tokyo's road and power networks

In a quite unique process among industrialised countries, Japan went through the motor age with a clear supremacy of railroad over car in passenger transport share. The massive investment drawn not only by central state but also by a well devised railroad/retail/land development business model by private conglomerates, resulted in an attractive and highly performing public transportation system. Perhaps because of that, and despite having a world leading automobile industry, Japan's road development felled much behind, not only in the building of new roads, but also on improvement of existing ones. As already discussed, the intricacies of the fast urban growth process posed considerable problems to the establishment of quality road infrastructure in existing and developing areas. As a result, many of today's road networks in Tokyo face daily congestion, fail to provide safe and comfortable sidewalks to pedestrian and bicycle riders, and are far from providing adequate levels of reticulate configuration. Great expectation is due for the completion of Tokyo's metropolitan expressway radio-concentrical system, with the building of the remaining sections of the two outer-most ring

Motorway traffic information panel. Photo by the author



Tokyo's existing and planned motorway network.

motorways (*Gaikan Expressway* and *Ken-O Expressway*). Until then, the existing network will keep on missing the critical nodes for distributing traffic – namely passing through traffic – from central Tokyo. With much of its path compromised by existing urbanisation, it is needless to say that most of these projects will fall within the conventional frame of hard infrastructure, with soaring costs and demanding technological solutions. They may, however include innovative solutions in some of its components, as will be discussed in the next section.

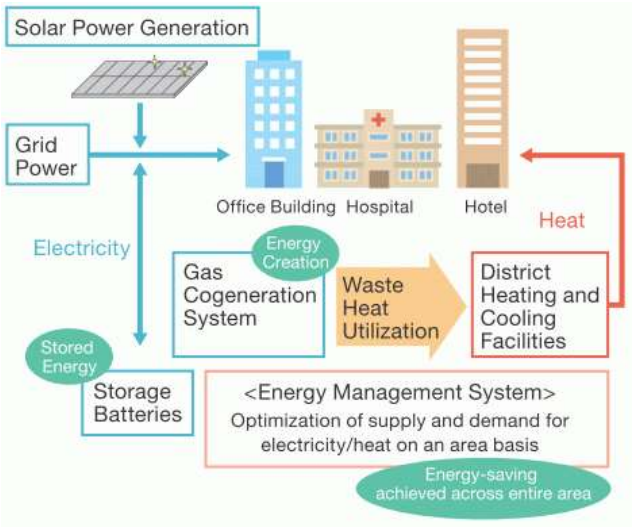
The second major critical issue concerns not only Tokyo's but the entire Japanese electric power network. The voltage divide between eastern and western power networks represents a major shortcoming when it comes to ensure resilient and flexible transmission between different regions. The Post-Great East Earthquake energy discussion has yet to come to terms with the nuclear issue. But it is clear that, despite considerable efforts in improving local autonomy in energy production, the magnitude of the problem cannot be handled solely on renewal and small scale power sources.

In the wake of the late 20th century process of de-industrialization, Tokyo's electricity consumption shares are now more concentrated on the business and household sources. Out of these, considerable weight comes from the extensive use of low-efficient air-conditioning systems to face hot summers and cold winters. Just like local roads and many other amenities, comfort demands in the household were clearly not a priority for many decades. Ideas for developing urban-scale networks, such as district heating and cooling, or collective systems in housing condominiums are met with short building life-spans and demands for low cost housing provision. In this case, individualized solutions may not be the most efficient and resource-minded. Medium to large scale networks with some degree of centralized operation are needed to improve the city's energy performance. In this context, it becomes clear that there is still a long way to run in the establishment of what could be called 'conventional' network solutions. A fair acknowledgment must be paid, however, to considerable improvement in lowering local energy demand, through effective campaigns such as the elimination of incandescent lamps and power-saving habits, following severe blackouts in the wake of 2011 earthquake.

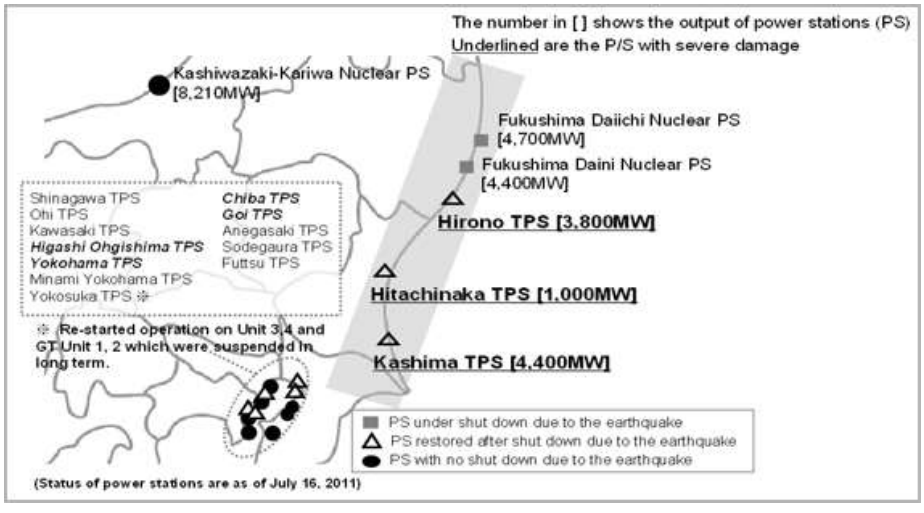
Metropolitan Government strategies such as *Tokyo Vision 2020* are aiming at bringing more efficient power production into the system (a new gas power plant is envisioned on the medium-term) and the dissemination of local solar, wind and co-generation power systems. Co-generation is seen as one of the most feasible and efficient solutions given the existence of large scale urban and industrial facilities with already installed autonomous power generation units. Electrical network redundancy with new autonomous production plants and transmission grids, smart-management through ICT, and district based shared energy supply and management, are being developed as part of Tokyo's strategy to improve its energy efficiency. Other research areas include promotion of lower consumption demand, waste-to-energy, smart district heating, heat pumps, floating wind mills and solar generation in Tokyo's rooftops.

Such approach is also seen in the motorway network, with technology research aiming at increasing the capacity of existing infrastructure by better managing individual driving decisions (GPS related software). Smart

The electrical frequency divide (50/60Hz) in Japan's power network.



Scheme of smart energy systems envisioned for Tokyo. Source: Tokyo Vision 2020



Impact of March 11, 2011 earthquake and tsunami on TEPCO's nuclear power plants. Source: http://www.tepco.co.jp/en/torikumi/thermal/index-e.html

traffic control and vehicle auto-guidance are also being devised under an overall IT based monitoring and control system.

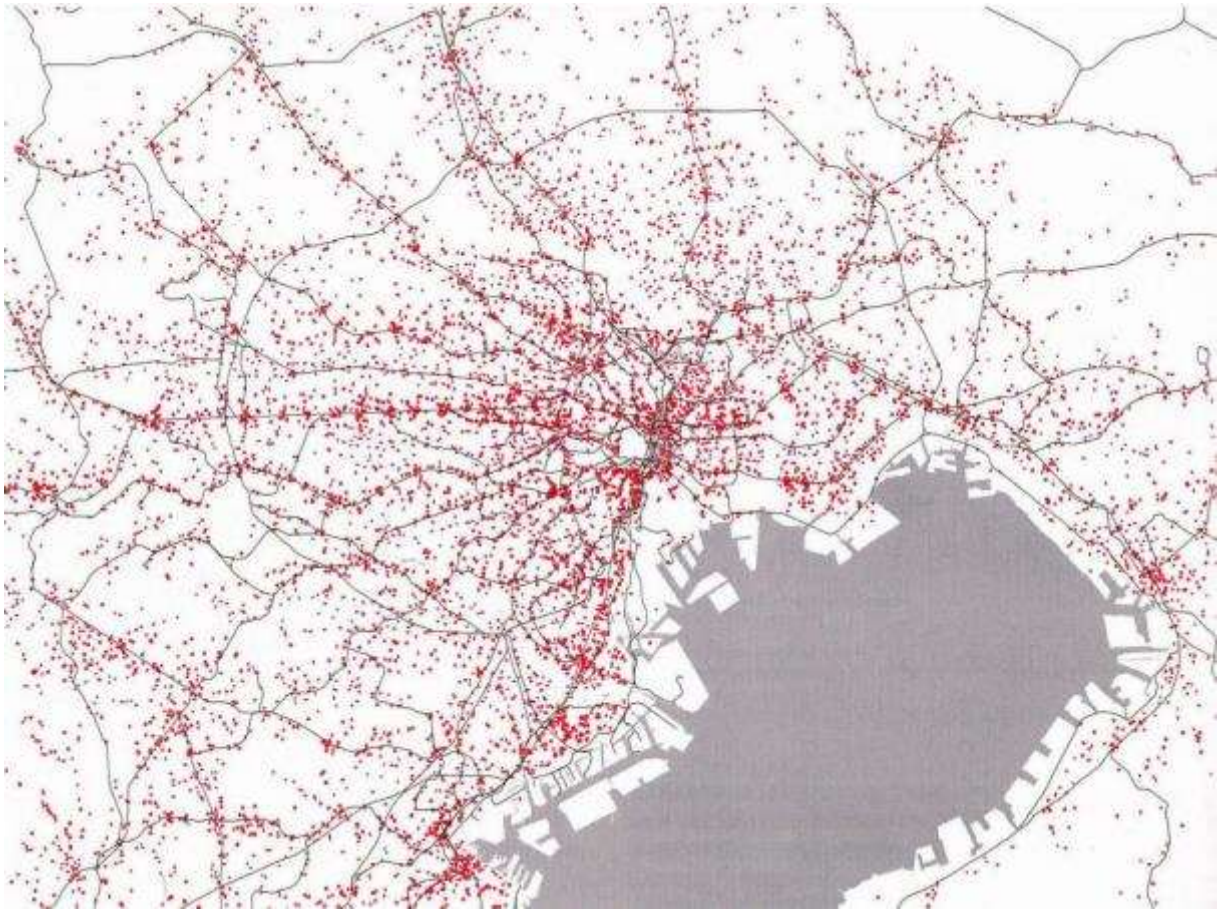
Ubiquitous and convenient social infrastructure

Tokyo provides noteworthy examples of meaningful steps being taken towards more decentralized, softer and stakeholder-shared realms of network provision. They don't flash out on Tokyo's usual descriptions as the vibrant, always on the move character of the Japanese capital city. Instead, these steps are found in the discrete, though common, sights of streets in quiet neighbourhoods. They may even be missed as 'urban networks' as it is the case of convenience stores, but the unparalleled role they play as local nodes for a wide array of community services is worth of mention.

Indeed, in such a patch-worked spatial, social and economic fabric, there is certainly much room for less centralized forms of organization, operation and management. Many social and community services are secured and provided at very local levels of society, such as neighbourhood organizations. Community meeting places, public toilets or police boxes are traces of the long history of community solidarity and self-organization. Additionally, some commercial shops play also an important role of highly decentralised and flexible social infrastructure, such as the ubiquitous and round-the-clock convenience stores and vending machines. These commercial and public facilities become local nodes for a 24 hour living socio-spatial fabric. They conveniently provide some basic needs for people on the move, for late-nighters, or in lower density areas where local shops aren't found. Convenience stores, for instance are usually fitted with various additional services and facilities such as ATM, post services, photocopying and fax, public restrooms or ticket vending machines, bill payment terminals. They are also required to provide aid and support in case of disaster or emergency. In some cases, fresh food sold in convenient stores, packed in small *bento* boxes, can be cheaper than a meal prepared at home. In an ageing society, they are becoming increasingly popular social resource, with particular value to elderly and less autonomous people.

Vending machines are seen almost in any place, numbering more than 5 million in Japan, the highest per capita in the world. From the crowded train station platforms to the narrow lanes of quiet suburban residential neighbourhoods, they can be found even in gardens, shrines and treasured landscape sites, or in the *shinkansen* and some commuter trains. In urban spaces, they are often placed on the thin outer recesses left between the road and the building. Their ownership, management and logistics are supported by the franchise company, and a small rent paid to the site owners. Although the most common ones sell cold and hot drinks, many sell food, both fresh (not only sandwiches and candies, but also vegetables or eggs) and packed (cup noodles, for example), with some selling otherwise uncommon products such as flowers, souvenirs, manga magazines, toys, or simple umbrellas for people caught by an unexpected shower.

7 Eleven convenience store. Photo by the author
Electrical cars for distribution of *7 Eleven* convenience stores.
Source: http://electriccarsreport.com/2012/07/seven-eleven-to-use-toyota-coms-evs-for-deliveries/



Location of convenience stores in Tokyo. Source: Ohno, 2006

Convenience and individualization are two important features of this kind of small-scale networked decentralization. Technological, commercial and organizational innovation seems to address them as central features of Japanese life and social demand. On one hand, the numerous gadgets devised to satisfy and foster consumerism become also a field for research and development to facilitate life in the big metropolis. Smart phones, for instance are widely used as tools for real-time decision about the best possible public transport itineraries, resorting to online applications. Earthquake and emergency warnings can also be sent almost instantly to each one's phone. On the other hand, in Japanese highly and densely populated cities, standardized and mass-produced products make a rather dull and repetitive landscape, as many of the small detached house or larger condominiums testify. Consumer individualization and commodification of small scale devices and products is therefore a form of differentiation and self-enveloping. Some operations handled by human interaction in western societies are performed by machines, such as change return in stores cashiers or meal order and payment in fast-food restaurants. The use of such technology builds a sort of mediated relationship between the individual and the *other*, whether it is another person or a company or organization.

Mobility and the changing society

The field of mobility is one example of how the introduction of new and individualized technology is changing the social *facies* of Tokyo and other large Japanese cities. As many commuters ride the train for long journeys, the use of the multi-media smart phone has become a common sight, replacing book and newspaper reading as the most usual way of spending such time. However, passengers are asked to refrain from talking on the phones, to avoid disturbing fellow passengers. Social interaction falls again to the private realm, mediated by real-time messaging on the phone.

Japan's motor industry is investing in edge-cutting technology regarding smart, compact, energy-saving and convenient vehicles for a new generation of urban mobility. Special focus has also being paid to software, communication and management technology allowing automated driving and improved safety, performance and economy. However, advances in mobility studies are also emphasising the potential of low-tech solutions, for their economical production, commercialization and possibility of mass use. In either case, specific research on this topic is primarily concerned with the vehicles, their technology and energy-wise issues. For this study, a few features associated to mobility were identified for a brief discussion, not from the standpoint of technological or vehicle perspective, but from a rather casual and peculiar ways how everyday mobility systems intersect with Tokyo's spatial fabric.

From an urban network perspective, such intersection is particularly interesting as it explores the spatial and technological combination of different networks, as well as their operation and adaptation to new societal challenges. In the case of Tokyo's central wards, while public transportation is widely available, individual transportation is actually quite expensive – to own, ride and park a car can be a luxury only a few can stand.

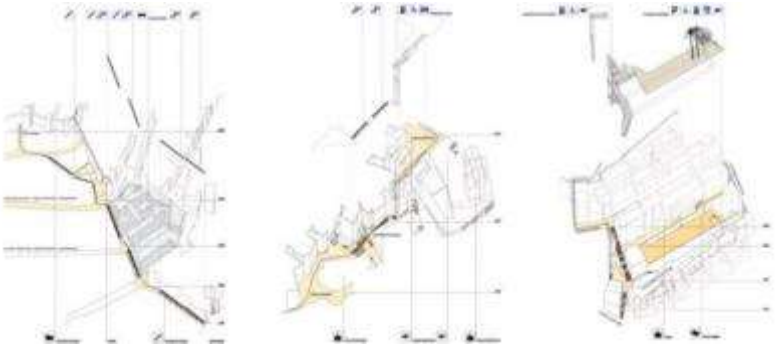
Vending machines. Photo by the author
Mobile commercial vans by convenience store brand used in Sapporo. Source: http://www.japantimes.co.jp/news/2012/05/08/business/convenience-store-chains-go-with-flow-grow/#.Uwsq6U3ivIU

Community Bus in Shibuya district. Photo by the author

The use of very small urban lots in Tokyo for car parking is a common sight and can be seen both as a temporary use of vacant or idle land, and as a highly distributed network with potential for alternative mobility patterns. Some of these spaces are leased to parking-management companies, who rent them to individual car users. The size can vary widely – from as few as four parking spaces. But the system, allows for a permanently recombining and very flexible offer of convenient parking. One of the most interesting combinations is the possibilities some parking companies offer for car-sharing and car-renting from their small parking facilities. Electrical charging stations are also being introduced throughout these facilities, helping to raise the share and convenience of electric-car use. An example of linkages with other networks, *Seven-Eleven*, one of the convenience store chains and Japan's largest, introduced small electrical vehicles for home delivery services. They are single seat vehicles and have a radius of 50 km with one charge. Given the stores widespread, the introduction of these vehicles introduces convenient groceries, ready-made food delivery and other daily products to people with restricted mobility.

Small sized vehicles are, indeed, a distinct feature of Tokyo's streets. It also introduces specific adaptation to plot and building configuration. Several types are used, both for private use and public transportation. Small garage and compact parking facilities are common to most of both central and peripheral areas. Buses too, are often smaller in size than its foreign counterparts. However, the use small buses doesn't mean they are operated in such a flexible and individualized way as in many Asian countries – where the tradition of small van is a common feature. Buses in Japan are often operated under the same regular and perfectly synchronized way as trains and subways, many belonging to the same transport company.

In the face of changing demographics, with shrinkage and ageing issues in many small cities, older suburban districts and rural communities, adequate and regular public transportation has become a major problem (Khan and Khan, 2012). In face of a mostly privatised transport system, sustaining cross-subsidies from high-occupancy and profitable routes to support less profitable ones is becoming more difficult. One of the main research topics for *Fibercity*, innovative mobility solutions in such changing social and spatial context have already been implemented with success in Japan. 'Community bus' is one of them, with several routes already operating in many Japanese cities (Khan and Khan, ibid.), with some interesting and diversified examples in Tokyo. It is modelled having in mind better adapted service to the local context and may be seen as a step away from conventional static and scheduled bus routes towards a more flexible and responsive solution to issues such as the mobility needs of elderly people, local commercial revitalisation, and traffic congestion around train stations. The main feature, however, is the collaborative partnership of government, private operators and community organisations in its set up, funding and management, thus allowing other considerations that just the economic ones. From its inception in Musachino City in 1995, the concept has evolved from an elderly-minded service, to a multi-dimensional collaboration platform. For example, parking-and-ride fees for bus users are waived by local shops, thus creating cross-incentives for riding public transport, legally parking cars at some distance from the station, and boosting local shopping.



In central Tokyo, community buses have been playing a growing role in districts such as Asakusa or Shibuya, where train and subway stations are not near enough to serve local residents, tourist spots or community facilities. The services were set up with several routes, usually looping around major stations, using small buses, well adapted to the inner quarters' intricate street fabric and step-free to facilitate universal accessibility requirements. In some areas, community bus is associated to bicycle-ride improvement, with provision of new parking areas. Its potential can be further explored taking the collaborative stakeholder perspective. For instance, and surprisingly when comparing to other cities, Tokyo doesn't have a convenient night-time public transportation system, aside from taxi. Only now, first steps are being made to set up night-time bus service in the Roppongi-Shibuya entertainment districts. Involvement of local businesses could be devised in order to establish convenient service beyond last-train hours.

> Hong Hong's mid-level escalator

The system comprises a sequence of escalator and passageways climbing through Hong Kong's steep slopes. It functions on a downward direction early in the morning and upward from 10am onwards. The escalator is a convenient transportation solution, shaping not only the space but also fuelling commercial activities around it. Local people and tourists alike flow through as a curious cinema camera on a ever-changing scenery. It adapts to the irregular contours of surrounding buildings, melting with the narrow streets, alleys and stairs on which it passes, often at less than a meter from the nearby windows and façades.

> Caracas 'Metrocable' of San Agustín district

Designed to improve the accessibility to the surrounding public transport stations in the poor neighborhoods of San Agustín, the 'Metrocable' is a simple and convenient solution that shifts the use of a technology commonly used to serve leisure areas to the everyday needs of urban residents. The system is seen as supplementary network to the Caraca's subway, aimed at improving the social integration of low-income areas, and providing commercial and social facilities on the stations. Minimum fabric invasion helps to keep costs low. Involvement of local community in the system's design and refining allowed better meeting of real needs and gaining public support.

> Lisbon's assisted pedestrian connections between Chiado, Baixa, the Castle, and Alfama districts

Lisbon's historical districts have a charming relationship with topography, with steep valleys and geo-morphous streetscapes. However, convenient connections between upper and lower areas have been a problem only partially overcome with some elevators and funiculars. The new assisted pedestrian connections continue that tradition, merging them into existing buildings, improved public space and combined with various urban facilities and commercial spaces useful both for visitors and local communities.

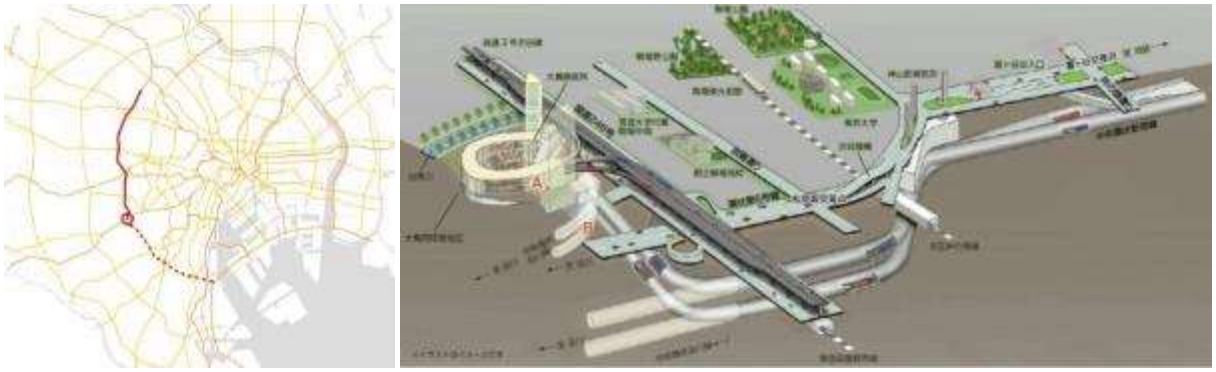
6.4 Infrastructure in-between: the architecture of hybrid spaces

Collage, *additive process*, *juxtaposition*, *patchwork*, *co-existence*, *gigantic agglomeration of physical structures*, *organization of radical heterogeneity* are some of the terms often used to describe and provide meaning to Tokyo's urbanscape. Although they give little insight into the morphogenetic processes, regulation and driving forces behind Japan's unique way of urban fabric weaving, they acknowledge the contrasting and rather free way of arranging spaces and activities. The almost infinite possibilities of programmatic addition and recombination have produced unforeseen urban and architectural organisms, way beyond many traditional western functional categories. Vertical layering is often rearranged, with many activities which in the West can only exist at ground level, visible and accessible from the street, shelved in narrow multi-story buildings with a public lift. On top of department stores one finds open-air terraces with cafes and restaurants, along with mini-golf courses, playgrounds, stages and cinema-screen, gymnasium and fitness centres, car parkings, and even temples and small gardens.

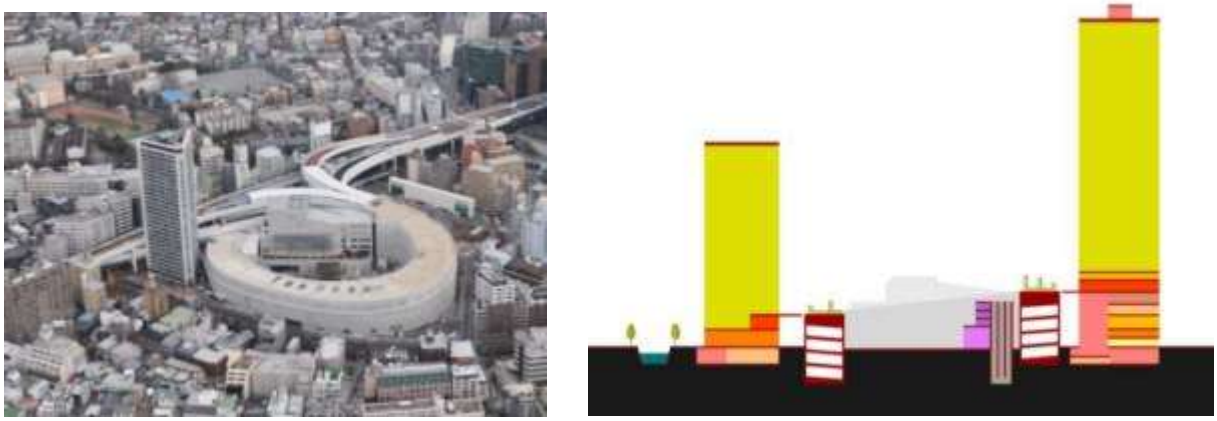
On another hand, buildings connect to each other and to outer spaces, at various levels. Entrances are often discrete, exits even more inconspicuous. Elevators and stairs, escalator and galleries are overly present but hardly conveying any sense of hierarchy and direction. Spatial order doesn't play a prominent role in leading one's mental map. More than abundant maps and signs (still, requiring an experienced eye), the only guide in this juxtaposed inner landscape is the topological accumulation of experience and memory.

This fluid layering can also be seen on Tokyo's urban space through the multi-level expressway viaducts insinuating through dense the city's built fabrics, or in the trains drilling through elevated train stations and department stores. The use of air and sub-surface rights is intensively exploited as a revenue making asset. Considering a step forward in (post)networked infrastructural systems, this flexibility and adaptability can be seen as a valuable characteristic. Overcoming functionalist dichotomies between infrastructure and architecture, in which server spaces hierarchically determine the path of served spaces, the possibility of hybridization allows for a re-balance between local and metropolitan levels, feed-back in flow cycles, and decentralisation and redundancy of critical systems. The potential of hybridization can also be extended to the thresholds between city and landscape, between built artefacts and natural flows – an artificial nature capable of guaranteeing sustainable ecosystem services.

A few recently developed examples of this approach in Tokyo are identified and briefly discussed. They include both large scale, comprehensive developments associated to metropolitan level infrastructure (Yamate Dori and Ohashi Junction), as well as some small sized but innovative designs around two suburban railway stations (Ookayama, Kaminoge and Seijogakuenmae).



Yamato Dori and Ohashi Junction, as part of Ring Road n. 4, in the context of Tokyo's road network. Drawing by the author
Ohashi Junction and Yamato Dori tunnel schematic. Source: adapted from http://roadkawasaki.web.fc2.com/hi/hac2/hac2-ya.htm



Ohashi junction aerial view
Diagram section. Drawing by the author

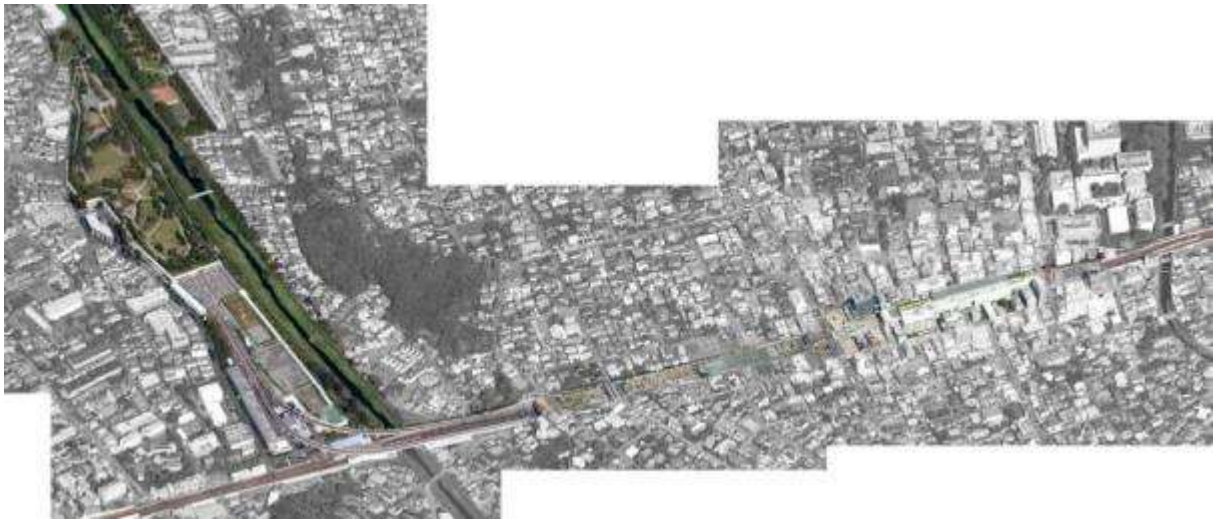
Ohashi junction. Photos by the author

Yamate Dori and Ohashi Junction

Yamato Dori is a north-south avenue running from the southern district of Shinagawa to the area north of Ikebukuro, defining a section of arch west of Tokyo's central wards. It is a major metropolitan thoroughfare recently widened and partially accompanied by a 30 meter deep underground tunnel to increase traffic fluidity. A section of Oedo subway line is also running along its path, with three stations built right under its surface. As one drives or walks along Yamato Dori, a number of high-rising ventilation chimneys from the tunnel below give a clue to the underground apparatus needed for such complex work of infrastructure. The chimneys scale and rythmed presence in the urban landscape reminds us of Barragan's *Torres de Satelite* sculpture in Mexico City, an abstract composition of geometrical solid volumes, framing the choreography of the passing by traffic and setting a reference scaled to the metropolitan flowing landscape. The re-development of Yamato Dori had also profound impact on the road-side fabrics, as it was widened to allow for better traffic and generous sideways. Improved and coherently designed public space and street side buildings were introduced. At some of the intersections other urban renewal operations took place, such as the redevelopment of Higashi-nakano train station, the building of office facilities in Nakano crossing and the development of Tokyo's new National Theatre complex at Hatsudai crossing.

At the current end of this tunnel in Ohashi, near Shibuya, a junction was built with to connect the Shuto Expressway with the Central Circular Route. However, and unlike many other motorway junctions in Tokyo, it has been designed into a multi-functional structure linked with surrounding buildings and providing community facilities, under a coordinated development scheme. As the junction layout required the passing from underground level to an elevated viaduct, a spiralling roadway structure was devised, encircling an inner courtyard with a sport ground and local public service facilities. At the top of the spiralling structure, a public garden offers a climbing pathway towards an open-air auditorium. At its side, two residential towers were built, but with the lower floors reserved for commercial and office spaces as well as for city offices, community services and a public library. Crossings were established at mid-levels allowing for easy access between these facilities and the junction's rooftop garden.

The combination of these various activities into a complex built structure is an example of the possibilities of scaling down such heavy networks to the benefit of local communities. At the same time, they are a step forward in the teaming of engineering, architecture and landscape architecture, often apart practices in the design and development of large scale infrastructure. Finally it testifies to the entanglement between public and private interests and fund-raising, in what is clearly a long standing tradition of Japanese urban development.



Seijogakuenmae station, agro-park, shopping centre and railroad yards (Odakyu Odawara Line)
Photos by the author. Aerial view by the author, based on Google Maps

Ookayama and Kaminoge stations

Ookayama station is an interesting case of new programmatic combination with railroad infrastructure. Starting as a suburban rail station to the west of Meguro, Ookayama station became the focal point of a local commercial street running across the line, along with Tokyo Institute of Technology (TIT) campus, which moved to Ookayama in 1924. Meguro line is operated by Tokyu Corporation which has developed its own commercial spaces over the line. Recently, however, in an overall redevelopment operation, it has buried the station, releasing space for a medium-sized supermarket and bicycle parking over the line and for the corporation's hospital just above the station. Although commercial activities are common in station areas, the hospital is clearly an innovative move, as it shows that even more sensitive and social-driven activities can also take place at such interfaces. Designed by Yasuda Koichi, its façades covered with vines and greenery offer a unique landmark to the town.

TIT campus encompasses an area both to the south and to the north of the station on which some acknowledged buildings stand, such as the Centennial Hall by Kazuo Shinohara. Next to it, on the north side it has built the 'Campus Front', a commercial and multi-use building offering a qualified space to the community. Not far away, and right at the edge of the line, it has built the Energy and Environment Innovation Building which includes an electricity generating façade turned towards the railway. This positional, technical and architectural entanglement with infrastructure – transportation and energy generation – though rather abstract in its design, showcases potential paths for further development of distributed networks through individual buildings.

Kaminoge station, 4 km to the west in the Tokyu Umachi Line, has also been recently rebuilt with an interesting strategy of combining infrastructure with public facilities (a small *Koban* police box and bicycle parking) and improved urban spatial amenities. Designed by Tadao Ando, an encompassing roof defines the long building profile over the line, while creating a covered passage to the converging commercial streets on each side. Rainwater is used to water greenery around the station and a thoughtful section brings natural lighting to the underground platforms. Despite some iconical examples, such as Kyoto's central station by Hiroshi Hara, this move towards a more sophisticated infrastructure-related design seems to be rather new to Tokyo's smaller stations. Given the long established reciprocity between Japan's urban life and the railroad networks, it may well be the first steps of a long-term trend towards higher standards of metropolitan place-making.

Seijogakuenmae station and railroad yards

Hybrid architectural compositions are acknowledgedly a mark of Japanese architecture, with many examples sharply identified and displayed by Atelier Bow Wow's work *Made in Tokyo*. This rather unrestrained approach to unusual but clever use and programmatic combinations is, however, often limited to the buildings themselves. Seldom it extends towards open space or becomes a new kind of landscape. The soil itself, rivers,

Ookayama station and Tokyu Corp. Hospital (right), Tokyo Tech Campus Front (middle left) and Tokyu Corp. supermarket (left). Photo by the author

Tokyo Tech Ookayama campus – EEI Building. Photos by the author
Kaminoge station (Tokyu Umachi Line). Photos by the author

Ookayama station (right), Tokyo Tech Campus (middle), EEI Building (lef). Aerial view by the author, based on Google Maps

slopes and other natural features are often moulded into artificial constructions, denying softer forms of relationship with other the built spaces. Unlike many European countries, where a tradition for shaping the ground and earth into wall-bearing structures can be found, Japanese tradition of the post-and-beam wood framing may have prevented the pursuit of telluric techniques and design.

The Seijogakuenmae station and railroad yards located at Odakyu Odawara Line, also to the west of Tokyo central districts, give an interesting insight of a rather naïve though honest approach to the potential of architecture-landscape combinations. Taking advantage of a long surface covering the rail tracks, Seijogakuenmae station has become a linear device along which a sequence of commercial spaces, bicycle parking, street passages and a rental vegetable garden are found. The vegetable garden's 300 small plots are owned and exploited by Odakyu railway-commercial Corporation, which rents them to local customers. The railroad's yards, located at a small distance to the west, have also been covered with a public garden, an amenity often lacking in Tokyo's fast growth suburbs. Despite its limited relevance in the overall eco-cycle, these forms of green space and urban agriculture exploitation becomes a part of the infrastructural apparatus surrounding stations and can contribute to further hybridization and innovation in heavily artificialized environments.

> The Hague's Souterrain Project

Designed by OMA in central The Hague, this project combines the construction of an underground tunnel to accommodate the city's busiest tram line, along with the provision of car and bicycle parking facilities. The underground structure is a hybrid between tunnel engineering and complex public space architecture, linking two tram stations and offering multi-level visual and spatial connections through a well-thought section approach to design. The project is part of a city scale strategy to increase density and multi-use areas within a loop enveloping the central city districts. Within this loop, ground space is relieved from car traffic and several underground parking facilities secure space for local traffic.

> Kilometro Rosso

Literally translating as the *Red Kilometer*, the design by Jean Nouvel for the business and science campus along A4 highway near Bergamo, Italy, brings a colorful and ironic feature to the landscape of fast speed infrastructures – a long red-wall which simultaneously defines the campus edge to the highway, gives a coherent spatial frame for the various buildings, and conveys and simple though powerful brand on the A4's landscape. More than a building, urban design scheme, or sculpture, the Kilometro Rosso is a hybrid threshold that acknowledges and negotiates the diverse and sometimes conflicting conditions of architecture, infrastructure and landscape.

> Lisbon's Alcântara wastewater treatment plant

Taking the opportunity of a major renovation and expansion, Lisbon's largest wastewater treatment plant has a new roof covering with a landscaped patchwork of local species of vegetation. The overall design aims at merging this new surface with the surrounding slopes and nearby park areas. The valley, which was once one of the city border and a site for many overlapping infrastructures, is step by step coming to terms with its new condition as a meaningful and attractive artificial nature.


Activities along Nakagawa River and Nogawa River embankments. Source: http://www.kensetsu.metro.tokyo.jp/english/kasen/gaiyo/05.html


The banks of Sumida River and Tamagawa River (near Fukatotamagawa). Photos by the author


Tsukudajima and Minami-Senju waterfront redevelopments. Source: http://www.koho.metro.tokyo.jp/PHOTO/contents/sp3/index_5_en.html

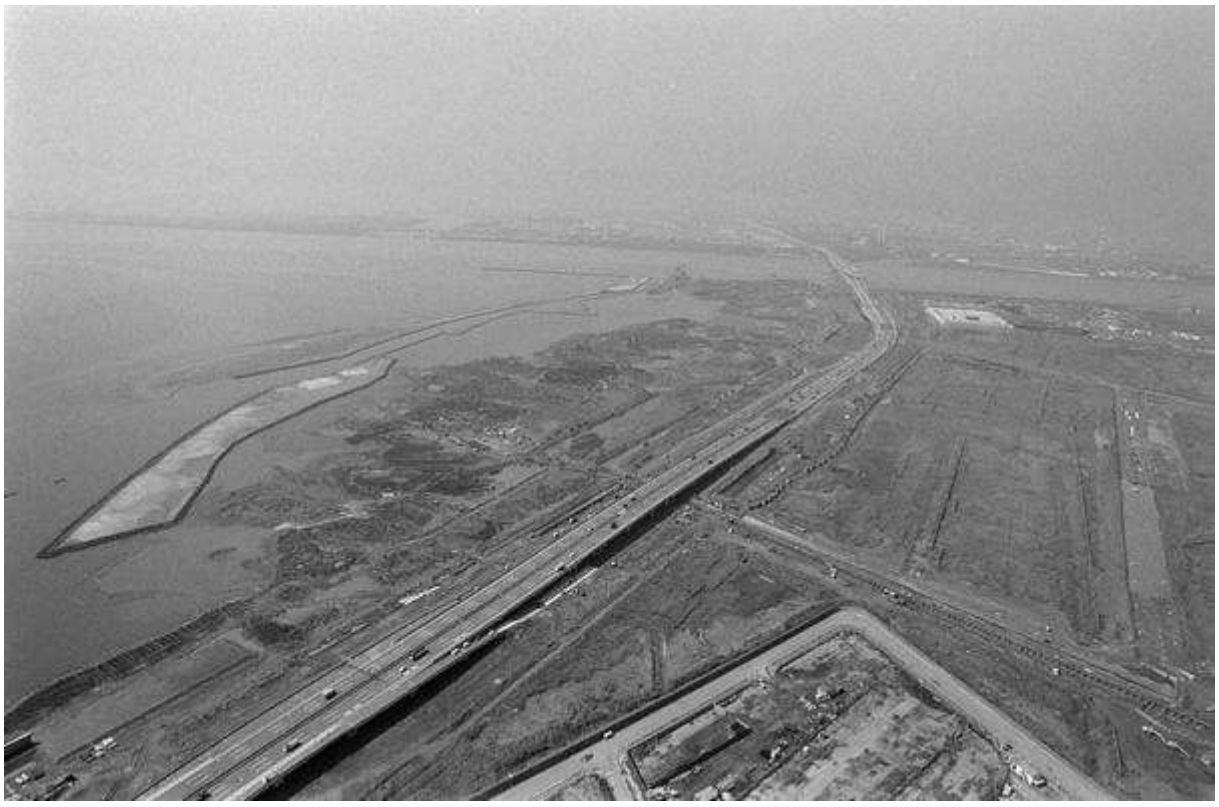
6.5 Reclaiming infrastructural landscapes: topical programs for dross territories

As discussed and outlined in the previous sections, sophisticated forms of entangling infrastructure and landscape have not only been shaping Edo's water and land into today's Tokyo fascinating metropolis, but are also a major feature of some of the most interesting designs for its future development. In this last section of a chapter concerned with tracing examples of change in innovation regarding new solutions beyond the conventional 'urban network' paradigm, the combination of *infrastructure* and *landscape* is again recalled. On one hand, it can be seen as a sort of a open cycle, starting with the 'modernization' through infrastructural development, and becoming a landscape shaped together by man-made and natural forces; on the other hand, it underlines the possibility of reading and design contemporary metropolises as *infrastructural landscapes* – a conceptual challenge put forward by authors such as Mossop (2006) and Tatom (2009). With the multi-layered array of networks, utility systems, transportation lines, today's metropolitan condition is beyond the simple big size, of its population and built fabric. Their attraction and complexity is inseparable not only from those infrastructural layers, but also from the now re-shaped – and thus 'landscaped' – natural flows that run through them, support their live and ground their fabrics. With its extensively artificialized rivers and channels, slopes and valleys, Tokyo can indeed portray one of the clearest examples of a metropolitan infrastructural landscape. It becomes an eco-system made out of many sorts of flows, with sophisticated devices to steer them, but often elusive and pervasive to strict boundaries and control. Like a bicycle, it requires balance while on the move, discrete adjustments to its trajectory, constant attention and skilful diversion from unexpected obstacles.

Within this conceptual framework, some recent projects in Tokyo can be portrayed as small thrusts in a constantly adapting and transitioning path into new urban, environmental and economic paradigms. Like in the first section of this chapter, ground and water are again the fields to use in briefly outlining some of these projects: the riverfront urban redevelopment areas and the reclamation of former waste landfills in Tokyo Bay.

Tokyo's rivers and water: urban amenities and ecosystems

In the wake of the severe environmental problems faced by Japan in the 1960's and 1970's, pressure from citizen and NGOs resulted in important changes in the policy frame for urban and infrastructural development. Together with this, a re-appraisal of often nostalgic consideration of nature and landscape as cultural assets and identity conveyors, took shape. This trend came in line with wider awareness of changing paradigms regarding quality of life, environmental protection and conservation and the limits and repercussions of fast and disordered economic growth. Protest against some large-scale developments at waterfront areas, water pollution and loss of scenic and cultural heritage converged to lay the grounds for a worldly acknowledged pioneering in environmental change in Japan in the 1980's (Takao, 2012). Academic, literary, media and political interest on Japan's landscapes historical legacy gave further support for reclaiming some of its features as meaningful amenities for urban life, especially in its large metropolises (Waley, 2000). In Tokyo, studies regarding its heritage as a *city of water* (such the acclaimed works of Hidenobu Jinnai), have also played an



Kasai Rinkai Park under construction, 1979. Source: http://www.koho.metro.tokyo.jp/PHOTO/contents/sp3/index_4_en.html

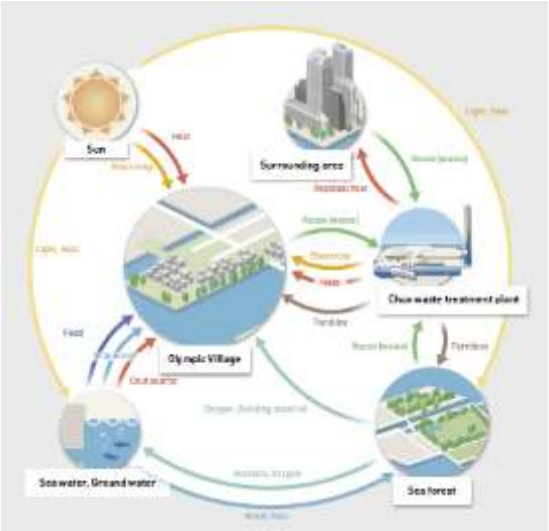
Kasai Rinkai Park. Source: http://naturewritingnotes.blogspot.jp/2013/12/tokyo-park-life.html

important role in rediscovering the hidden traces of a nature-shaped urban environment. A growing feeling of loss to relentless concrete-poured development has been met with changes in the real-estate market strategies, turning its attention to waterfront areas. With the withdrawal of heavy industry and some port facilities areas from Tokyo's river and bay shores, the opportunity was there to grasp, and a wave of large development schemes took the booming economic momentum to envision a water-borne megalopolis (Lin, 2007). The banks of Sumida River and the inner-city canal network were also rediscovered for its charm and old traditions, hosting various cultural events, festivals and tourist boat trips along its shores and bridges (Schulz, 2010). Waterfront parks and landscape improvements started to be implemented on an increasingly regular basis, but usually hosting rather formal design solutions – in line with Japanese garden tradition of symbolically shape scenery into artificially moulded natural features – instead of ecological-minded strategies (Waley, 2010).

With the splinters of post-economic bubble downturn, many of the waterfront projects were suspended and delayed or re-sized. In a rather unique result, however, a concentration of entertainment shopping and theme parks in Odaiba landfills were met with considerable success, making way for new hopes regarding the bay's future as an attractive real-estate asset. On the nearby cities of Chiba and Yokohama, large shopping malls, convention centres and sport stadiums were also built next to the bay, in what resembles a super-scaled and rather twisted design of European and American neo-liberal waterfront developments. Nevertheless, this change of pace regarding the transformation of formerly industrial and infrastructural areas near or over the water, resulted in greater planning consultation, community involvement and the adoption of new technical and policy perspectives towards environmental valued areas.

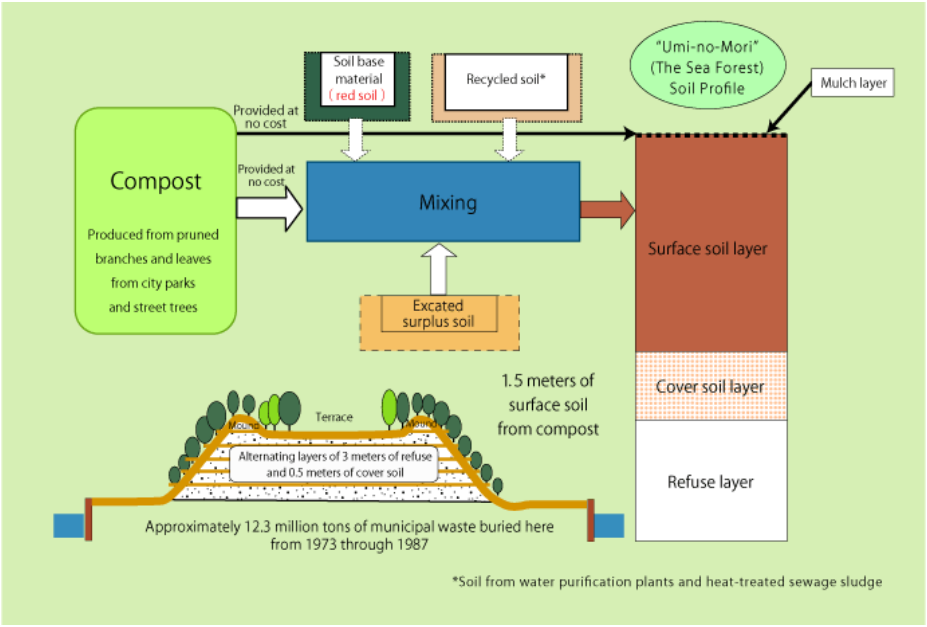
Criticism on construction-based solutions, identified with centralized and technocratic bureaucracy, has spur out in the wake of the devastating Kobe Earthquake in 1995, with major infrastructure collapse (Waley, 2000, Sorensen, 2002). Research and import of international best-practice in these fields have rendered some improvement in turning towards better balanced policies regarding the development-environment equation. 'Multi-nature-style river planning', for instance, has been one of the result of these shifting practices. It involves the recognition of the multi-dimensional character of rivers, often seen from narrow flood-control perspectives. Nevertheless, and despite enacted guidelines concerning ecological-minded and soft technical solutions for river re-landscaping projects, a long commitment for safety through nature control – meaning concrete-pouring solution – in the established bureaucracy has often prevailed.

Kasai Rinkai Park can be seen as pioneering exception. Built in 1989 over reclaimed land at the mouth of Arakawa River, it was designed not only as a leisure green area but also as a step in restoring natural habitats to Tokyo's Bay waterfront. Two artificial islands and a wetland area meant as bird sanctuary are combined with themed leisure areas, such as an aquarium, a Ferris wheel and a hotel. Standing close to Disneyland Tokyo, it cannot be seen apart from the overall sense of Tokyo's Bay shores being a multi-polar entertainment area.



Tokyo Olympics 2020 Eco-cycle strategy. Source: Tokyo 2020 Olympics Candidate City Application

Sea Forest impression and diagram for wind cooling passage. Source: http://www.uminomori.metro.tokyo.jp/outline_1e.html



Sea Forest diagram for soil creation process. Source: http://www.uminomori.metro.tokyo.jp/outline_21e.html

Nevertheless it testifies to a changing perspective in the late 1980's environmental policies, with growing concern for the re-creation of natural habitats.

The urban eco-cycle and the Olympics in the future of Tokyo Bay's landfills

Even in the redeveloped areas, waterfront landfills keep large areas for urban infrastructure, such as water and waste-water treatment plants, garbage incinerators, power plants, port areas and logistics facilities. The *Super Eco-Town* project (Fujita and Hill, 2007, Low, 2013), one of the most advertised in the field of Tokyo's environmental policy and located in a landfill south of Haneda Airport, testifies to the ongoing infrastructural nature of Tokyo's Bay area. Established in 2003, it is meant to bring together under one site various waste-related industries, allowing for streamlined flows between them. The idea is to take full advantage of by-products released from the recycling and waste treatment transformation processes, whether in the form of energy or biological compounds. As part of 'Zero waste city' policies (Fujita and Hill, op. cit.), the reduction of final waste is a critical goal of Tokyo's environmental policy with the its dumping facilities nearing full capacity.

Sea Forest project – known as *Umi-no-Mori* – is also an interesting and undergoing initiative aimed at reconverting Inner Central Breakwater Reclamation Area, one of the now closed waste landfills in Tokyo Bay, as a large forest park. Besides providing new green space for leisure and recreation on the waterfront, its most important feature is the contribution for cooling air coming from the sea towards Tokyo's central areas, an important relief during the hot summer season. The concept's inception in 2005 was boosted by the recent winning of 2020 Olympics bid, which will change the face of some of Tokyo Bay's landfills. Having Tadao Ando as its Project Chair, it combines a public awareness and raise funding campaign regarding the need to address climate change and environmental harmony between cities and nature. Environmental and citizen NGOs have been actively involved in the process and have received the patronage of Tokyo's Metropolitan Government. Production of rich soil for planting the forest results from the recycling of waste soil from water purification and water treatment plants, from construction sites and from Tokyo's parks fallen leaves. This is a form of establishing eco-cycle combinations with other networks and resources, in a process that is expected to be delivered through the next 30 years.

Aside from these two specific projects, the major driving force behind future development in Tokyo's Bay landfills will certainly be the Olympic Games of 2020. With two zones for the main venues – the Heritage Zone (on the central city large parks and 1964 Olympics site) and the Tokyo Bay Zone – the city wide strategy for the Olympics is grounded on two ideas: taking up the potential of existing infrastructure in the central city, and taking full advantage of landfill area through completion of metropolitan infrastructure. With the loss of development thrust in the 1990's, the idea to claim Odaiba and the Sea Forest landfills is meant to drive new energy not only to regain Tokyo's momentum in the world metropolis competition, but also to speed up the construction of planned large scale infrastructures.

> Rhur Valley and the Emscher Park

Following the closing of Ruhr Valley's mining and metallurgical industries from the 1970's onwards, a region-wide strategy for reclaiming brownfield sites was initiated. The driving concept combined the cultural value of industrial heritage with the diversified landscape as the common ground of a highly decentralized urban region. Emscher Park became the brand under which Germany's former coal basin was redeveloped as a result of creative and knowledge based initiatives, while providing a renowned example of the Thomas Sievert's concept of the *Zwischenstadt*. The polycentric patchwork of cities, rustic fabrics and open spaces, re-used old factories and man-made infrastructural landscapes is now connected through various soft mobility, water and railroad networks.

> New York's Fresh Kills park

Once the world's largest waste landfill, Fresh Kills in Staten Island is being reclaimed as a large metropolitan park, three times the size of Central Park. The global landscape design by Field Operations combines a number of recreational facilities, ecological restoration and the setting of smaller-scaled green connections to its neighboring residential districts. Wetlands, bird sanctuaries, meadows and woodlands are to be introduced next to and over the man-made mounds engineered by the influential NY Park Commissioner Robert Moses to dump New York's waste for half a century. Programmed to be developed in stages for the next 30 years, it is devised not only as a multi-functional landscape, but also as keeping its role as urban infrastructure, hosting a methane-gas fueled power plant, wind turbines and a solar panel field.

> Lisbon's port and railroad landfills and its regeneration

From the mid-19th century onwards Lisbon's eastern riverfront became one of its main industrial and port areas. Together with the airport, it framed the modernistic urban development of Lisbon's northeastern districts. However, following de-industrialization, a large scale regeneration operation was developed by the government, having the International Exhibition of 1998 as its main engine. After more than 15 years, the area has been changed into a lively mixed-use district, with excellent transport connections and landscape quality. Its success and public acknowledgement made it a showcase and model for benchmarking national policies regarding urban and environmental regeneration not only in Lisbon metropolis' river and waterfronts, but also in many Portuguese cities.

7 Traces of (post)networking in Asian metropolises: Taipei, Hong Kong, Singapore and Bangkok

"Asian chaos, uncertainty, hybrid richness and evolving complexity are now being accepted as essential elements of its urban dynamics and character." (Hee et al, 2012, p. xxii)

Being at the forefront of Asian metropolises in terms of economic and network development, Tokyo is hardly comparable to other Far Eastern cities. Its highly engineered urban landscape is the outcome of a unique model of societal development, substantially different from other Asian countries. For that matter, the diversity, richness and specificities of urban development in Asian metropolises prevent simplified descriptions under a unifying umbrella. On the contrary, they can be seen as opportunities to introduce a new level of discussion of urban network transitions, taking into account clearly differentiated social, economic and technical backgrounds. This chapter's aim is, therefore, to provide a brief discussion of 'post-network' issues in four other Asian metropolises – Hong Kong, Singapore, Bangkok and Taipei. More than a descriptive approach to its evolution, planning apparatus and infrastructural configuration, it looks to identify potential 'traces' of transitioning network characteristics. Such approach rests primarily on site observation and secondarily in specific literature for each of the cities' urban and infrastructural development. This approach – more phenomenological than analytical – will therefore be mainly focused on the most visible layers of urban networks: mobility and transportation. The outline of a conceptual 'cross-section' between Tokyo and these cities may eventually lead to a wider geographical perspective on the research's topic.

As the first decades of the 21st century are showing, the global shift of power from west to east will certainly bring new forms of urban organization to the contemporary metropolitan studies discussion. Along with this geo-political shift, the transition from Modern rationales, deeply rooted in Europe and North America, is also prone to be seasoned by the cultural and socio-political constructs of Asian players. The western influence in modern Asian urban development and planning, mostly stemming from the 19th century's technological and industrial paradigms, has now been subject to criticism and reassessment as it fails to provide adequate solutions to many of the specific challenges in this fast-changing region. At the same time, the growing influence of Asian powers like China and Singapore in the global economy and scientific realms has also been attracting considerable scholar attention not only to its unique issues, but to the wider ranged interplays that make the common ground for contemporary urban development at the global scale.

Within the field of urban network studies, Asian realities bring critical insight and contributions to the debate on infrastructural transitions from conventional and 'modern' paradigms. Being at the core of the emerging engine of globalization, Asian metropolises face considerable challenges in dealing with climatic change, with the latent socio-economic inequalities and poverty, the fast urbanization rate, and difficulties in sustaining natural resource-minded economic models. Within such a complex context, the conventional urban infrastructure solutions based on large-scale, technically demanding and centrally managed infrastructures that have shaped western-influenced cities, are facing growing limitations to its feasible implementation and efficiency. On the other hand, some of these cities have devised many alternative and creative solutions to overcome economic and financial limitations, usually resorting to more informal, individualized and highly adaptive schemes to provide the need urban services, such as mobility. Being less dependent on sophisticated technical, management and financial apparatus, they provide important lessons and contributions in the face of 'post-networked' urban configurations. Even in cities like Hong Kong or Singapore, with a long standing and

Taipei. Google Maps

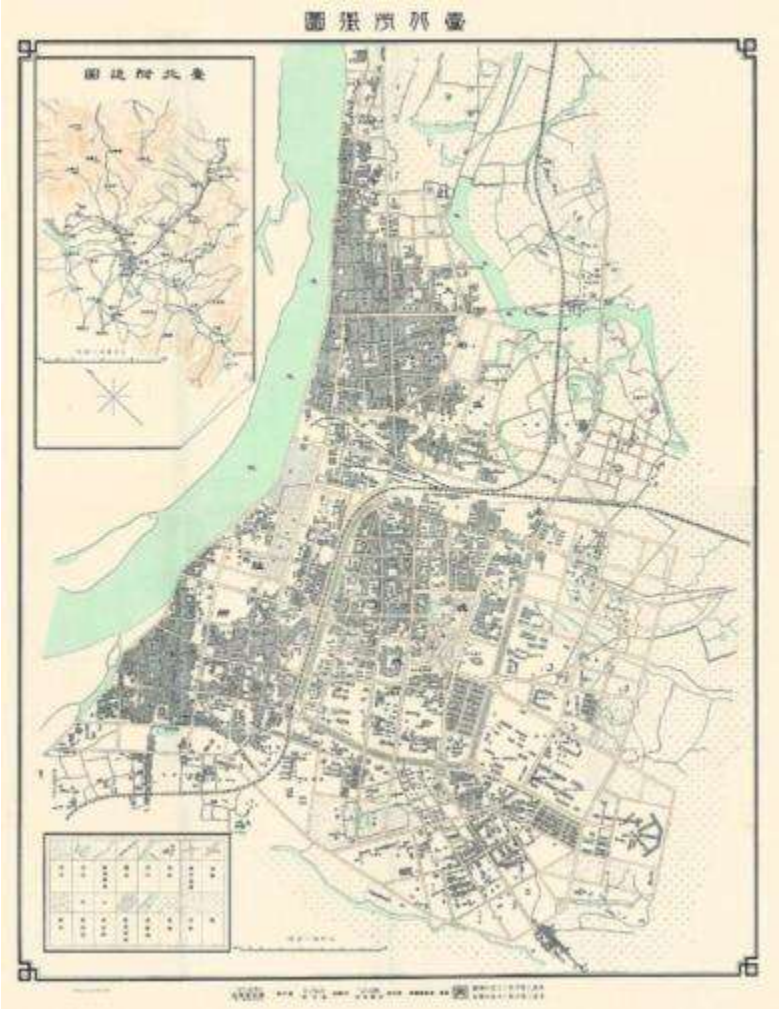
successful tradition of heavy investment in public transportation infrastructure, critical issues regarding its future and limitations can be identified.

Hong Kong and Singapore share a unique position as a sort of 'city-state', providing a bounded and exclusive milieu with unique economical, legal and tax framings that have allowed them to play a role as intermediaries of global and regional trade. In the times of globalization, their geographical prominence in trade routes was replaced by the inconspicuous, smooth and virtual flow of capital through tax exemptions and investment attraction policies. These unique condition, allowed them to have the financial resources to develop and maintain highly sophisticated urban infrastructure and extensively provide housing and industrial amenities to its citizenry. Both cities have a remarkable streamlined 'transit-oriented' urban configuration. Especially in the case of Kong Kong, where topographical constraints prevent dispersed growth patterns, the laying of mass transit lines has been the backbone of publicly funded housing development projects. In Singapore, the planning of mass-rapid transit (MRT) has been shaped as an urban development mechanism. However, and unlike Japan, in which transit-oriented development has been led by private railroad/retail stakeholders, Singapore's model has relied on government agency.

7.1 Taipei: from making a capital to going wireless

If a city can be said to be shaped by the threads of political transformation, then Taipei is certainly one of the best examples in the world. Formerly a sleepy Chinese province isolated from mainland, Taiwan was ceded to Japan in 1895 after the First Sino-Japanese War, only returning to Chinese sovereignty after the end of World War II in 1945. During that period, Japanese influence shaped Taiwan and its capital city, Taipei, according to many of the visions that were being implemented at Japan mainland and its capital, Tokyo. With the retrocession to China, the island would take an unforeseen status in the following decades as the refuge of the Kuomintang Nationalist government of the Republic of China, defeated by the Communists after the Chinese Civil War. In the wake of these events, Taipei was made the provisional capital of the Republic of China, thus establishing itself as the head of an ambiguously positioned territory in the international arena. The island's status is still a disputed matter, having no recognition as an independent country from the United Nations (since 1971 People's Republic of China was acknowledged as the representative of China), although living as such in most of its social, economic and cultural dimensions. The transformation of the late 19th century provincial capital to a world city leading one of the Asian Tigers is not only an engaging topic but also a challenging case regarding the role urban networking played in the unfolding of such process.

Taiwan experienced much of Japanese urban planning during much of the first half of the 20th century. As already mentioned, key figures in the framing of Tokyo's 1920's development, such as Shinpei Goto, had a prominent role in Taiwan, namely through a strong move towards the laying of extensive railroad network



Taipei, 1940

Taipei: view from *Taipei 101* Tower and the Presidential Office Building. Photos by the author

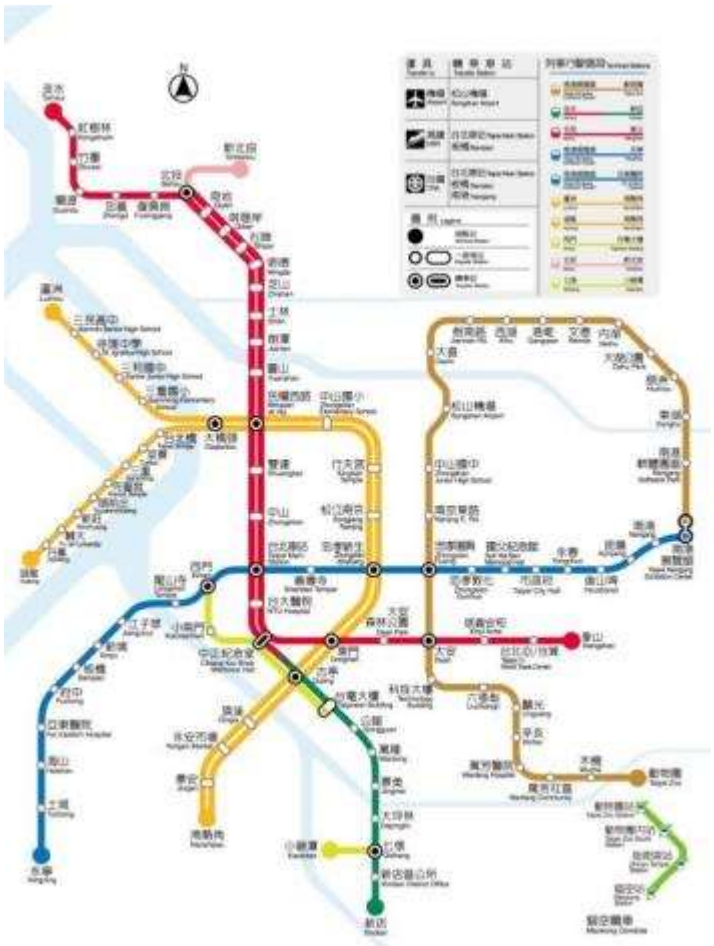
along with modern urban infrastructure (Kishiue et al, 2005). Flood control dikes, zoning regulations, land readjustment tools, major road improvements and spaces for park and civic facilities were introduced throughout the 1920's and 1930's and the first large scale plan was passed in 1932. Whereas Taipei's time under Japanese rule was one of modern infrastructural and industrial development, the second half of the 20th century would start with the transfer of massive capital assets from mainland China, along with its cultural and economic elite. Despite of ongoing dispute with People's Republic of China, Taiwan took advantage as an effective outpost of American interests during the Korea, Vietnam and Cold War years.

This context would be one of the main drivers of Taipei's change into a capital city of an export-driven and highly internationalised economy. The 1970's were marked by a national policy of large scale infrastructural and industrial projects, designed to boost the country's economy in the wake of the oil crisis. In the field of urban planning however, the emphasis on government led infrastructural projects was only met with a *laissez faire* attitude which would only partially been counteracted in the context of late 1980's national political reconfiguration into a multi-party democracy (Huang, 2005).

As Selya (1995) notes, many traces of Chinese traditional urban patterns remain identifiable in Taipei: a grid street layout, the presence of agricultural land within the city, the dispersion of economic activities; also a relatively persistent and mixed land use with housing, small retail and manufacturing in the city centre. Such small scale and juxtaposed activities make Taipei central urban fabrics prone to a highly diversified and lively social environment. Older community spaces squeezed along narrow alleys on densely built blocks stand aside to recent and often piece-meal developments. Despite being demolished by Japanese colonists, traces of the late 19th century city walls are still identifiable in the central city urban pattern. However, the old commercial core is now accompanied by a more multi-centred urban landscape, shaped by long avenues that criss-cross on a north-south, east-west pattern, Taipei's Basin. Today's the city is at the core of a 6,9 million metropolitan area. The city proper accounts for 2,6 million residents and is mostly surrounded by another municipality – New Taipei with a population of almost 4 million.

The transformation to a globalised consumer economy didn't completely erase traditional life styles and their spatial *milieu*, in which a lively and informal appropriation of streetscape remains a distinctively local feature. The major spatial transformations can be seen in the formerly tea planting plains east of central city, where a new administrative, cultural, hotel and business district has developed over the premises of old military barracks in Xinyi district. The city hall building, Dr. Sun Yat-sen Memorial Hall and the second tallest building in the world – *Taipei 101* – stand out of a gridded street layout, of wide avenues, shopping malls and planned public space. In a certain way, this area of the city stands in contrast with the local flavour of the Chinese colourful and dense fabrics, and is probably the result of an ongoing process of urgently wanting to become a world city along with its Asian neighbours of Seoul, Shanghai and Singapore.


Taipei: commercial streetscape and public space under MRT viaducts. Photos by the author



Taipei MRT plan

As the city grew, everyday mobility was supported by bus and an increasing and much popular use of motorcycles. Railroad links were mainly devised as part of the national network, instead of urban or metropolitan mobility, and thus unable to provide mass transit to the fast growing metropolis. It was not until 1996, when the first rapid transit system – MRT – began operation, that a metropolitan scale mass transport was deployed. Some parts of the initial network were built over the right-of-way of former railroad lines connecting central Taipei with Tamsui to the north and Xindian to the south. Since then, it has acknowledgedly improved urban mobility in a very effective way, with increasing ridership and lowering traffic congestion. Its attractive and convenient spatial design pays considerable attention to the climatic specificities, easy orientation, information and signage, convenient ticketing systems and easy at-grade connections between different lines. The system has become the backbone of public transport in metropolitan Taipei, with its stations set as hubs for local bus feeders.

Before the development of MTR network proper, a major step forward in improving infrastructural integration in the city was the burring of 4,4 km of railroad tracks under the central city districts in 1989 (Selya, ibid.). This project, together with a new central station with interfaces with the high-speed train, bus, taxi, and later the MRT, has become the heart of the metropolitan transportation system. The core of 1970's and 1980's tertiary development, the main station district was accompanied by a new development scheme in Xinyi area to the east, around *Taipei 101* tower. The burying of the main railroad lines and the elimination of grade crossings along the MTR network have triggered considerable opportunities for urban renewal, later emphasised by the introduction of a national high-speed rail along the island's west coast in 2007 using Japanese Shinkansen technology and expertise. With Taiwan's urbanized land concentrated on that narrow corridor, the high-speed rail serves about 90% of its population.

One of Taipei most prominent moves was the policy to become a *wireless city*, through the development of a wi-fi local area network (LAN) covering the city's most populated public spaces. The system relies on about 4500 wi-fi access points placed on existing public infrastructure such as train and metro stations, street lamps, traffic signs, urban facilities and parks. Some convenience stores and franchised cafes also provide access. Together with the hard infrastructure, a number of software applications, internet based platforms and e-government initiatives spurred to shape the 'world's largest wi-fi network city'. The development of this soft network had its inception in the late 1990's as part of wider policy measures (*Taipei CyberCity*) towards the promotion of a highly internationalized business and living environment, the lessening of the digital divide among its population, the development of advanced IT, communications and media services.

In spite of criticism regarding its implementation and corporate model (see Huang, 2012 for a detailed discussion on the topic), the network has attained considerable success and acknowledgment world-wide. Monitoring and lessons from the first years led to a new stage of the program (*UI-Ubiquitous and Intelligent Taipei*) in which interfacing with other systems, improved interactivity and customized services are aimed to be explored. One example is the Advanced Intelligent Transport System, designed to offer on-time mobile

Hong Kong. Google Maps

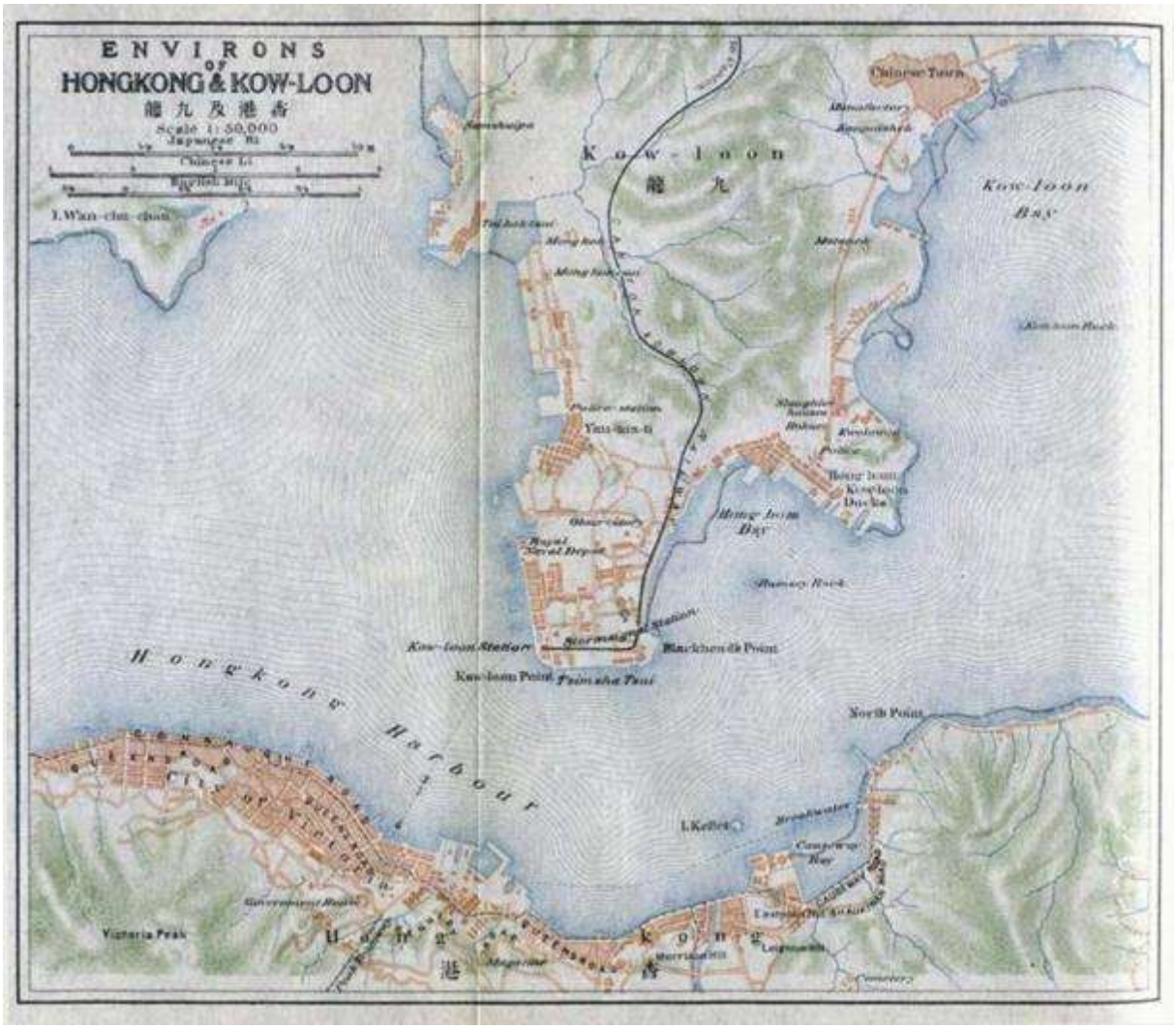
information regarding traffic management, parking offer, bicycle rental and metro and bus services (Huang, ibid.). Efforts are also being made in order to make the system free to its users. Having public space, urban facilities and heavy road, rail and transit infrastructure as its backbone, w-fi wireless Taipei may provide lessons in promoting a better integrated information technology approach to urban living and urban planning. Its role in countries with considerable gaps in terms of conventional network provision and socio-economic divides, the political and governmental acknowledgment of personal IT networks as part of the public realm and a tool to foster social development is challenging and highly relevant to the post-networked cities debate.

7.2 Hong Kong: from a three-dimensional city to a cross-border networked megalopolis

Both in the times of British domain and since 1997 as a Chinese Special Administrative region, Hong Kong has taken a role of *entrepôt* between mainland China and the various overseas powers, in constant realignment in the face of changing international and regional geo-political conditions. The Chinese Civil War, the US/UN embargo to China from the 1950's to the 1970's, the establishment of Special Economic Zones in Shenzhen Region in the late 1970's, all have contributed to make Hong Kong an alternative platform for people, trade and investment, benefiting from its economic openness and worldwide links. Firstly the sea-port, then export-driven manufacturing industries (from the post-war years until the 1970's), later the financial services, have been the drivers of Hong Kong's economy and the shapers of a unique urban landscape, confined in a narrow threshold between steep land and water.

Hong Kong's leading position in high-level corporate and financial services was mainly shaped by the post-1978 gradual opening of China to international markets, in which the Pearl River Delta region absorbed labour-intensive manufacturing, with Hong Kong retaining and developing its role as a service and logistics intermediary between China and the world. Its current economic challenges include its realignment in the Pearl River Delta region, in face of greater competition from other cities, and the role it can play in the context of the growing political and economic power of China (Yeh, 2010). Efforts to promote regional integration with Shenzhen Metropolis are being pursued, namely in the fields of economic cooperation, environmental protection and quality of life (Shen and Luo, 2013).

Its rising position in the global trade was accompanied by fast population growth, mainly through immigration, which led to significant problems of crowding and poor living conditions. Despite a distinctly liberal economic policy, the Hong Kong's Government has nevertheless been forced to address the housing issues after the 1953 devastating fire of, burning down the precarious homes of 53000 people. Since then, huge investment on publicly rented housing has paved way not only to the impressive verticalization of housing condominiums but especially to the inception of a new territory-wide urban development strategy based on de-concentration to new towns, such as Tai Po and Sheung Sui, and transit-oriented corridors. With both the original settlement in



Hong Kong, 1915

Hong Kong: view of Victoria Harbour from Victoria Peak and elevated passageways in Central. Photos by the author

Central district of Hong Kong island and the traditionally Chinese settlement in south Kowloon peninsula reaching its limits, the undeveloped forest areas of the New Territories to the north became Hong Kong's new urban frontier. The outcome of a planning policy of new town development, they are now the home for more than 50% of Hong Kong's residents (Yeh, ibid.), and the main link between mainland China and the territory.

With further demand for port, airport, industrial and office space, large scale reclamation of land over the harbour has shaped Hong Kong's waterfront landscape into a vast artificial ground which has narrowed the straits to half of its original width in some points. With the initial settlement pattern shaped by the narrow east-west corridor running through Central, Causeway Bay and North Point on Hong Kong Island, a linear pattern developed between the steep slopes of Victoria Peak and the deep waters of Victoria Harbour. As the slopes began to be short to accommodate unstoppable growth, Kowloon emerged as a pressure valve, accommodating most of the newly coming Chinese population. The old north-south Nathan Road, connecting the piers on Victoria Harbour with the heartlands to the north, kept its central role too. In his research on Hong Kong's spatial development, Ohno (1992b) identifies a number of 'segment-lines' as a specific character of the city, the outcome of a clear relationship with the changing coastline, the topographical contour lines, the cutting and levelling of hillsides and the specialized shop streets one can find.

At the same time this horizontal plane was laid, the exponential increase in buildings height stretched Hong Kong's skyline into one of the most verticalized in the world, housing over 7 million residents in just 1100 km^2. Unlike many western cities, where horizontal functional zoning is dominant, Hong Kong's buildings feature a highly diversified vertical stratification of uses and functions. Virtually all kinds of building – office, but also residential, and mixed-use – are developed on extremely narrow lots attaining remarkably slim vertical proportions. Navigating through Hong Kong's urban forest has become truly a three-dimensional experience, emphasised by its dramatic topography.

To this three-dimensional construction, one may add the city's ubiquitous network of unfolding horizontal connections through various levels, above and underground. Initially developed from simple pedestrian passageways over main roadways, these connections have developed into a comprehensive network that allows people to move through without needing to set foot on the ground and cross a traffic lane. The network is made of continuously added stretches of passageways, not only associated to the public/outer space, but also crossing through and linking various privately developed buildings. As Frampton, Solomon and Wong suggest, this footbridge network attains such a degree of complexity in all three dimensions, that it eliminates one's spatial and perceptual reference to the ground (Frampton et al, 2012). One could also argue that the ground has indeed been unfolded as multi-level surface, of which the original topography, now extensively moulded, stands almost as an undistinguishable reference when moving through the city.

The impact of such multi-level unfolding can also be seen in the recent development of high-rise mixed-use buildings, in which large atriums are laddered at high levels, with direct and seamless escalator connections

Hong Kong: new town along tram line and the Mid-Levels Escalator. Photos by the author

Hong Kong's MTR plan

from the outside space. For those who go inside, the ground is no longer on the ground floor. The atriums' scale and design, together with pedestrian bridges between neighbouring buildings, allow living on constantly elevated levels, leaving the streets to the logistics of supply, traditional marketplaces and small shops. In such a fluid spatial realm, the boundaries between public and private are diluted in the midst of the complex interlockings between the volumetric (Shelton et al, 2010) enveloping of individual buildings and the surrounding open space.

As expected, the multi-level pedestrian network is mostly associated to the transport hubs and to the high-intensity commercial and office development districts. Nevertheless, it also stretches into other more conventional and residential areas, such as Graham Street's Mid-Levels Escalator. This long pedestrian infrastructure was designed to offer convenient connection between the harbour front and the residential areas in the hills and slopes. Since its construction in 1993 it has become the spine along which an unforeseen thriving of urban activities spurred out. A unique blend of vernacular and trendy, cross-cultural atmosphere bustles around the first half of its 800 m long and 135 m high path, boasting an interesting and unplanned form of urban regeneration (Zacharias, 2013). In its zig-zagging through densely built fabric, the Escalator becomes a moving camera from which to shoot and participate in some of the most peculiar urban experience in contemporary cities.

Known for being one of the densest cities on the world, Hong Kong also features one of the highest urban intensities, in terms of high-level activities, transportation networks, and capital exchange. Such intensity on a limited land territory can only be properly sustained through a highly efficient and diversified mobility system, on road, rail and water. On the other hand, such intensity in a rather compact urbanized pattern can also be seen being the ideal condition to feed such a demanding transport system. Especially since 1998, the mainstay of heavy commuter transport is the MTR, a mass transit system devised to link Hong Kong's the central areas with the peripheral districts and new towns. The MTR Corporation is also engaged in a wide-range of property and real-estate operations, both residential and commercial, promoting coordinated action between public transport and urban development. Some of the recent large scale development schemes, such as West Kowloon landfill, have considerable interests by MTR Corporation.

With the harbour crossing as Hong Kong's main geographical constraint to smooth mobility, infrastructural projects have been focusing on establishing new underground links between both banks of Victoria Harbour, devising better network effects between the various lines. In fact, the system evolved from the 1980's single line connecting Hong Kong island to Kowloon, through Nathan Road, bisecting east around the former airport at Kowloon bay and west to Tsuen Wan, to a multi-line and redundant configuration. Especially in its first stages of development, MTR lines followed main urban corridors, but especially since the late 1990's, the system has evolved to more complex configuration, serving critical hubs, such as the new airport, Central district CBD and the newly developed West Kowloon district with alternative parallel lines. Current projects are devised to strengthen the network effects with new harbour crossings and interfaces, reducing bottle-neck

Singapore. Google Maps

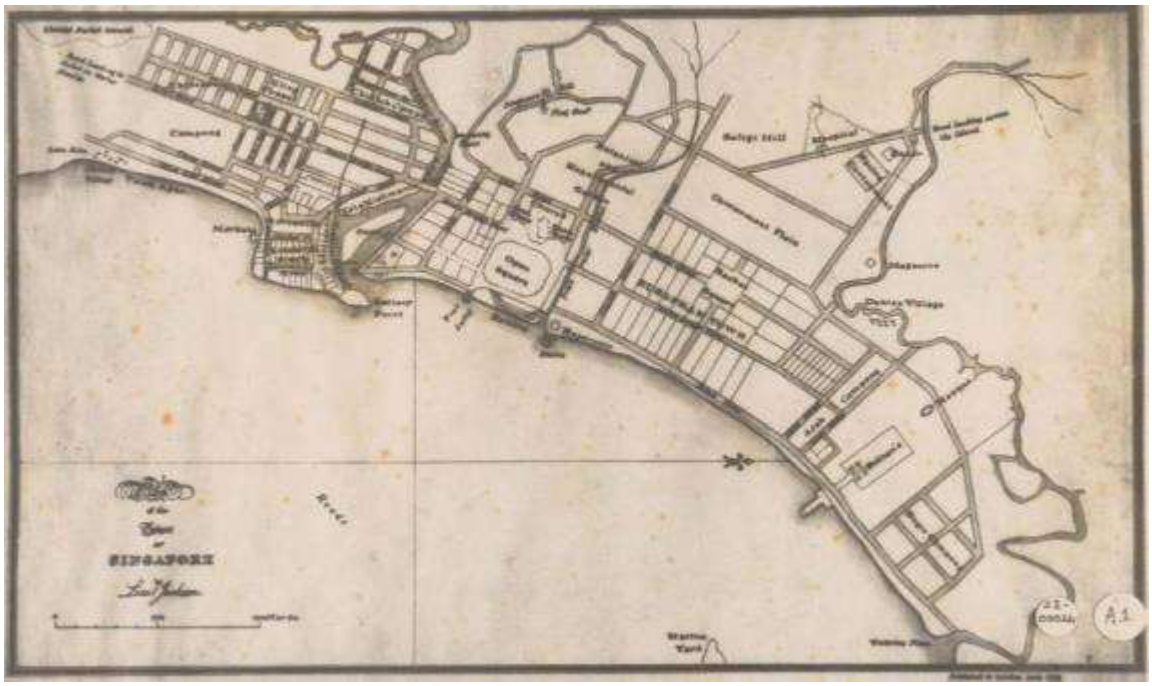
pressure on Tsim Sha Tsui – Admiralty link, while developing new connection corridors to Shenzhen, through the New Territories.

The future of (post)networked Hong Kong will most likely be framed by its wider positioning within the Pearl River Delta Region, the HK-Shenzhen Metropolis probably being a ground-breaking test-bed for further integration. In such a scenario – rapidly becoming a reality –, Hong Kong's topology will certainly undergo considerable change to become a dual core metropolis, within an even larger and dynamic region extending across to Macau and Guangzhou. *Shenzhen/Hong Kong Urbanism/Architecture Biennale* is clearly setting the speculative stage for such challenge. With much of recent development in China fundamentally driven by basic network developmental criteria, in order to meet the demands of its critical urbanization growth, a deeper understanding of the overall trends in the future of China will certainly be decisive in Hong Kong's transition trends, but beyond the scope of this research. However, it is most likely that the former *entrepôt* will continue to play a prominent role with its century-long embedded culture of knowing how to take advantage of being on the edge.

7.3 Singapore: adding smart to heavy infrastructure

Singapore, the head of the former British Strait Settlements Colony (together with Melaka, Dinding and Penang) and an independent nation since 1965, aligned its economic policy to become a hub in Southeast Asia, taking advantage of its position on the Europe-Australia route. In a not so much different path from Hong Kong's, short of natural resources and highly constrained in its small territory, Singapore has grounded its development as an open platform to process and redistribute goods and capital. It has become one of the world's largest logistics and oil-refining hubs, a highly globalized financial and exchange centre and an attractor of highly educated and specialised foreign professionals, featuring itself in good ranking along with global cities like New York, London or Tokyo (Yuen, 2011). Besides Changi International Airport, Singapore's largest, the island has seven other airports and the world's fifth largest seaport, holding key positions on a world-wide net of infrastructure, military and financial assets, thus expanding its external economic hinterland and becoming 'multi-territory' nation.

In a rather unique association between state-driven intervention framework with global private capital investment, Singapore has made an astonishing step upwards from a poorly developed society in the post-war years to become one of the most successful Asian Tigers with a 'First World' GDP per capita (Yuen, ibid.). Although this has resulted in a remarkable overall improvement on living conditions and average income, it is also heavily dependent on external conditions and prone to unexpected and uncontrolled change in the highly volatile and competitive arena of global capitalism.



Singapore, 1828. Source: National Archives of Singapore

Singapore: The Bay and Raffles office district; the Padang with Supreme Court and Cricket Club. Photos by the author

On recent decades, strong investment in sophisticated services and the knowledge economy spurred the development of science and technology parks, expo fairs, specialized health services, and hotel, leisure and business complexes. As a result of a deliberate policy to attract investment, tourism and qualified foreigners, recent development has also been geared to promote a fashionable and exciting city lifestyle, with large scale schemes built on reclaimed land around Marina Bay and Sentosa Island. With its daily light and sound shows, sophisticated gardens and public venues, in the midst of iconic buildings and trendy shopping arenas, the city by the sea is becoming more of an open-air entertainment park, with only a superficial taste of its humble but lively ways of life at the mouth of Singapore River. Indeed, as Preston regrets, the 'austere functional beauty' that one feels when strolling around Singaporean promenades hides decades of step by step replacement of traditional Malay communities and settlements under vast urban renewal schemes. Much of the water-borne features that made Singapore urban life distinct and embedded in its Asian natural and cultural realm, has vanished under a westernized, sophisticated and sanitized 'waterfront', which needs to be continuously reinvented as a marketing brand (Yuen, 2011).

Singaporean urban-making is largely framed by a highly structured planning system, since its inception as an independent state. Aimed at claiming a place at First World cities, the pursuit of economic growth, efficiency and seamless quality of life has shaped Singaporean social and political arena as a remarkably *taylorist*, master-planned society, with a 'half capitalist' and 'half social-welfare' state (Zhang and Tan, 2008). Effective implementation processes have rendered the planning system a major tool for delivering both the large scale and infrastructural development and the small scale but widespread orderly urban environment. Grounding itself mostly in modernistic planning concepts, rationally planned growth and renewal operations were carried out throughout the 1960's and 1970's with an emphasis on improving the country's disrepaired living conditions. Housing, public transport, sanitation and urban facilities were promoted as the backbones for a spatial and societal change, under the coordinated and effective action of several government agencies (Boontharm, 2013). As a city-state, the urban-making process was clearly interlocked with the political and technical vision of nation-building.

With about 80% of the housing stock built by the state-run Housing Development Board (Yuen, iibid.) and with 60% of the land publically-owned, the role of government led planning and development is clearly preponderant. Rooted in highly voluntaristic technical apparatus, state agencies such as HDB or the URA – Urban Redevelopment Authority – have deeply reshaped the island's low rise, slum and squatter pattern of settlement of the 1950's into a 'well-oiled machine' (Richardson, 2008, taking on a URA exhibition motto). As part of that effort, a British-influenced approach to new towns (just as was the case in Hong Kong) was carried out, establishing large urban districts around the island, polarised on transit stations. Decentralisation to sub-centres was meant to alleviate centre city congestion and provide core functions to new industrial and business areas.

Singapore: Little India district; housing estates along MTR line. Photos by the author

Singapore's MTR plan

A rather plain topography, allows Singapore urban pattern to rely on extensive built-up areas, although with high-density building typologies developed in comprehensively designed estates, kept in an orderly and extremely clean way through diligent control. Strategic natural resources (water reservoirs, forest land) are tightly preserved and virtually no unplanned urban sprawl can be identified (Boontharm, ibid.). Agricultural land, on the other hand, has a residual presence both in the economy and on the land use share. This establishes a clear boundary between urban and surrounding green areas, making Singapore a quite unique case when comparing to other large cities worldwide.

However, and thanks to the multi-ethnic composition of the country's 5 million inhabitants and favourable climate conditions, (controlled) appropriation of streets and HBD estates ground floors and passageways for temporary or everyday trade results in a lively and cosmopolitan feeling in the city centre. Some of the remaining old shophouse districts that survived the 1960's mass renewal schemes are now listed as heritage and thoroughly managed and maintained as commercial and touristic showcases for the Chinese, Malay, Indian and Muslim communities. Creative quarters are also part of the urban planning and economic development policy, in a rather paradoxical 'top-down' driving of innovation and cultural flourishing.

In the field of infrastructure provision, this highly coordinated and centrally managed approach has also played a key role. In fact, and unlike other sector's investment ventures, the risk on infrastructural development ventures has been strongly backed by government support. Not surprisingly, in such a synchronized and 'well-oiled' environment, urban networks are seen as the core realm for the smooth, seamless and controlled flowing of people, goods and virtual information.

With the port and industrial areas developed in reclaimed land and small islands, Singapore's clearly zoned residential districts are linked by a modern network of expressways and mass transit system – the MRT. Despite a well-developed road network, car ownership is very low (only 1 out of 10 Singaporeans owns a car) as a result of restrictive quota, tax and toll measures akin to Hong Kong's designed to deter car travel and congestion in the central city areas. Light rail system (LRT), based on driverless people mover technology, feed MRT stations in large public housing estates. They operate on loop routes and have been replacing much of previous bus services. This change has been contested by local residents, as the LRT appears to be much less flexible and convenient when it comes to saving time and promoting direct connections (Richmond, 2008). The layout follows a clear tree-like hierarchical pattern, in line with the rationality behind the centrally-planned residential estates.

As Richmond (2008) argues, this outstanding development as not been achieved without pain, and relies on a rather strict top-down governance model, in which political power, technical expertise and urban planning converge with largely state-owned land, growth oriented policies and frail citizen political activism. He takes the metaphor of the air-conditioning, labelled by Singapore's Prime-Minister (1965-1990) Lee Kuan Yew as the 'most important invention of the millennium', to describe the country's centrally managed and controlled

Bangkok. Google Maps

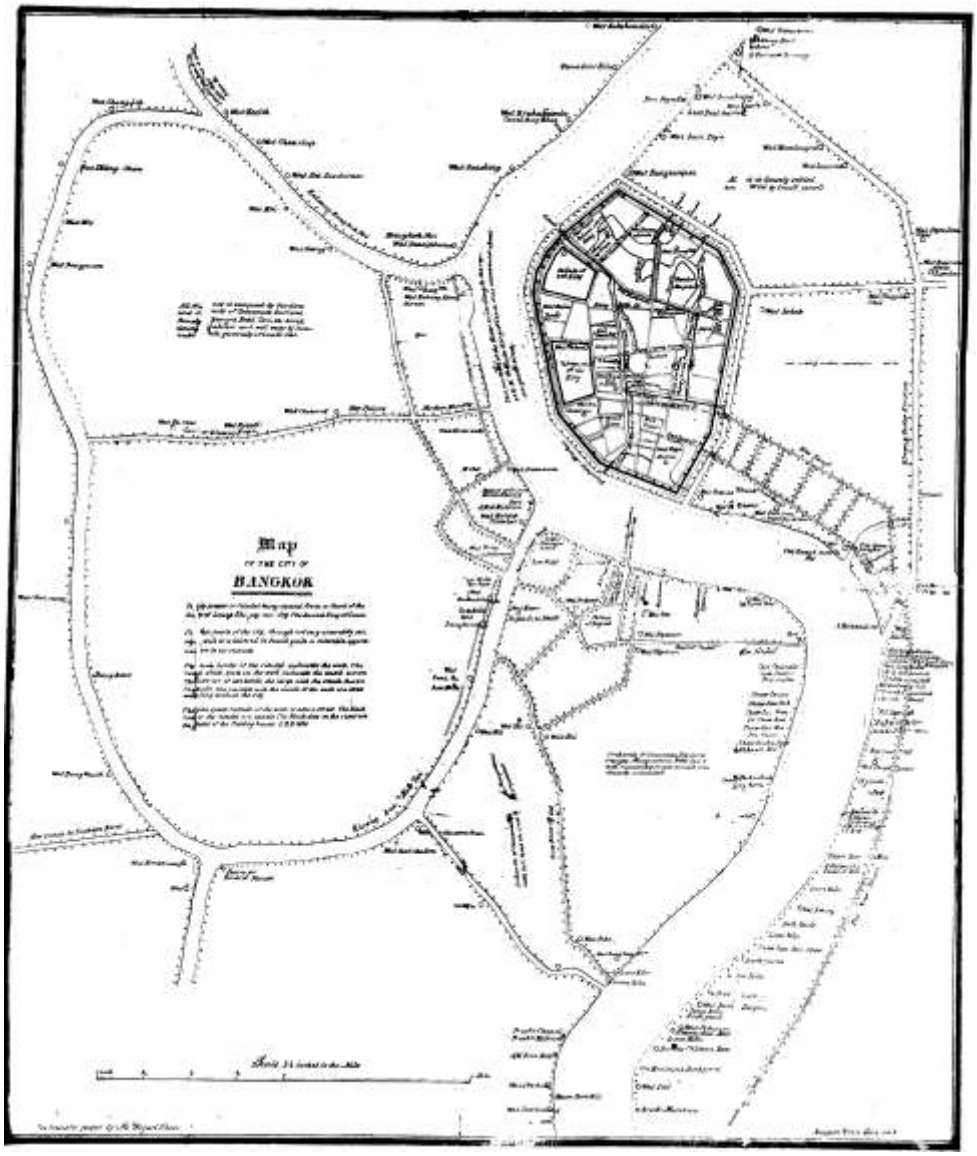
environment and its implications in urban transport. The metaphor illustrates not only the dependence on an artificialized machine organization to which Singaporean life has become dependent, but also the comfortable and convenient spatial enveloping of city dwelling and flowing. Naturally, it resonates with the limitations and pervasive effects that air conditioning systems have on their surroundings, bridging to a critical discussion on the post-networked debate, on which three issues can be highlighted: the rigidity of transport routes, based on heavy infrastructure (MRT, LRT) and tree-like hierarchical bus feeding service, with limitations in the face of changing mobility patterns (beyond conventional house-to-work commuting); the network control apparatus, dependent on highly centralised, regulated top-down procedures, with limitations in addressing individual and all-inclusive expectations; and the enforcement of a tight modal split favouring public transport through highly restrictive car ownership and travel measures.

However, and despite its functional rigidity and frailty in the face of alternative mobility expectations, the smooth and coordinated management apparatus of these systems is allowing for very effective and technologically innovative improvements. They are mainly associated with the overlaying of information technologies to adjust the system's demand and offer capabilities, such as smart road tolls (charging modelled fees according to traffic congestion), elderly and handicapped smart cards to extend the pedestrian time for crossing roads, and mobile phone applications to better manage on-time mobility (Land Transport Authority, 2013).

7.4 Bangkok: the potential of small scale mobility and water patterns in a fluid landscape

The fourth city in this Asian itinerary, Bangkok stands as a notable case of South-east Asian urbanism, with a strong and often contradictory duality between its grass-roots as a water-borne tropical city and the emerging forms of a now globalized and fast-growing metropolis. Being the capital of the only country in SE Asia that was not colonized by western powers, Bangkok has developed according in rather unique conditions when compared with some of its neighbouring capital cities. The site of its establishment in 1782 as the capital of Siam (the name of Thailand before 1939) on the western banks of Chao Phraya River, and close to the ocean, made water transport the mainstay of its development during the initial stages. Settled on highly irrigated land, canals (*khlongs*), irrigation and drainage ditches were laid as the first infrastructure, which together with the rice-field layout providing the city's first and basic pattern.

While initially surrounded by the country's richest agricultural land, the city would grow at a fast and extensive pace throughout the 19th and 20th century (Sintusingha, 2011), leaving behind its water-borne and amphibious character. Lacking the resources and direct European influence of other colonized Asian cities, Bangkok modernization during the 1860's was mainly carried out without an overall vision or combination between urban planning, infrastructure provision and economic development. Instead, it modernization was driven by a



Bangkok, 1870

Bangkok: view of the old city along Maha Nak canal; Victory Monument Plaza. Photos by the author

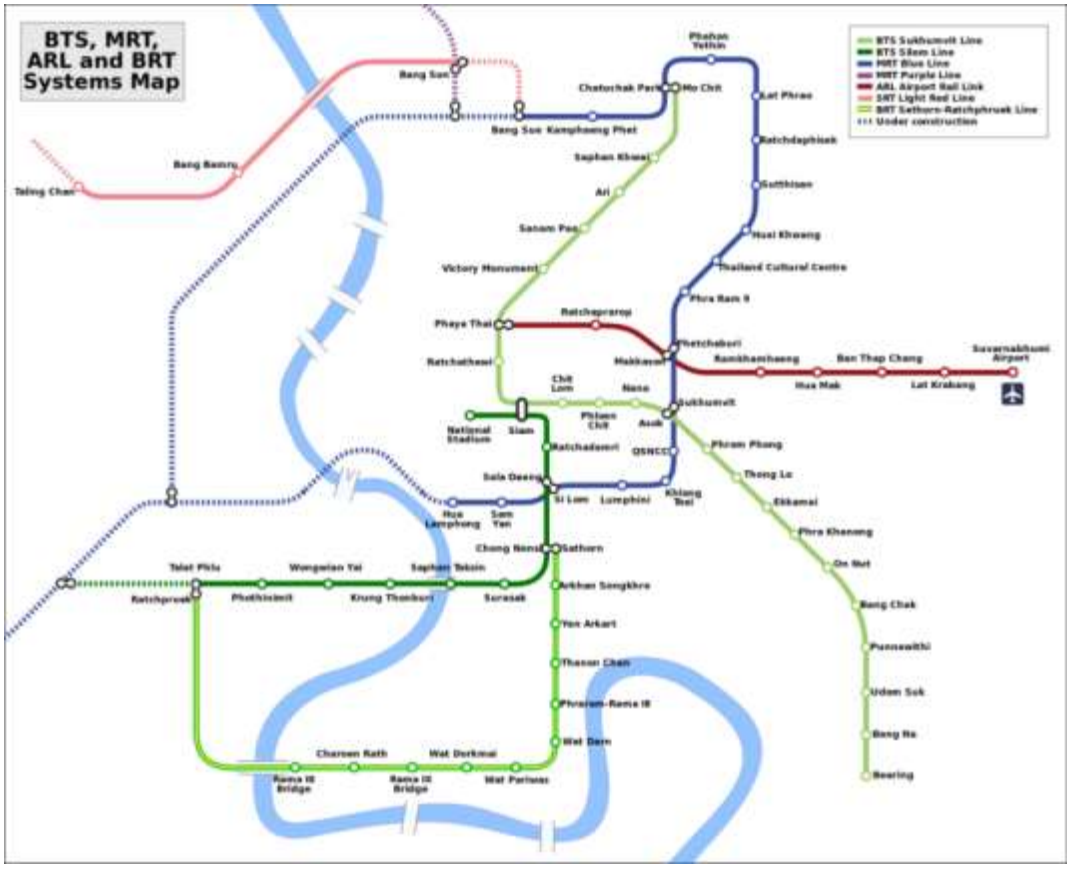
sum of different beautification and partial projects, mainly associated with road development and representational buildings. Bangkok as a water city was increasingly becoming dependent on land transportation for its development (Kishiue et al, 2005). However, and despite an early adoption of railroad development in the 1890's, it has never become a truly efficient and popular means of transportation. Road based traffic quickly developed as the mainstay of Bangkok's urban transportation. With a population of 8 million in the city and over 14 million in the metropolitan region, Bangkok has experience exponential growth since the 1950's, with peak booming in the late 1980's and 1990's, under the driving force of foreign-funded Asian economic development. Suburbanization patterns are mainly associated to the prevalence of car mobility. The introduction of road-based mobility was accompanied by a change of land use and spatial organization in which the former water-based structure was landfilled, constrained by dikes and overlaid by 'super-block' lanes – some of them as large as 20 km^2.

Especially after 1932, with the transition to a regime of constitutional monarchy, Thailand's political instability has made the drafting of formal planning tools a difficult and rare process. In such a context, urban plans and zoning tools, have failed to accompany and drive the exponential growth of the metropolis. Infrastructure development, carried out in a project by project approach (Kishiue et al, op. cit.) has been mostly focused on large scale highway construction as a control measure to ease traffic congestion in central areas and commuting axes, framed by metropolitan plans in 1960, 1972 and 1992 (City Planning Institute of Japan, 1988). However, the lack of a multi-level and comprehensive land-use and urban development control legal system, allows for constant loop-holes and haphazard growth pattern. The road development has fostered the reliance of car-based transportation and had limited impact in framing a coherent metropolitan structure. Especially between the 1960's and the 1990's, a *laissez-faire* approach to urban planning and development control prevailed (Sintusingha, 2011), leaving space for piece-meal private development but also for 'organic', self-organized and fragmented forms of small scale adaptation and spatial change.

Besides the national railway system, heavy public transportation has only been implemented in the late 1990's, with the opening of the first stage of BTS, an elevated metro network also known as *skytrain* in 1999 and of an underground metro system – MTR – in 2004. Both systems are still far from becoming a truly metropolitan network, serving mainly the central business and hotel district of Siam Square and Silom, Suvarnabhumi Airport and some north-eastern and south-eastern districts. With limited transportation choices, Bangkok residents rely on a number of car and motorbike-based transport solutions. Besides individual car and an outdated and poorly maintained bus network, three other systems become the mainstay of commuting and short-trip travels in the city: minivan buses, *tuk tuk*, and motorbike-taxis. Thriving on the ambiguous boundary between the 'formal' and 'informal', these systems have indeed become a common and distinctive feature of Bangkok's urban landscape, and can be seen as holding potential in the 'post-network' debate.

Minivans are mainly used in medium distance commuting, ranging from 10 to over 70 km, allowing for a group of people (9 to 15) to be moved along a rather flexible route, on a given itinerary. Although they operate with

Bangkok: Maha Nak canal; streetscape and minivan traffic. Photos by the author



Bangkok's transit systems plan

fixed points of departure and destination, the actual routes are determined by the needs of individual users, allowing for considerable flexibility and convenience. Being small and agile, air-conditioned minivan buses combine the best features of taxi and bus into an agile, reliable and comfortable service. *Tuk-tuk* (tricycle motorbikes) on the other hand appear as a more traditional and cheaper alternative to conventional taxi. They can carry three persons (some push beyond that limit) and are attractive in short trips, especially among tourists. With the main heritage district still unserved by MTR and BTS systems, *tuk-tuk* are a common sight around main monuments, attractions and cross-roads.

Motorbike-taxis are especially used in central districts and allow for a short one-person transport. Given Bangkok's specific land patterns, still shaped by formerly agricultural parcels and narrow lanes, much of the city's fabrics are poorly serviced by wide roads and avenues. These traditional fabrics, known as *soi*, are the realm where motorbike-taxis become the most popular and adapted means of transportation. Although they can hardly be seen as a mass-transit system according to 'modern' criteria, its characteristics as alternative solutions for decentralized mobility in developing and poorly serviced cities are becoming to be acknowledged – or at least looked with interest (Sengers, 2014). In fact, they have developed interesting forms of organization and responsiveness resorting to ICT technologies (for metering and cooperative association. With an astonishing number of over 200.000 motorbike-taxi drivers, the system play a key role in the city's 'transport ecosystem' (Sengers, ibid.) as it connects the highly spread and poorly linked transport hubs and major roads with the inner fabrics, overcoming permanent traffic jams and effectively navigating through the narrow *soi* alleys.

Tuk-tuk and motorbike-taxis are informal networks based on a rather volatile though adaptive capacity to adjust offer to the demand. Fares and negotiated between driver and rider, and service may be unavailable or refused if the requested destination goes through highly congested areas. For instance, peak hours are a problem that even such systems hardly overcome. On the other hand, their ubiquitous presence throughout the city makes individualized and cheap transport almost immediately available most of the time. Together with the rich tradition of street-vending (Boontharm, 2005), these systems contribute to make a lively streetscape, and overcome rigid barriers between formal and informal, public and private, individual and shared space. As Sintusingha argues, Bangkok's unique and complementary relationship between the formal and informal practices, governance mechanisms and spatial features is an important support for preventing social tensions, being inclusive and providing a structure for upward social mobility (Sintusingha, 2011).

Despite legitimate concerns regarding their share in increasing air pollution and CO2 emissions, they are net contributors to the employment market and provide an effective solution to move millions of people in an under-serviced and low income urban environment. If combined with technological and organizational innovations, with better interfacing with other transports – namely the MTR, BTS and water-borne taxis – and with enhanced visibility, formality, and safety, they are probably a ground-breaking solution not only for the future of Bangkok's mobility system, but a case with sound lessons for other developed metropolises

worldwide. Tracing back its foundational character as a ‘fluid city’, the promotion of this wide-array of small scale mobility solutions, also holds considerable potential in the face of now recurrent problems with floods and climate change. Reclaiming the city’s water infrastructure as the common ground for a more fluid and adaptable mobility, urban trade and dwelling may be a relevant endeavour to be taken towards greater environmental resilience, societal inclusiveness and spatial attractiveness.

8 A final overview

Railroad tracks between high-land and low-land. Nippori. Photo by the author

The aim of this research was to identify and assess critical issues within the overall concept of a 'port-networked metropolitan landscape', having Tokyo as its territorial focus. This aim is expected to provide a wider understanding of the concept, in scale, complexity and geographical diversity, thus contributing to advance the knowledge from previous research on metropolitan Lisbon.

The research was developed by framing recent metropolitan development of Tokyo and its infrastructural spaces, resorting to specialized literature and cartography; by identifying critical issues and spatial features in Tokyo which could be related to the 'post-networked' transition topic; providing the basis for critical discussion and conceptual assessment in terms of contemporary metropolitan morphology and design, with a brief overview of other Asian cities.

Having Tokyo as its main subject, the report is expected to sequentially provide an interpretative reading of its development and spatial features, under the lens of infrastructural configurations and (post)network transitions. The first chapter (*A metropolitan outline*) introduces basic notions and overall figures of Tokyo, while the second chapter (*Networking Tokyo*) provides an outline of its main infrastructural features, by identifying the spaces and times that shaped its evolution and modernization into a completely networked urban landscape. The third chapter (*Fabric weaving Tokyo*) looks for the intricate threads that shape built and open space in a fabric-like texture, in which Tokyoites life and socio-spatial practices and culture flourish. The fourth chapter (*Becoming Tokyo*) bridges an interpretation of the unique Japanese spatial culture with an overview of Tokyo's urban planning system and rich history of urban visions and designs for the future.

After this preliminary overview of Tokyo, the fifth chapter focuses on the wider conceptual discussion of transitional metropolitan development issues, by identifying and looking for parallel and alternative approaches by key authors and by the *Fibercity* strategies developed by Ohno Laboratory at The University of Tokyo. A tentative conceptual cross-section between *Fibercity* and Post-network theory is outlined. The sixth chapter highlights specific cases and projects in Tokyo which can stand as interesting examples on innovative approaches to network development and serve as test-beds for further assessment. Finally, the seventh establishes links with some brief impressions on the networking issues of Taipei, Hong Kong, Singapore and Bangkok.

In order to allow for a simple overview, concluding remarks are systematised in three lines of argument:

> 1. Tokyo as an outstanding territory to understand and devise (post)networked metropolitan landscapes
> 2. Bridges between 'post-network theory', *Fibercity* and Tokyo projects
> 3. Asian metropolises as critical test-beds for innovation beyond conventional networked configurations

Tokyo as an outstanding territory to understand and devise (post)networked metropolitan landscapes

- The world's most populated metropolis, Tokyo relies on on-second synchronized public transportation networks, mostly based on an extensive and efficient railroad network, to guarantee smooth flow of people and goods throughout its territory. However, and unlike most of its western counterparts, a considerable part of this network was built as part of private-led comprehensive business portfolios, in which transport, retail and land development were tightly intertwined. Such combination proves to be quite efficient in delivering transit-oriented development and interfacing between different kinds of urban network. It remains however to be seen how increasing autonomous lifestyles, individualized mobility demands and territorial de-concentration of activities are worked out in railroad under-serviced areas.

- The political, economic and technical stronghold of Japanese heavy engineered infrastructure industry can be seen as both a potential for widespread and powerful innovation and slow and inertial apparatus when major adaptation is required. The largely successful quest to improve the economy's environmental performance from the 1970's highly polluted years attests to this powerful capacity, although largely dependent of sophisticated and demanding technological investment. Future challenges include softer realms of decision, botton-up action and low tech solutions, with longer-term return, probably less adjusted to the dictates of capital-driven market economy and growth-oriented *taylorist* momentum.

- Tokyo's dense, continuous and fine-grain urban fabric is in a constant state of transience, with everyday renewal of buildings and not-so-old structures. This continuous verge for impermanence can be seen as a driver of urban vitality, rooted on Japanese cultural perception of the ephemeral nature of life and things, but also as a constraint to more sustainable building practices. Short life spans require constant provision of resource and generate high levels of waste. New balances between an open-mind towards change and a sobriety attitude in the face of resource and economic scarcity must be further enticed. Although still framed under neo-liberal approaches to development through better design, recent changes towards better qualified urban space, architecture and building construction in Tokyo may entail such a path in a near future.

- Lacking much of western's biased duality between city and countryside, Japanese culture stands at a privileged point to address recent discussion regarding extensive urbanized landscapes beyond the constraints of rigid hierarchies of centre/periphery, urban/natural or compactness/sprawl. On one hand, intensity and vitality can be found in distant places from Tokyo central hubs; on the other hand, even in central Tokyo, those hubs stand surrounded by a carpet of quietness, sense of vicinity and low-rise fabrics. This rather 'democratic' distribution of activities and living spaces, can acknowledgedly be said to provide fairly distributed opportunities for Tokyoites, notwithstanding long-standing issues with land prices and the weight of housing in the household budget.

Changing landscape. North of Edogawadai. Photo by the author

> Contemporary metropolises worldwide are now the result of multiple overlaying patchworks, in which natural features and open spaces become embedded in new forms of social, infrastructural and cultural landscapes. Considerable levels of artificialization have rendered Tokyo's metropolitan landscape as a finely tuned mechanism, in which natural flows are channelled, pumped and contained in an (almost) totally controlled environment. Despite its impact on sound ecological metabolism, this now fully artificialized territory holds an interesting character as a multi-layered cultural landscape, as sections through river levees would show. On the other it is still prone to recurrent and uncontrolled extreme natural phenomena, such as earthquakes and typhoons. Tokyo's landscape is therefore a socio-technical and cultural construct in which the weather seems to change at a faster and unpredictable pace.

> Some of the local social infrastructure – such as the convenience stores and community buses – rests tightly dependent on the corporate strategies of its providers. As such, they can not be said to stem from their political acknowledgement by the government as citizen rights or basic needs that must be secured by public policy. They prove to be, however, a valuable resource in securing a wide range of services, on a 24 hour and almost ubiquitous pattern. In societies where demographic change is a major concern (whether it is fast growth and migration, or shrinkage and ageing), conventional growth-oriented rationales are bounded to become unsustainable and require considerable reassessment, technological innovation and socio-political legitimacy.

> Within the realm of a highly engineered urban landscape, traces of innovation and alternative infrastructural configuration stand out as seeds for future research and development. They introduce relevant features in their metabolism, systemical role, and network interfacing. Innovation in metabolism is related to synergetic combinations between infrastructure and ecological cycles (see *Grounding infrastructures*/6.1 and *Reclaiming infrastructural landscapes*/6.5); alternative systemical roles are identified in projects aimed at providing more resilient, small scale and autonomous services (see *Metropolitan interfaces*/6.2 and *Beyond heavy networks*/6.3); improved network interfacing capability is featured in cases where several infrastructural systems are connected to provide higher efficiency, value and flexibility to its users (see *Metropolitan interfaces*/6.2, *Beyond heavy networks*/6.3 and *Infrastructure in-between*/6.4).

Bridges between 'post-network theory', *Fibercity* and Tokyo projects

Sharing many conceptual questions and concerns for contemporary urban living, in the face of profound changes in socio-environmental trends, *Fibercity* and 'post-network theory' can be said to work on common grounds, each with its disciplinary backgrounds and specific outlook. A common matrix is tentatively drafted to highlight potential linkages as a simple exercise of framing both approaches. It includes four domains: *Network configuration*, in which it conventional network patterns are identified; *Post-network issues*; *Fibercity vision*; and a bridge to the *Tokyo cases* discussed in chapter 6. The matrix is structured around seven basic urban

networks: 1. public transportation, 2. streets/roads, 3. electricity, gas, heating & cooling, 4. water supply and waste water management, 5. Waste management, 6. Communications, and 7. Flood control and disaster relief.

> Public transportation

Network configuration	Reticulate, large scale rail-based systems Spatial and business model combination of transport, retail and urban development Increase in car-based configurations in distant metropolitan districts
Post-network issues	Lowering demand in some older suburban areas (shrinkage and ageing) Spatial strategies to integrate heavy infrastructure with urban fabrics and landscape
Fibercity vision	Urban compactness around railroad stations *Orange web*: new strategies for bus services
Tokyo cases	*Metropolitan interfaces:* Yamanote and Oedo ring lines *Beyond heavy networks*: Community buses, smart mobility IT *Infrastructure in-between*: Ookayama (RR station/hospital), Kaminoge (RR station/kindergarden)

> Streets and roads

Network configuration	Radio-concentrical (incomplete) metropolitan expressway and trunk road network Narrow and irregular local street patterns, limited sidewalk and public space features
Post-network issues	Ageing and maintenance of infrastructure, spatial qualification of older roads and streets, sustainability of road infrastructure costs in shrinking areas Spatial integration in urban fabric and landscape
Fibercity vision	Linear compactness along public transport axes *Orange Rounds:* mobile, portable and convenient services (health, commerce, postal…) *Urban wrinkles* and *Green partition*: local fabric spatial upgrade, open space/green network, improving attractiveness of existing neighbourhoods and urban landscape
Tokyo cases	*Beyond heavy networks:* closing expressway gaps; the streets as support for social infrastructure *Infrastructure in-between*: Yamate Dori and Ohashi Junction

> Electricity, gas, heating & cooling

Network configuration	National voltage divide, power generation at Tokyo and seaside plants, radial and circumventing transmission lines, elevated local distribution electricity lines Extensive use of household/room air conditioning
Post-network issues	Fuel-mix for power generation, nuclear issues, development of renewable sources, smart-grids, demand-side management, efficient technologies
Fibercity vision	Shrinkage as a process to escape 'exploitation' of resources *Green web*: district heating networks along renewed Central Expressways
Tokyo cases	*Infrastructure in-between*: Tokyo Tech EEI building *Reclaiming infrastructural landscapes: Sea Forest* and *Super-Eco-Town*

> Water supply and waste water management

Network configuration	Long-distance sources, channelled transport, supply treatment Tradition of local waste water treatment Large scale waste water treatment plants
Post-network issues	Dependence of long distance water sources and transport, inefficiencies of sprawl infrastructures Privatization of water resources
Fibercity vision	Fostering decentralized systems Shrinkage as a process to escape 'exploitation' of resources *Blue necklace*: reclaiming Tokyo's rivers and canals for leisure and transport
Tokyo cases	*Grounding infrastructure*: storm-water systems

> Waste management

Network configuration	Decentralised collection and separation: neighbourhoods and households Municipal scale treatment, recycling and dumping
Post-network issues	Zero-waste policies, recycling and reuse cycles, waste-to-energy
Fibercity vision	Fostering decentralized systems Shrinkage as a process to escape 'exploitation' of resources
Tokyo cases	*Grounding infrastructure:* landfills *Reclaiming infrastructural landscapes:* Sea Forest and Tokyo Bay

> Communications

Network configuration	Highly distributed mobile communications, 'teleport' global data connections
Post-network issues	Integration with other networks (smart grids, smart home management), changing forms of trade, consumption and logistics, public realm and social links
Fibercity vision	*Personal technology* adjusted to new forms of community and vicinity *Orange (warm) infrastructure* ICT as support for decentralized and customized services in ageing/shrinking society
Tokyo cases	*Beyond heavy networks*: smart phone technologies, convenient social infrastructure

> Flood control and disaster relief

Network configuration	Extensive and engineered flood control: levees, dams, retention basins and tunnel floodways Emergency escape areas (parks, public facilities) with easy access, fire-proof urban barriers Urban renewal through re-building older sub-standard buildings
Post-network issues	Re-naturalising sections of river; compatible uses in flood control areas Appropriation as public and leisure space
Fibercity vision	*Green web*: emergency access in renewed Central Expressways *Green partition*: fire-breaks in dense residential neighbourhoods
Tokyo cases	*Grounding infrastructure*: super-levees and storm-water reservoirs and tunnels *Beyond heavy networks*: Convenience stores, *koban* police boxes *Reclaiming infrastructural landscapes*: river restoration initiatives

Asian metropolises as critical test-beds for innovation beyond conventional networked configurations

> Asia is far from being a homogeneous continent, with some of the world's most contrasting socio-economic and landscape features. Asian countries stand at unique cross-roads between colonial western influences, local cultures and rooted practices, and today's global market and cultural arena. Adaptation, hybridity, and intensity are common features one can find in Asia, as the world's fastest-changing urban continent. As such, a multi-scale, diversity-aware looking out for Asian's wide variety of solutions, issues and challenges will probably provide better insight.

> Stages of development of Asian cities differ considerably, both on its inception and evolution context over time, and on specific spatial, economic and socio-cultural characters. Urban networks simultaneously shape reflect those contextual and site-specific conditions. They share, however, strong links in their political, technical and socio-cultural layering. If seen in their potential and unbiased from developmental perspectives, such differences in the provision of urban networks can provide lessons to the advantage of all, beyond the rigid boundaries between *developed* and *developing* countries/cities.

> A common feature of Asian public space is its blurred boundaries, opening the opportunity for a varied and ever-changing appropriation of its thresholds: Hong-Kong's unfolding multi-level links, Tokyo's railroad stations, Bangkok's informal and changing roadside and streetscape. Seen more as a common shared ground, than as a government framed space, Asian public realm holds great potential as an interfacing space between the different forms of networking and the social and cultural fabric.

> Water is a critical element in Asia. With demanding climate and unsettling topography, modern urbanization trends and its environmental support are met in a risky and difficult interplay. Water is at core of these cities culture and morphogenesis (Bangkok's canals, Tokyo's rivers and lowlands, Hong Kong and Singapore as islands at cross-roads), but also at the top of their critical concerns: increasing floods, rise of sea level, river biodiversity, limited water supply resources, irrigation and food supply for high population concentration.

> Large and intensely populated metropolises live in a constant battle to secure the best opportunities for the scarce available land. Through a highly diversified range of architectural, urban planning and infrastructural codes and spatial devices, Asian cities are pushing the boundaries of experimentation, both at the level of large scale development and micro-scale adjustment, either resorting to top-down and sophisticated technical expertise or by convening the layman entrepreneurship and community common-sense. They provide a new benchmark to devise alternative three-dimensional, flexible and adapted solutions to improve quality of life and spatial and social inclusiveness.

> The network control environment is extremely varied and shaped both by external factors (colonial and neo-colonial influence, globalization, geo-political disputes) and internal conflicts and compromises. From the

View of *Skytree* tower from the Environmental Studies Building of the University of Tokyo at Kashiwa Campus

highly centralised and regulated Singaporean milieu to the overly informal and compromise-based relations in Bangkok, Asian cities display original features in their continuously adapting socio-political *milieu*. The interplay between the networks of power and the networks of space is staged on highly disputed grounds, sometimes providing unexpected but surprisingly resilient results (as Bangkok's minivan, *tuk-tuk* and motorbike taxi industries).

Open questions for ongoing research

Far from expecting a comprehensive and detailed overview of Tokyo's infrastructural strata, urban planning apparatus or urban design projects, this research was mainly concerned with identifying traces of spatial innovation in the networks of one of the most challenging metropolises in the world. The results are therefore seen as a step forward from previously developed research regarding Lisbon, an European metropolis facing considerable challenges in its societal and infrastructural configurations. *Tokyo's traces* provide conceptual and design-minded references for an ongoing research agenda, in which the morphological, organizational and socio-political constructs of contemporary urbanization can be discussed in the light of acknowledged paradigmatic transitions.

As such, more than claiming closed conclusions, this research stands at mid-point, open to further questioning and cultural contamination. The following five questions are but a small sample of what this continuing research agenda may be looking for.

> to which extend can change be induced in a highly sophisticated and structured networked environment?

> what role can play *niche* innovations in reconfiguring the established apparatus?

> which forms of low tech, locally operated and conveniently distributed services can be further developed, taking into account these cities' spatial, cultural and societal characteristics?

> which unique characters of Asian cities' network configurations, with its diverse levels of technical sophistication and organizational formality, can be assessed as holding potential for innovation in other geographical contexts?

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