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Figure 3.1 Kinkaku-ji
Source: James Steele

Kyoto (Figure 3.1). He bought the property, originally called Kitayama-dai, from the Saionji family, in 1397, and transformed it into a particularly legible metaphor of the complex undercurrents rippling through Ashikaga society at the time by projecting each of his layered identities onto its three telescoping stories. Appropriate to his aristocratic status, the ground floor, of natural wood frame and sliding white panels, can be completely opened up to its peripheral balcony and the lake and garden beyond. The equally square second story, which was once covered in gold leaf but is now painted, is also paneled, but less open, as befitting his military stature as a Shogun, superior to other nobility. Both lower stories are then capped with a Chinese-style roof, as if drawing a line above these contiguous responsibilities. The smaller third story has a roof of its own, conveying the image of a separate entity, yet it is also carefully detailed to be part of the ensemble. In spite of being incongruously covered in gold, however, its modest scale and arched windows send the unmistakable message that this is the retreat of a ruler in Insei, as a Zen monk.[2]

Gold was discovered at Toi, in the Tagata District, Shizuoka Prefecture, Japan on the west coast of Izu Peninsula facing Suruga Bay in 1370 during the Ashikaga period, followed by other mines at Yugashima and Nawaji. It started to play an important part in architecture, arts and crafts from then on. The Silver Pavilion, or Ginkaku-ji built by the 8th Ashikaga Shogun Yoshimasa, is often thought of as the companion piece to Kinkaku-ji, but was actually built 83 years later, in 1483 (Figure 3.2). Yoshimasa died before it was completed, so it never received its silver coating, but its rustic natural wood sheathing makes it seem much more approachable than its golden relative, and reminds us that Yoshimasa was an aesthetic iconoclast, who rejected formality and artificiality. He dedicated one quadrant of the interior to social events, planned by his tea master Shuko, which were the highlight of his Higashiyama set.

Figure 3.2 Ginkaku-ji
Source: James Steele

The Azuchi-Momoyama period and the three unifiers: 1573–1600

Ginkaku-ji was the Ashikaga swan song, however, because a succession dispute after Yoshimasa died led to the disastrous Onin War, and this, along with the assassination of Ashikaga Yoshiteru in 1565, encouraged Oda Nobunaga, who was the son of Oda Nobuhide, a Daimyo in Owari province, to seize power. He initially put Ashikaga Yoshiteru's brother Yoshiaki forward as a surrogate but then followed a previous pattern of taking over himself. This marks the beginning of the 35-year-long saga of the fatefully intertwined lives of Oda Nobunaga, Hideyoshi Toyotomi and Tokugawa Ieyasu, which eventually led to an end to constant warfare and the final unification of Japan.

Nobunaga is famous for being a brilliant strategist who not only stabilized the government after years of upheaval, but also brought nearly half of the country under his control by neutralizing the power of the Daimyo. He probably would have succeeded in unifying all of it if Akechi Mitsuhide, who was one of his retainers, had not betrayed him. He was caught by surprise with only a small group of defenders at Honno-ji in Kyoto in 1582, and committed suicide to avoid capture.

He also built a castle in Azuchi, near lake Biwa, which, along with another in the Momoyami district of Kyoto housing his successor Hideyoshi Toyotomi, gave this period its name (Figure 3.3). Unlike Nobunaga, Hideyoshi was not of aristocratic birth, first serving as a servant at the Imagawa castle before switching sides and joining the Oda clan in 1557, as Nobunaga's sandal bearer. He was present at the battle of Okehazama when Oda defeated Imagawa Yoshimoto in 1560, and slowly worked his way up through the ranks, impressing Nobunaga with his tireless resourcefulness and ability to convince opposition forces to surrender and join the Oda cause.

Figure 15.3 Chokkura Plaza
Source: Kengo Kuma

His Stone Museum in Nasu, built in 1998, was much more challenging in terms of erasure, given the inherent heaviness of the material, but he made it seem lighter by using long, thin slabs and leaving gaps between the horizontal layers, to allow light into the interior. He was also prompted to use stone at Chokkura Plaza in 2006, because of three pre-existing masonry storage barns on the site, and integrated his building with these old Oya stone warehouses, once used to store rice. This stone, which Frank Lloyd Wright also used for his Imperial Hotel in Tokyo, is soft and easy to carve when first excavated, and hardens after exposure to air. Kuma used a diagonal metal frame to support it.

His attempt to break down building mass continued in 2012 with his design the Asakusa Culture Tourist Information Center, located on a 326-square-meter corner site directly across from the outer Kaminari-mon Gate of the Sensō-ji Temple.

It is primarily a tourist information center, to promote interesting sites in Tokyo and throughout Japan but also has an exhibition space, offices, a conference room and auditorium. In this instance his anti-materialistic strategy includes a series of roofs that visually slice the tower into eight horizontal sections according to function, as well as first attempt at using vertical louvers to fragment the surface into strips.

As recognition increased, Kuma had to push back against the growing international tendency toward singular computer generated and constructed objects, with no apparent ties to their site, climate or cultural context. His counterinsurgency against objectification and its economic association with commodification, which he believes to be a central characteristic of Western architecture, has revolved around "recovering place" and its temporal and natural relationships, as well as a Japanese sense of lightness and transparency.[2]

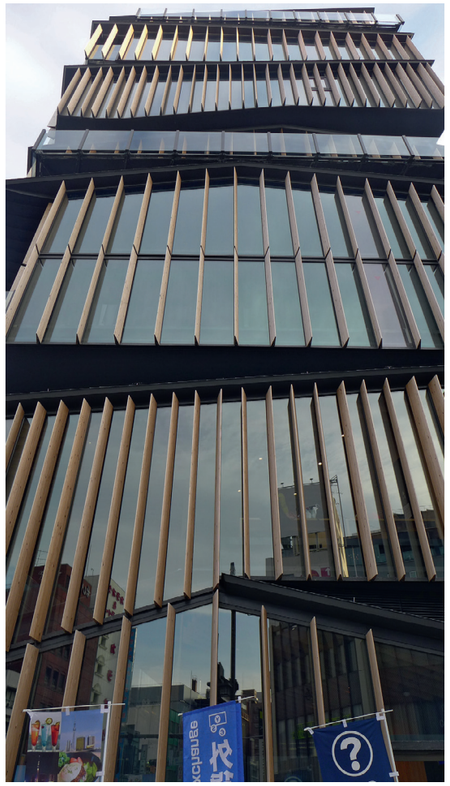


Figure 15.4 Asakusa Tourist Center
Source: James Steele

The feminine factor

Kazuo Sejima, who is the first major female architect since Itsuko Hasegawa to achieve superstar status in Japan, was born in 1956, two years after Kengo Kuma. Unlike Hasagawa she has spoken more openly about the challenges of making her way in a male-dominated profession and her selection of Japan Women's University, rather than another more mainstream provider of professional training hints at her early awareness of emphasizing gender identity. It is a private institution founded in 1901 as *Niħon Joshi Dai-Gakko* by Jinzo Naruse, who studied at Andover Theological Seminary and Clark University in the United States and was dedicated to promoting higher education for women.

After receiving her master's degree in 1981, Sejima joined Toyo Ito and Associates and remained with him until establishing Kazuyo Sejima & Associates, in 1987. She later formed SANAA with former employee Ryue Nishizawa in 1995. The trail that both Hasagawa and Sejima blazed in Japan has subsequently widened considerably, consistent with a general trend of more women entering architectural schools and the profession in both Japan and throughout the developed world. In addition to Sejima, Ito also has named former employee Maki Ohnishi, as part of the younger generation in his "constellation" of influence. Her firm Onishimaki and Hyakudayuki architects, which she founded with Yuki Hyakuda in 2008, will be seen here to be a new normal in Japan today. She joins other female members of the latest generation in partnerships featured later here, such as Yui Tezuka of Takaharu and Yuki Tezuka Architects, Chie Nabeshima with Makoto Takei of TNA Architects, and Momoyo Kaijima, who established Atelier Bow Wow with Yoshiharu Tsukamoto, in addition to sole practitioners Kumiko Inui and Hiroshi Nakamura, among many others.[3]

Along with Ito, and by extension the Shinohara circle that their ethereal architectural lexicon recalls, Sejima also somewhat surprisingly cites Modernists from the heroic phase of the movement, such as Mies van der Rohe and Le Corbusier as inspirations. Once revealed, however, that seemingly contradictory nexus helps us to make sense of her distinctively different, prescriptive approach to programming, as a mild form of social engineering, rather than the descriptive method favored by Modernist functionalism.[4]

The 1991 Saishunkan Seiyaku Women's Dormitory in Kumamoto, which is her first major design, begins to explain the difference. It houses 80 new employees of a pharmaceutical conglomerate in two parallel two story 4.5{—}meter-wide by 45-meter-long apartment blocks flanking a 9-meter-wide atrium that is as high as the apartment blocks on either side of it. Residents are housed four to a room and must collectively use bathroom facilities on the second floor as well as the central social space, in an attempt to nurture camaraderie and build team spirit during their first year with the company. The bathroom block levitates within an

GENZYME CENTER, Cambridge, Massachusetts

The Genzyme Center is a twelve-story, 350,000-sq-ft (32,500-sq-m) office building in Cambridge, Massachusetts. The project was awarded a LEED Platinum certification in 2004. Naturally, it contains plenty of green features, but extensive daylighting is the most remarkable feature immediately noticed by both visitors and occupants. (The interview in Chapter 5 with architect Stefan Behnisch explains how the daylighting design evolved.)

Genzyme Corporation is an international biotechnology company dedicated to making a major positive impact on the lives of people with serious diseases. The company's products and services are related to rare genetic diseases, multiple sclerosis, cardiovascular disease, and endocrinology.

In 2000, as the company approached its twentieth anniversary, Genzyme decided that the time was right for a new headquarters office, and it wanted a signature building that would be a reflection of its core values. Completed in November 2003, the building provides office space for more than 900 employees.[88]

"Creating a green building—one that sets new standards—is consistent with what we do every day as a corporation," said Henri A. Termeer, Genzyme's former Chairman and Chief Executive Officer, at the grand opening of the building. "Genzyme Center is consistent with our purpose, which is to innovate to create new standards of care for patients with untreatable diseases."[89]

Designed by Behnisch Architects, Genzyme Center uses natural daylighting and transparency to create an optimum working environment for the occupants. Behnisch proposed that the building be designed from the inside out, and the design team carefully studied how Genzyme employees work and interact. The team designed the building around an indoor environment that emphasized natural night, views of the outdoors, and an open communicative environment. Three key concepts reflect the company's values and are the themes for the design: innovation, collaboration, and transparency.[90]

The design team, including the architects, engineers, owner's project manager, and Genzyme employees, followed an IDP, where the entire project team worked together to optimize the building from a holistic perspective. For the Genzyme Center, the design process was dynamic and continually evolved as the team's knowledge of green building practices grew. Because a Platinum rating was the goal, the LEED checklist was used as a guide for making sustainable choices and to maximize the number of points earned by the project.[91]

According to Behnisch Architects, the Genzyme Center is "organized as 'a vertical city' with individual 'dwellings,' public areas and gardens which extend up to the full height of the central atrium. The open staircase forms part of a 'vertical boulevard,' starting at the ground-floor lobby before proceeding upwards through various neighborhoods with open workstations and separate offices."[92] An abundance of open space allows for air circulation and sunlight diffusion and facilitates creativity, interaction, and collaboration among the employees.

"There are all these views. It is communicative," said Christof Jantzen, Partner at Behnisch Architects. "You can wave to your colleague two floors down and across the central space. It is not so much about the details . . . it is a combination of how the elements come together as a whole."[93]

Informed by the interior environment, the building exterior is sheathed entirely in glass, connecting the outside and inside environments and aligning with the company's transparency ethos. Several key employee-friendly features also enhance the connection with the external environment: operable windows, indoor gardens, natural light enhancement systems, and a cafeteria with views of the Charles River and the Boston skyline.[94]

Located in a neighborhood adjacent to the Massachusetts Institute of Technology, the building and site are part of a major urban infill redevelopment project, which is intended to create a mixed community in an area of formerly polluted sites.[95]

One of the building's innovations, which earned it recognition as a top green project from the American Institute of Architects, is the filigreed wide-slab construction system. This technique uses two-inch-thick slabs of pre-stressed, precast concrete which are laid on pillars. Then a concrete reinforcing bar is added, and polystyrene foam is used to fill voids.[96]

This method reduces the amount of concrete used in construction and lessens the weight of the structure. For Genzyme Center, it eliminated 2,552 cu yd (1,951 cu m) of concrete, 386 tons (350 metric tons) of reinforcing steel, and 250,000 sq ft (23,234 sq m) of plywood. Overall, use of the filigreed wide-slab lowered the weight of the building by 25 percent. With less weight, fewer concrete piles were needed, and the number of foundation elements was reduced.

7.19 Completed in 2003, the Genzyme Center in Cambridge, Massachusetts, was one of the first buildings awarded a LEED Platinum certification. Photo: Anton Grassl. Courtesy of Behnisch Architekten.

Concrete remains exposed throughout the building to take advantage of its thermal mass, helping to maintain a comfortable ambient temperature while reducing the mechanical heating and cooling requirements. Filigree concrete-slab construction also contributes to the building's extensive daylighting. It helped create a structure with cantilevered floors situated around a central atrium, allowing for an extensive glass exterior.[97]

The building envelope is a high-performance curtain-wall glazing system with operable windows on all twelve stories. The operable windows are linked to the BMS, which opens on cool summer nights for night-flush cooling. More than 30 percent of the exterior envelope is a ventilated double façade with a four-foot buffer space. In the summer it blocks solar gains and ventilates the heat away before it enters the space, and in the winter it captures solar gains, reducing the heat loss from the façade.[98]

In addition to supplying natural light, the atrium acts as a huge return air duct. Fresh air is introduced to the occupied space by ceiling vents throughout the floor plates or through the operable windows.

10

Sustainable Cities

(How) Can Sustainable Urban Development Be Quantified?

Beyond getting individual buildings to work well, there is a larger issue of placing them in sustainable cities. In this section, Ulf Meyer relates his experience teaching sustainable urban design and challenging students to come up with metrics for sustainable cities.

Nowadays, everything and everyone wants to be sustainable. Just like the inflation of labels such as "organic" or "eco" a few years ago, which soon adorned conventional products and processes, the same is now happening to the "sustainable" label. It threatens to become a victim of its own success. The label has become so popular that it will soon cease to mean much. Because there are no strict, clear, and universal rules for sustainability for building and construction (or any other service or product), rating systems for sustainable construction must therefore take the bull by its horns and consider ever-larger contexts and processes.

For the world of architecture and building this is a welcome development: The "right" building in the "wrong" urban context does not help the world. If, for example, an "ecological" office building, equipped with all the tricks and treats of environmentally friendly design is built on the extreme outskirts of the city and hundreds of its users have to go there by car every day, the site of the building forces a larger energy consumption than the building itself could ever save. The analysis and rating of a larger context is therefore quite useful for buildings. In the past fifty years alone the urban population has increased by 50 percent worldwide. However, people's use of resources increased during the same time by about 1,000 percent.[1] The resulting danger is imminent, making urban development the new arena for sustainable construction.

The global rating systems for sustainable construction have names such as "LEED," "BREEAM," or "CASBEE." The largest system of its kind, the American LEED rating, has already detected the trend to look at greater contexts and relationships. After LEED for new buildings of all types, LEED for renovations and existing buildings followed, and, since 2009, there also is a LEED for Neighborhoods program. This does not consider the performance of individual buildings, but considers them as one part of a whole town. The next logical step will be the consideration and comparison of entire cities (Figure 10.1).

Indeed, headlines like "Portland Beats Seattle as the 'Greenest' City in the US" and "Energy Consumption Per Capita Decreased by 14 Percent" could be quite conceivable in just a few years. Which mayors would not like to adorn themselves with the fact that their city is among the "Top 10 Greenest Cities in the Country"? So how do you measure the environmental performance of whole cities? What criteria should be used for evaluation?

I gave this task to my students in a seminar at Kansas State University in 2009 and received amazing and thought-provoking answers. It was a special and great enrichment of the seminar to have students from different parts of the world present—even in remote and rural Kansas. I asked my students to start thinking about some basic parameters of sustainable urban design such as "high density and urban mix/little sprawl" or "well-developed and affordable public transport network" and to propose what else could be measured as part of a possible LEED for Cities system?

10.1 Australia's largest city, Sydney, is dense but very livable. Photo: H. G. Esch, Hennef. Courtesy of ingenhoven architects + architectus.

For example, could simple units be used such as number of inhabitants per square mile of urban area or number of subway kilometers per 100,000 population? The students were each asked to develop a point system and to rate their hometown with the system to evaluate whether the result represents an accurate assessment of the city or if it was too strict or too generous.

First, the seminar looked at the Ecological Footprint analysis by Bill Rees, which expresses the consumption of fossil fuels (and their residues) as a surface that is needed to ensure that the city functions.[2] While this metaphor nicely shows that the environmental effects of cities go far beyond their borders, it is not good for the comparison of different cities.

In his book *Taking Sustainable Cities Seriously*, Kent Portney examined twenty-four American cities on the basis of thirty-four criteria and expressed the result of his findings in a single figure with a hit list of the most sustainable cities (as is always popular in America).[3] The system mainly looked at "smart growth," public transport, the prevention and reduction of pollution, and direct energy-saving measures.

Mr. Al-Tashkandi, a graduate student from Riyadh, Saudi Arabia, took Herbert Girardet's principles for sustainable urban development as the basis for his proposal, as defined by Girardet in *Creating Sustainable Cities*. For Girardet, a sustainable city is "organized in such a way that all its citizens can satisfy their needs and welfare and enjoy

2 Urban Design Product Types

Design professionals usually think of urban design in terms of product types and much of the literature defining the field focuses on them. Projects have been categorized in many ways. It seems impossible to devise a fine-toothed categorization system that is exhaustive. The categorization used here is simple. Urban design product types can be: (1) new towns, (2) urban precincts of which there are many types, and (3) elements of infrastructure, and, possibly (4) individual items within the city that add luster to it: clock towers, monuments, works of art, and curiosity objects. The focus of attention in this book is on the first three types.

New Towns

A "new town" is a settlement that is self-consciously built from scratch to provide all the amenities of life, including employment opportunities. Many so-called new towns only partially fulfill this definition. There is no census of new towns built since the Second World War but the number is substantial. They range in size and importance from small company towns to the capitals of countries.

A number of countries in Europe and Asia have had the creation of new towns as part of their political agendas. Between 1950 and 1990, the Soviet Union employed new settlements to extend central control over its constituent republics. The reasons elsewhere

FIGURE 2.1
New town design: a proposal for the new capital of Egypt, 2014.
Source: © Skidmore Owings and Merrill LLP

have been economic or social. During the latter half of the twentieth century, over twenty new towns were built in the United Kingdom in order to keep London's population down to a manageable size and to encourage industry to locate outside the southeast corner of the country. They continue to be built.

In North America private companies have built the genuine new towns and large suburbs. Columbia in Maryland (see Chapter 6) and Reston, Virginia are probably the best-known examples. There are few such new towns in the United States because the land acquisition and infrastructure costs are high and the developing consortium must be capable of considerable investment prior to any return on capital being received. New towns do, however, continue to be built in the country. Celebration in Florida, which was begun in the 1990s, is an example (see Chapter 10).

New towns are being built around the world. Many more are proposed. A number of countries seek new capitals. Egypt is an example. Many new towns result from decentralization policies in the face of a country's increase in population. Modi'in is one now under construction in Israel (see Chapter 10). Many new towns are being built in Asia, particularly in China. Songshan Lake in southern China is an unusual example for that country (Figure 3.1b). It has antecedents in the Garden City idea.

Company towns generally have a mining or other resource base, but a number have been manufacturing or military settlements. Some of the non-military examples are the products of government policy, particularly in socialist countries, but others have been built by private industrial organizations to suit their own purposes. The towns vary considerably in size and longevity. They have been as small as five hundred people while others have over a hundred thousand inhabitants. The GSFC Township in India is an example of a small, industry-based new town (see Chapter 9). It is, perhaps, really a suburb of Vadodara.

Precincts

Most urban design deals not with new towns but with precincts of cities and new, predominantly residential, suburbs. They may be designed on green-field sites or be the subject of urban renewal. A number of new precincts of cities have been called new towns. The use of this term can be a little misleading. The new towns of the city-state of Singapore, although they contain many of the amenities of a city and are also employment centers, have little industry and are really new mixed-use precincts of the city-state.

During the 1970s the term "new-town-in-town" was used to describe large mixed-use urban design projects on cleared brown-field sites. In New York City, for instance, Roosevelt Island (see Figure 2.2a) and Battery Park City (see Chapter 9) were referred to as such. Roosevelt Island, formerly Welfare Island, the home to a number of aging hospitals and other obsolete institutions, has been transformed into a residential precinct and, increasingly, one containing institutional buildings. Surrounded by water, it is a clearly defined new district. So is Battery Park City with the Hudson on the west and the West Side Highway on the east.

Much urban design in cities consists of relatively small enclaves of like-use buildings. The CBD for Beijing is a commercial precinct (see Figure 2.2b). Lincoln Center in New York is an example of a cultural complex. Whether such facilities should indeed be agglomerated into a single precinct or distributed throughout the city is much debated. This question was also raised about the decision to assemble so many of the facilities that were required for the highly successful 2000 Olympic Games in Sydney into a single area. Much of the open space necessary to accommodate the crowds attending the games is now being filled in with housing and commercial developments that will transform

Blocks and Parcels in the South Harbour—Sluseholmen and Surroundings

Copenhagen's best-known new tenement development was erected on Sydhavn (South Harbour), the southern portion of the Harbour approximately three kilometres southwest of the Inner City. Previously it had been a decaying industrial district dominated by the H. C. Ørsted Power Plant and surrounded by few residential buildings. Since the 1970s the wider area also featured self-built houses similar to those in the "Freetown Christiania," which were inhabited by hippies and other non-conformists prominently portrayed in Erik Ballen's 1984 film *Midt om natten* (In the Middle of the Night).

In the early 2000s the South Harbour became subject of ambitious urbanisation plans. The first completed and to date most famous project was **Sluseholmen** (2000–9, master plan by Soeters Van Eldonk, various architects coordinated by the firm Arkitema) (Figure 9.42). Sluseholmen offers approximately 1,300 flats for approximately 2,700 residents. It was the first development of Soeters's already mentioned master plan that covered the entire South Harbour between Sluseholmen in the south and the Fisketorvet Shopping Centre in the north (opened in 2000).[35] This area was designed to become home to 18,000 residents and provide offices for 7,000 workers.[36] Between 2000 and 2009 eight blocks in the southern portion were realised according to Soeters's plan (Figure 9.43).

Sluseholmen stands out against other large new tenement schemes in Copenhagen and elsewhere for its great formal consistency. The development divided what had previously been a large monolithic factory area into small blocks surrounded by newly built canals. The buildings are erected on the block perimeter with similar height around a publicly accessible courtyard. They plan pays homage to the picturesque tradition. Canals are slightly bent to give a vanishing vista. The buildings faced the canal either directly, as in Venice, or with a small street between building and canal, as in Amsterdam (Figure 9.44). There is no on-street parking, only underground car parks as well as bike sheds in the courtyards (Figure 9.45). There are also parks, a rowing club, a nautical museum, restaurants, and slips for houseboats. The density, the legible plan, pedestrian orientation, and aesthetic harmony led to widespread praise for the project and continuous popularity among both architects and the general public. The plan was rewarded with the 2009 Danish City Planning Award "for proportions and solutions that have been tried out for centuries"[37] (Figure 9.46).

How was this unusual formal harmony achieved? The main factor was an assertive municipality. Like all large developments in Copenhagen, the project was led and overseen by the local authority and not at some point handed over to a private developer. It would be exaggerated to claim that a Haussmann-style plan also required a Haussmann-style level of autocracy, but an important aspect that facilitated the realisation of Soeters's uncompromising plan was strong municipal guidance. The City of Copenhagen opted for a direct commission rather than a lengthy competition process. It also supported strong regulations based on Soeters's conviction that for a satisfactory urban neighbourhood the careful design of streets and alleys was more important than that of individual buildings. The second aspect was a highly regulated environment in which more than half of the inhabitants are renters and, in contrast for example to Glasgow, architects and planners do not have to cater to expectations of quick value increase. The third point was a cultural environment in which the post-functionalist design principles of density, mixed use, and restricted car use were mainstream.

35. Soeters van Eldonk, Plan for the Sydhavnen area, published in Kim Dirckinck-Holmfeldt, "København i vandet" *Arkitekten* 102 n. 18 (August 2000), 7.
36. Københavns Kommune, Center for Bydesign and Gehl Architects, *Bydesign i København—Erfaringer fra Sluseholmen* (Copenhagen: Københavns Kommune, 2013), 23.
37. Press release on the Dansk Byplanlaboratorium website, dated 1 October 2009, online at www.byplanlab.dk/byplanprisen/2009 (accessed July 2015).

FIGURE 9.42 Sluseholmen, South Harbour, Copenhagen—master plan by Soeters/van Eldonk, final version of 2008. The first version was worked out in 2000. Only the southernmost set of eight blocks was realised according to the plan (courtesy Soeters/van Eldonk)

Re-zoning occurs when a development proposal does not conform to the site, significantly alters its land use, or increases its building height and density. The City reviews applications for development proposals that wish to change the zoning by-law and will grant, revise, or reject a proposal.

Section 37 is a clause in the provincial Planning Act. It is an arrangement through re-zoning where a developer can increase the height or density of their development, in exchange for which they provide funding for a community project in the neighbourhood. Each development is reviewed on a case-by-case basis and there is neither precision in the way height or density is appraised, nor clear definitions as to what constitute community benefits. Critics have argued for more rigorous and transparent planning practices where there would not be a need to individually assess bonus settlements. Many councillors have boasted Section 37 funds as leverage to demonstrate how they helped their community, and the achievement can be useful for the purposes of re-election.

The OMB is an independent, apolitical adjudicative body that often assesses appeals on planning processes and disputes in the province of Ontario. The OMB acts in accordance with the city's official plan, and the decision and ruling of the Board is final. The Board has routinely overruled decisions made by the City, been accused of favouritism towards developers, and appeals on their rulings have rarely been reversed. In May 2017, the provincial government gave in to public pressure and announced it will replace the appeal process of the OMB with a committee made up of local planners, the Local Planning Appeal Tribunal.

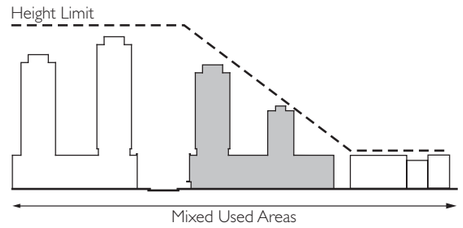
Tower Floor Plates and Elevator Core

From the Tall Building Design Guidelines, the size of a tower plate area should be 750 square metres (8,072 square feet) or less; this limit, together with exit stairs and elevator cores, are important factors in determining whether the tower plate is economically feasible to develop. The typical elevator core in a tower consists of two, three, or four elevators, the number required in a tower is dependent on the number of storeys and residential units to meet building code requirements and also to achieve an acceptable expected elevator waiting time of approximately forty-five seconds. In order for a tower plate to be economically attractive for development, the ratio of saleable area (area of the units) to gross floor area (area of the tower floor plate) should be around 85 percent.

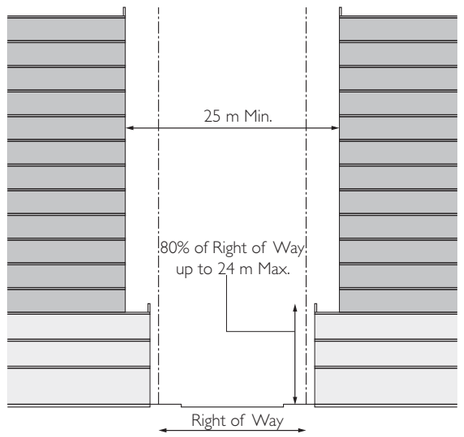
Building Components and Organisation

Top

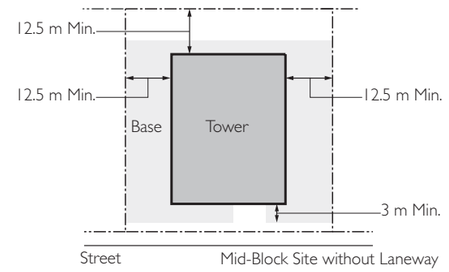
The upper floors, including the rooftop, are known as tops in a condo tower. The tops of condo towers house the penthouse units and mechanical units. Some buildings locate an amenity programme at the roof level and then the design for the top of the condo tower has integrated lighting, a cantilever roof to act as shading device, or other design articulation to denote that the top is occupiable.

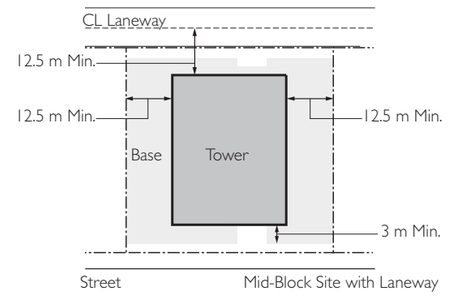


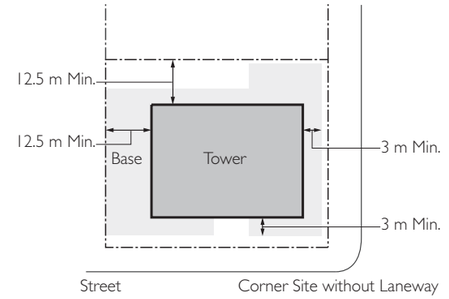
Fit and Transition in Scale

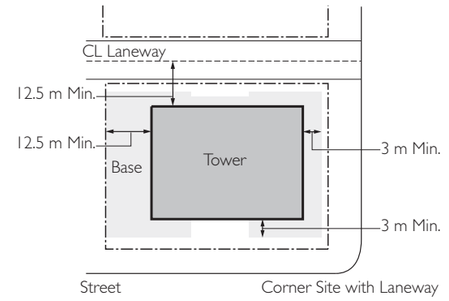


Separation Distances and Base Building Scale and Height









Separation Distances Small Sites

Tall Building Design Guidelines

3.3.1 Windy View from an Oregon hill top. BILYEU HOMES INC.

3.3.2 Sheathed and sealed floor framing. BILYEU HOMES INC.

WINDY VIEW PASSIVE HOUSE

This residence in Philomath, Oregon, commands majestic views of the coastal range and Mary's Peak and combines modern aesthetics with a high-performance building envelope. The house features thickly insulated assemblies, heat recovery ventilation, and an airtight exterior shell that achieved 0.31 ACH50 during the blower door test. A unique and steeply sloping lot proved challenging for several reasons. The customer's need for ADA accessibility at the front door, as well as preserving space for a required emergency vehicle easement, necessitated positioning the house very near the steep slope. Geotechnical engineering requirements made an insulated slab very difficult, if not impossible, and, as a result, a modified crawl space was employed. Northwest Oregon's unique climate zone is one of a few areas in the US where a passively ventilated crawl space performs very well,

PROJECT INFORMATION

Project title: Windy View Passive House

Location: Philomath, Oregon

Size: 1,660 ft.^{2} (154 m^2)

Completion: 2015

Recognition: Pre-certified (PHIUS), Net Zero Ready

Type: Single-family home

Architect: Concept by Nathan Good Architects; plans by Bilyeu Homes, Inc.

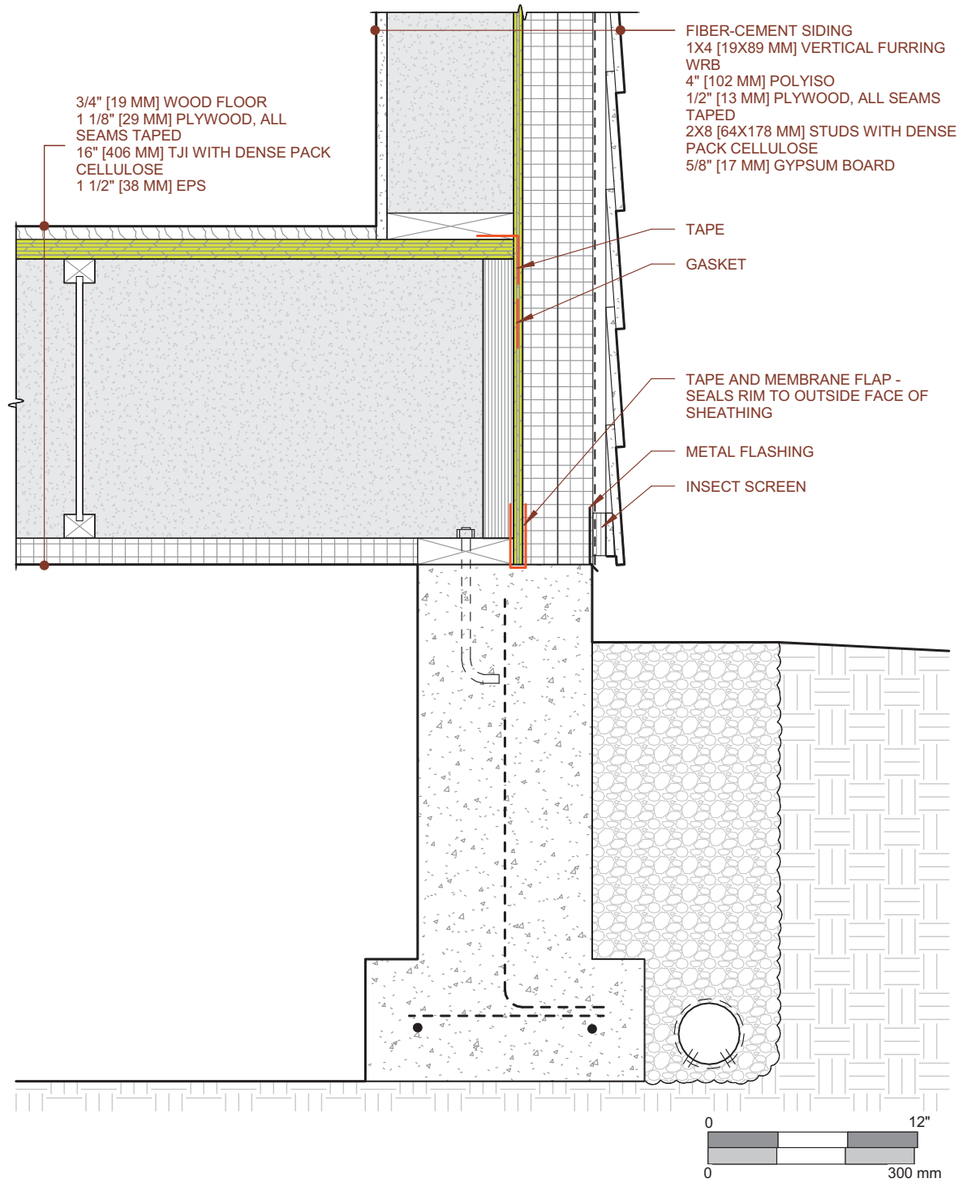
Builder: Bilyeu Homes, Inc.

CPHC: Blake Bilyeu

HDD: 4,204 base 65°F (2,336 base 18.3°C)

CDD: 412 base 65°F (229 base 18.3°C)

Annual precipitation: 67 in. (1,702 mm)



3.3.3 Deep insulated floor assembly spans over an unconditioned crawl space.

FIGURE 8.04
The so-called Vesta Temple (left) was restored by G. Valadier in the early nineteenth century, and the so-called Temple of Fortune by A. Muñoz *c.*1932. Both temples are in the area of Via del Mare in the centre of Rome.
Photo: JJ (2016)

Apart from working on planning issues, Giovannoni was a member of the *Consiglio superiore delle Belle Arti*, and of various commissions, for over 25 years. He collaborated with state authorities and municipalities in the restoration of historic buildings. Giovannoni distinguished himself from the previous Italian theorists in his approach to restoration as a cultural problem of evaluation, and the rehabilitation of historic buildings with respect to all significant periods – instead of reconstructing them to their ideal form. He considered Viollet-le-Duc's theory 'anti-scientific', causing falsifications and arbitrary interventions, presuming the building to be created by a single architect in one period, and presupposing in the architect-restorer and the builders the capacity to understand the monument in its vicissitudes and in its style, which they do not feel any more (Giovannoni, 1945: 28).

Considering the use of modern architectural forms in historic buildings, as had been customary until neoclassicism, he believed that this had not been successful in modern times due to the lack of a proper modern style, and the lack of sensitivity in using this. His concepts matured along the lines of Boito, finding a full expression in *Questioni di Architettura nella storia e nella vita* (1929). He placed emphasis on maintenance, repair and consolidation, and in the last case, if necessary, could also accept the use of modern technology. The aim was essentially to preserve the authenticity of the structure, and respect the whole 'artistic life' of the monument, not only the first phase. Any modern additions should be dated and considered rather an integration of the mass than an ornament, as well as being based on absolutely sure data. He presented these principles at the International Congress in Athens, in 1931, contributing to the formulation of the Conclusions of the Congress, the so-called 'Athens Charter'. Returning to Rome, he prepared an Italian charter, *Norme per il restauro dei monumenti*, which was approved by the Direction of Antiquities and Fine Arts in December of the same year, and published officially in January 1932. Comparing the spirit of the principles with those of Boito, where the monument was conceived primarily as a historic document, he presented a much

FIGURE 8.05
The Basilica of San Lorenzo outside the Walls (San Lorenzo fuori le mura), in Rome, was rebuilt after the Second World War destruction. The portico was reassembled using the original fragments. The upper part of the elevation was rebuilt in brick without attempting a replica of the wall painting that had been destroyed.
Photo: JJ (2016)

broader approach, including architectural aspects, the historical context, the environment, and the use of the building. Later, looking back at the Charter, he thought it comparable with a treatise of medicine and surgery facing clinical cases.

Giovannoni identified four types of restoration (E.I., xxix: 127):

1 restoration by consolidation;
2 restoration by recomposition (anastylosis);
3 restoration by liberation; and
4 restoration by completion or renovation.

FIGURE 8.06
Detail of the reconstructed portico of S. Lorenzo, originally a mediaeval construction using ancient spoils. New elements were kept plain to differentiate from the originals.
Photo: JJ (1995)

He agreed with Boito that it would be best if restorations were not visible, and that this could be achieved with modern methods and technology, grouting with cement, or using metal or invisible reinforced concrete structures as a safeguard against earthquakes. He insisted, however, that modernity should not be so excessive as to make the building suffer, as in the case of Pavia Cathedral. While not approving stylistic restoration, he could accept the removal of the bell towers from the Pantheon, the demolition of the later structures from the Parthenon, the restoration of the Maison Carrée of Nîmes, and the restoration of the Curia in the Roman Forum, as the significance of what was discovered was far greater than what was lost. While agreeing with the 'Lamp of Life' of Ruskin, and the impossibility of reproduction of older architecture, he maintained (as did Boito) that modern buildings, since the sixteenth century, were built with such perfect technology that reproduction was easier. Although Giovannoni, at times, showed some ambiguity, he should be seen in the context of his time. Professor Carlo Ceschi, restoration architect and teacher after the Second World War, has insisted that history of modern restoration cannot ignore the presence of Gustavo Giovannoni (Ceschi, 1970: 114).

FIGURE 9.08
The fortress of Suomenlinna was built on a series of islands in front of Helsinki by the Swedish administration in the eighteenth century. The fortification was modified to meet new requirements in the nineteenth century during the Russian period, and became an important national monument in the twentieth century. The present scope is to conserve and manage the fortified islands, respecting their historical stratigraphy.
Photo: JJ (2014)

(1870–1956), who emphasised the importance of historic stratification, **Bertel Jung** (1872–1946), who referred to the conservation policy of Heidenstam and Ruskin, and **Armas Lindgren** (1874–1929), who referred to the international meeting of architects in Brussels in 1897, where the problem of 'errors' in historic buildings had been discussed, but without a definite answer (Knapas, 1983). Protection of historic buildings received influence especially from German and Austrian conservation theories.

Eastern Europe

As a result of the division of Europe after the Second World War, the eastern part formed the so-called socialist bloc. Although the historic bases in relation to safeguarding cultural heritage were the same as in the rest of the continent, the new political situation imposed particular conditions on the countries of this region, impacting on their policies. Nevertheless, there remained differences among them, and the people's cultures continued to be felt, even through the new system. Immediately after the war, the general policy was certainly that of reconstruction and economic development, and this was based principally on industrial production. Traditional technology was a low priority, although tolerated to some degree, especially in rural areas and in the repair of historic monuments. Of the socialist countries, **Poland** took a particular pride in safeguarding its cultural heritage, finding expression in the immediate initiative to reconstruct and restore destroyed historic town centres (e.g. Warsaw, Gdansk and Torun). It is worth noting that this national effort was rightly acknowledged by including Warsaw on UNESCO's

FIGURE 9.09
(*above*) The historic centre of Krakow, the former capital of Poland, is one of the best-preserved historic urban areas in the country. It has been subject to the development of urban archaeology and preservation of its historic building stock for most of the twentieth century.
Photo: JJ (2006)

FIGURE 9.10
The Wawel Royal Castle in Krakow has been subject to restoration starting in 1905, when the Austrian army left it. After the Second World War, it had a major restoration conducted by Alfred Majewski and Jerzy Szablowski. The restoration works have also continued in the 1990s and 2000s.
Photo: JJ (2006)

Case Studies: The Blocks

Block 1: Wohnblock Köthener Strasse

Architect: Oswald Mathias Ungers

A perimeter block typology located at 35–37 Köthener Strasse, the concept of Wohnblock Köthener Strasse was to better assimilate the neighbourhood's existing commercial program with inner city living. The new urban construction brick building was five storeys in height with a flat roof and a partial basement for parking. The building opened on to the street on four sides and allowed light, air and sightlines to pass through the building. A grid of punched windows with soundproof glazing was present on all façades and dwelling units faced both the street and the large communal green space in their internal court. There was extensive landscaping and a green roof. The building housed close to 50 family-oriented dwelling units, the floor plans varied in size, and each unit had vertical access in each of its four corners.

Block 7: Condominium Mendelsohn-Bartholdy Park, Schöneberger Strasse

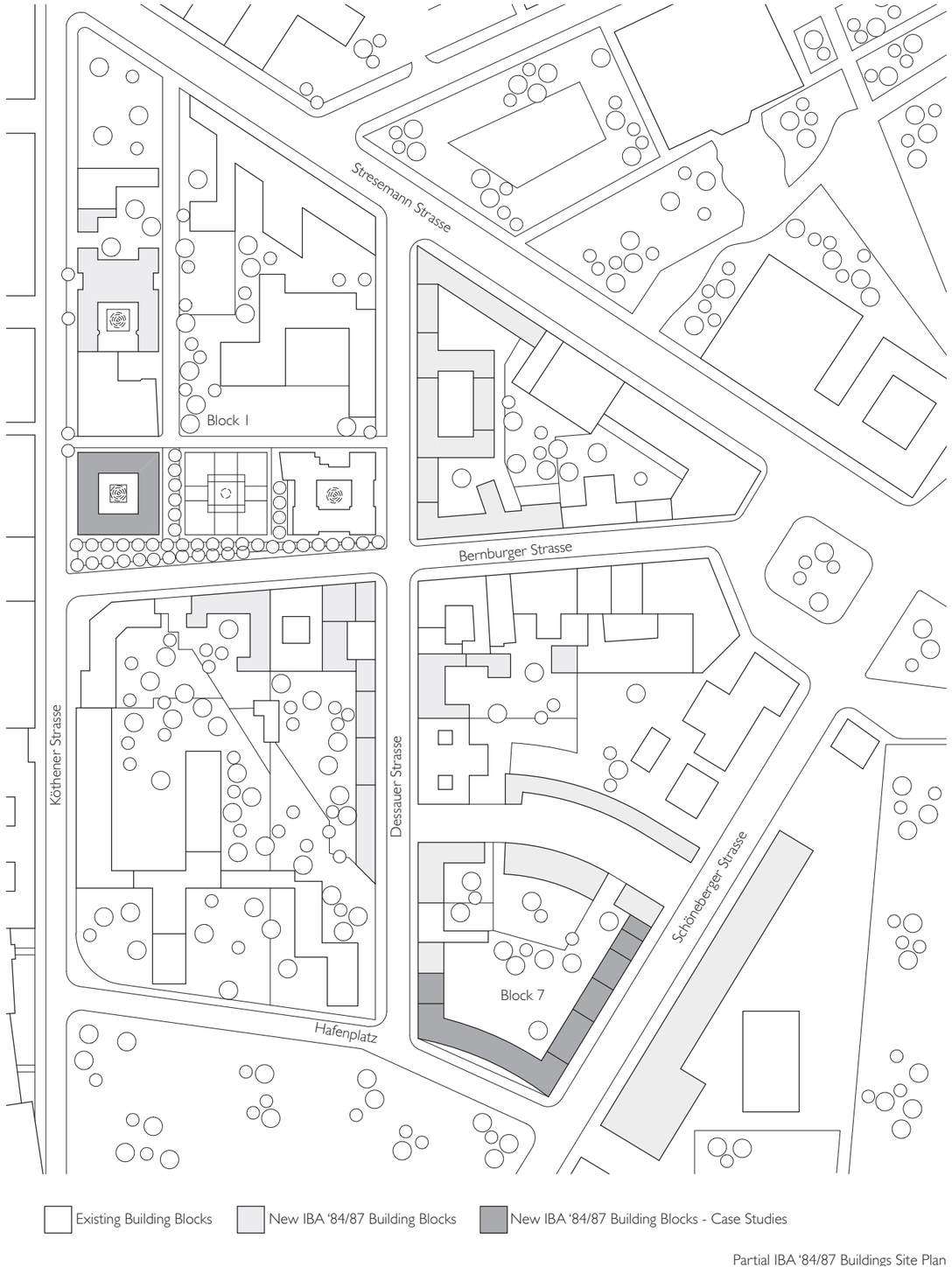
Architects: Haus-Rucker-Co., Günter Zamp Kelp, Laudris Ortner, and Manfred Ortner

A block-edge typology located at 9–12 Schöneberger Strasse, the project has a clean façade that aligns with the adjacent buildings. The building completes the existing neighbourhood street block and engages the historical architecture context. The concrete building is five storeys in height with a solar roof for passive energy conservation. The neighbourhood is family-oriented with a large park and child-care facilities. The street is a leafy tree-lined street and the building engages the vegetation with terrace gardens that face the streets, and an internal green space. In keeping with the commercial amenities in the neighbourhood, the building has ground floor shops and offices. The typical upper floors house residential units with a large percentage of two-bedroom dwelling units.

Block 7: Wohnungsbauten Hafenplatz, Schöneberger Strasse

Architects: Georg Kohlmaier and Barna von Sartory

A block-edge typology located at Schöneberger Strasse, the five-storey, brick building houses 43 units with private balconies and was designed to be energy-efficient. The use of brick was an acknowledgement to the office and factory buildings that formerly stood there, and the flat arch shape follows the edge of the historic block. The building has four vertical access points that service two to three units each. Most of the units are two-bedroom and some are two-storey units.



Partial IBA '84/87 Buildings Site Plan

Boulevard St. Germain c.1853–70

Boulevard du Palais, c.1853–70

partition walls in each individual dwelling unit. The heating permeated only the grand salons and dining rooms in the residential units. Sometimes only the *étage noble* was heated. The heating worked as hot air rose and moved through the pipes, and to help drive the air, outflow vents were installed near the ceiling to increase its flow. These vents are visible on the external façade in the form of a small ornamental cast-iron grate above windows, and made known visibly if the building had central heating.

The invention of the elevator, and its debut in residential buildings, changed the hierarchy of the apartment floors. During the Second French Empire, the hydraulic elevator slowly started to be incorporated into residential building design. The hydraulic elevator was powered by water pressure. Apartment buildings with an elevator connected into the city's infrastructure and used its non-potable water to operate the elevator. In the Haussmann apartments that had an elevator, the *étage noble* was no longer seen as the most desirable floor on which to live. As the elevator became more commonplace, the top floors became more popular for their views, sunlight and privacy.

Typical Unit Floor Plan Type

The typical Haussmann Apartment unit floor plan was separate rooms, all with clearly defined and formally arranged functions to separate private family areas and public guest areas within the home.

Access Type

The access for Haussmann Apartments was vertical. There was a common staircase or elevator in its core for circulation.

Construction Materials

The Haussmann Apartments were built of load-bearing stone. The tradition of wood and plaster architecture and construction ceased with the availability and ease of use of stone. The use of stone became widespread after the invention of hydraulic cement, which replaced lime for heavy construction during the Second French Empire. The combination of stone and cement created a much stronger and secure connection and buildings now became more structurally sound.

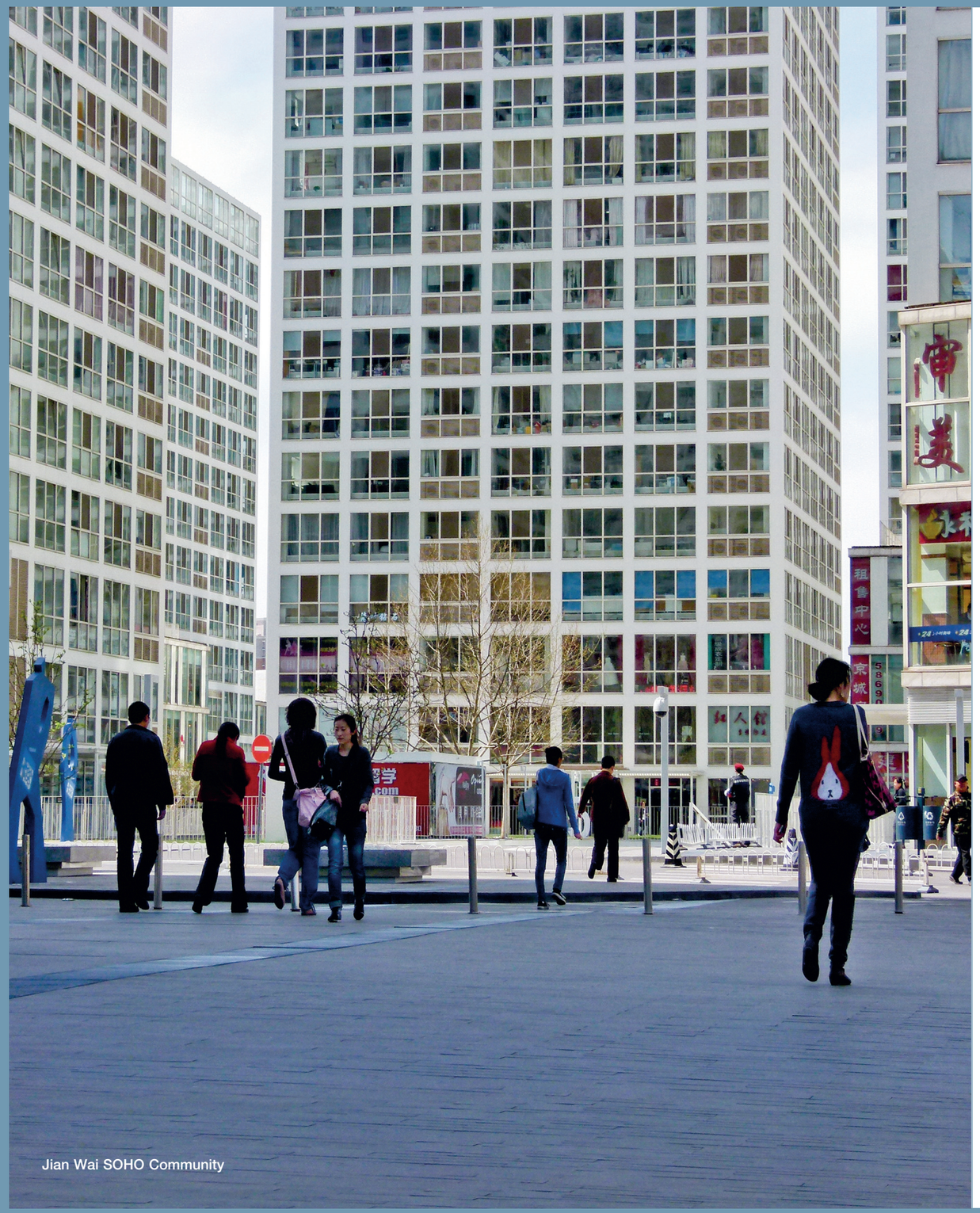
Mechanical stone cutting was a momentous benefit during the Second French Empire. With the aid of a mechanical tool, stone now could be cut to precise sizes and angles, and it became remarkably easier to dress a wall surely and quickly. As stone was becoming more efficient to work with, more decorative elements and stone patterning began to emerge in the architectural façade design as well.

The exteriors of the buildings were kept consistent with Lutetian limestone façades and mansard roofs. The use of the same materials meant that the buildings could be constructed more quickly and efficiently because labourers had a set repetitive routine that did not require much skill. The more detailed

Het Funen

Eastern Docklands – Oostelijke Handelskade

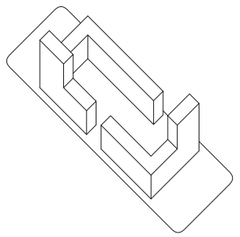
Eastern Docklands



Jian Wai SOHO Community

BEIJING

Circa 2000 to Present Day
Space-Enclosing Structure



Response to site

Adaptation of natural landscapes

Every site destined for an architectural or garden project is unique. Taking account of existing conditions is a given and will contribute toward its *genius loci*, its sense of place. As we can see from St Gall, enclosure can be a starting point for the organisation of spaces. Creating external rooms is a way of working with the landscape. If a building site appears to be an awkward shape, or has a variety of levels within it, a central open space can provide a datum around which the differences of level can be reconciled.

Landscape/architecture/garden

One of the most spectacular examples of working closely with the land is the Generalife Gardens to the east of the Alhambra complex in Granada, Spain. Landscape is integrated with gardens and architecture, nature and artifice working together to near perfection (Figure 1.41). The gardens were originated in the fourteenth century as pleasure gardens on an adjacent hillside to the already existing and well-established Nazrid Palaces, and have developed and spread back along the hillside ever since.

Figure 1.41
View of the Generalife from the Alhambra, looking across to the garden, terracing and pavilions.

The complex comprises three main components: the original pavilions with their patios, the formal 'New Gardens' and the Arena. The land has been manipulated through leveling and terracing using a pallet of architecture, walls, hedges, individual trees and planting. Gardens have been created where their layouts have been tailored to fit the natural curve and slope of the hillside, adding drama to the already spectacular promontory.[19] The design of the individual spaces is formal and orthogonal throughout, but the experience of it is of three-dimensionally weaving through them as you step around and along the hillside, with a new view at every twist and turn (Figure 1.42).

Figure 1.42
Bird's eye view of the Generalife indicating the detailed division of spaces and level changes.

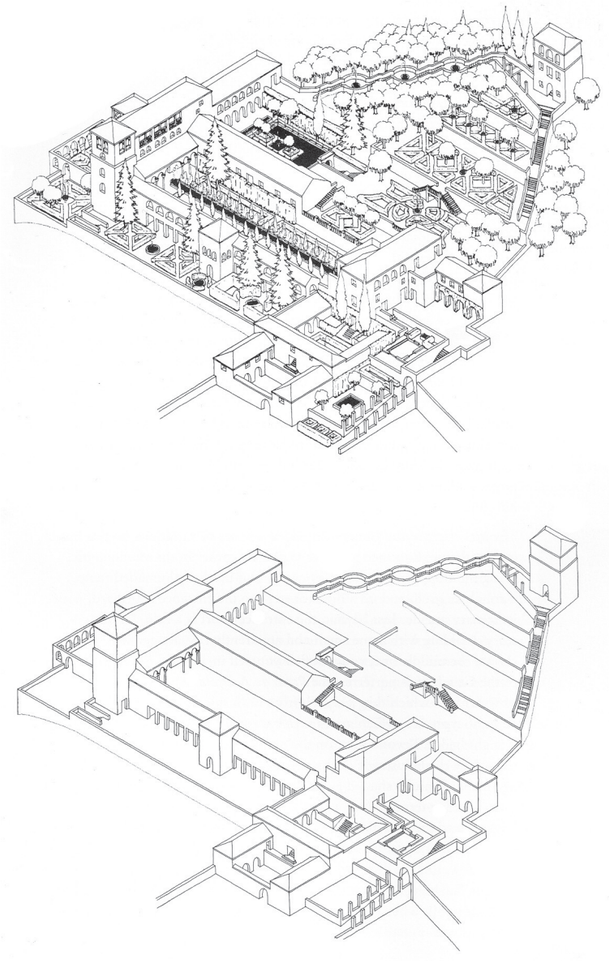


Figure 2.24
Approach to the Maggie's Centre, showing the enclosing wall and over sailing roof.

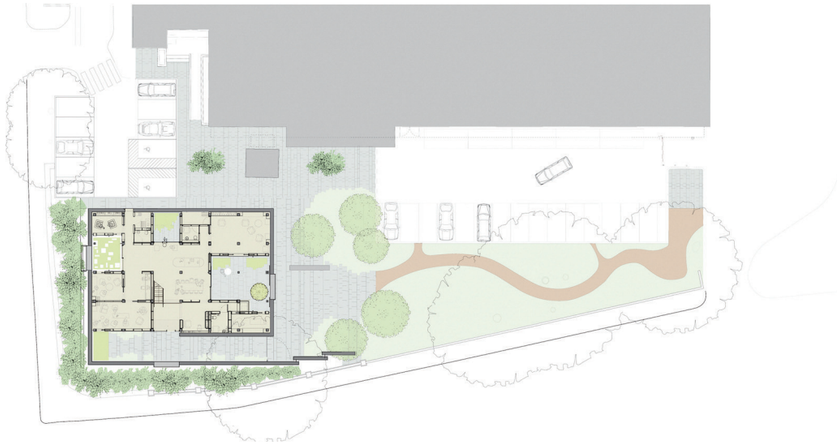


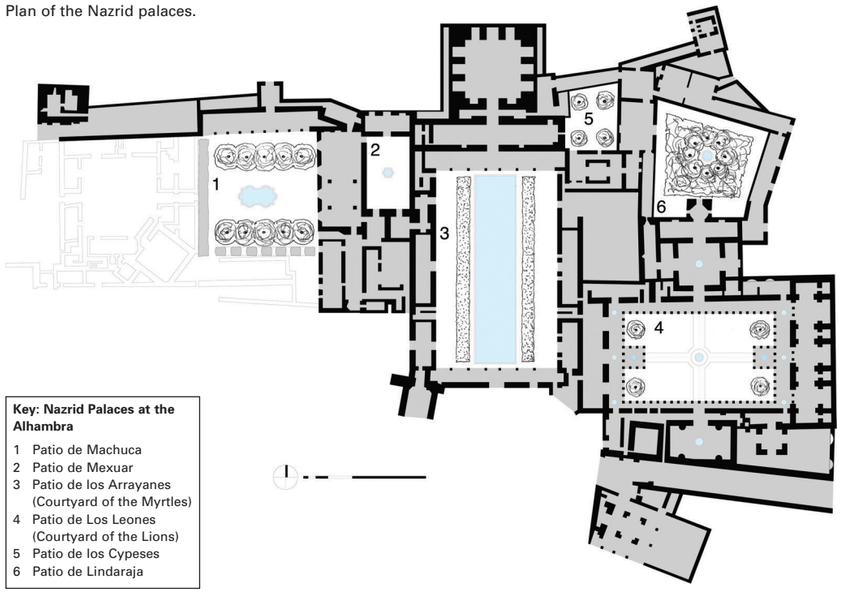
Figure 2.25
Ground floor plan of Maggie's Centre, London, showing the integration of external and internal spaces within the envelope of the building. The building has a protecting line of birch trees on the street side and the domestic scale garden on the entrance side. The garden reappears internally as integral to the functioning of the building.

attached to, where efficiency and hygiene have been drivers of often very de-humanised environments.

Emphasis has been put on the 'feel' of the place as well as its functionality. It is a modestly scaled building, but being coloured bright red it is unmissable, and stands out against the monotones of the hospital buildings and the urban grain of the street (Figure 2.24). As you approach it through a tranquil and domestic-scale garden, a projecting wall draws you in, past a plain façade with a single opening in it. As you get closer, you see that the space behind it is a garden. You are welcomed into a series of interlinked, domestically scaled, spaces. Nothing is overbearing. Most noticeably, the gardens have been brought inside. The largest one sits entirely within the envelope of the building, directly adjacent to the dining and kitchen area (Figure 2.25). You are aware of it from much of the ground floor and can even look down on it from the roof terrace garden on the first floor. The centrally placed table and benches seem to send an invitation to go out and sit on them (Figure 2.26).

Figure 2.26
Maggie's Centre. Looking through to the main courtyard.

Figure 3.21
Plan of the Nazrid palaces.



Key: Nazrid Palaces at the Alhambra

1 Patio de Machuca
2 Patio de Mexuar
3 Patio de los Arrayanes (Courtyard of the Myrtles)
4 Patio de Los Leones (Courtyard of the Lions)
5 Patio de los Cypeses
6 Patio de Lindaraja

where the notion of Earthly Paradise has been imaginatively embodied and continuously interpreted over many generations since the twelfth century. It was started when the boundaries between art and science, and the different disciplines of the arts we have today, did not exist (Figures 3.21 and 3.22).

There are three main interconnected palaces, each with their own patios. Although they have been adapted to suit a Christian culture after the Moors had left, the basic layout has not been altered, and the patios are intact. Each is integral with the surrounding architecture and is deeply embedded within the complex. No attempt is made to create linear visual links between each other or the outside world. As you walk through it today, it is easy to feel disoriented by an apparent maze of staggered junctions, through layers of space that make up a complex choreographed sequence.[23] Planting in the patios is sparse. Water is plentiful, much of which runs from pools to rills, and in some cases penetrates far into the interior spaces. Each patio exhibits an extraordinary wealth of architectural virtuosity, where interior, exterior, sculpture, decoration, art and science all intertwine. The simplicity of the overall space of each patio is implicit through its pure cuboid geometry that holds all the other architectural moves together. Each has a unique character but is entirely integrated within the whole scheme.

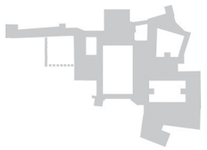
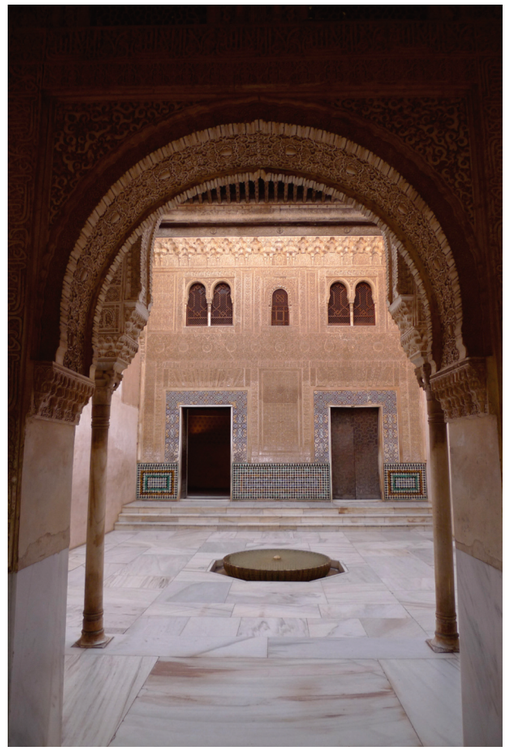


Figure 3.22
Simplified plan showing proportions and juxtaposition of internal and external space.

Figure 3.23
View across the Mexuar Patio toward the façade of the Comares Palace.



The proportions of Mexuar Patio are relatively small and convincingly room-like. It has no plants at all, and only a single centrally-placed pool. As you approach it, the main façade of the Comares Palace shimmers in front of you, framed by the arches of a double-layered colonnaded anteroom. The highly decorated but smooth surface gives the appearance of an internal wall of a room, complementing the other two uninterrupted, adjacent sides, which are now bare. A glimmer of light can be seen through two layers of façade and wall, the only indication of where to go next (Figure 3.23).

The Court of the Myrtles, Patio de los Arrayanes, is a grand space, dominated by the Comares Tower and a long, still, centrally placed rectangular pool, proportioned to perfectly reflect the façades of the buildings (Figure 3.24). There is a small circular pool at both ends, each with a central fountain that represents birth and life. There is a long axial view, but access is around the edges. The smaller scale of the windows and doors along the flanking walls, and the planting provide a sense of human

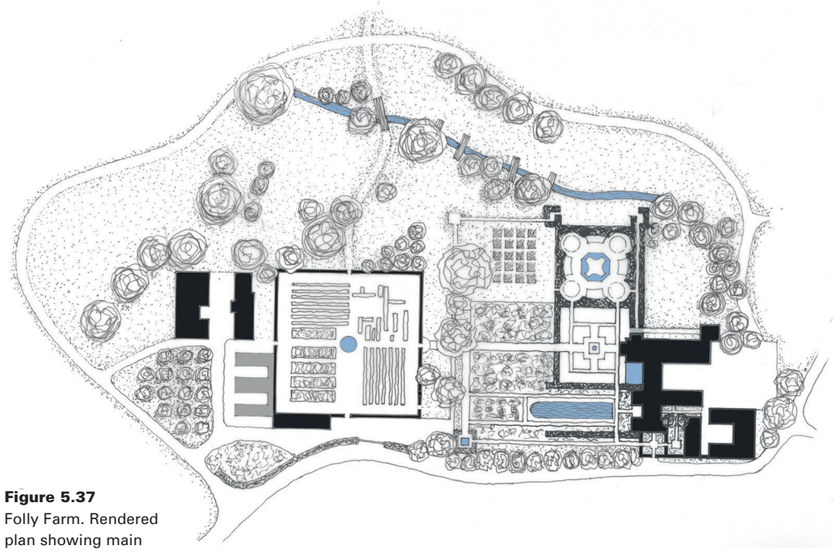


Figure 5.37
Folly Farm. Rendered plan showing main paths, walls, hedges and planting.

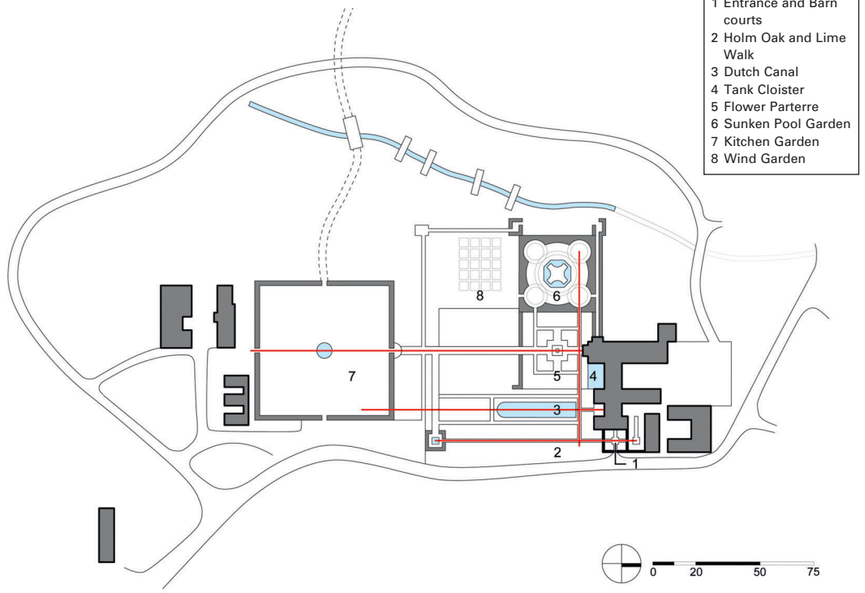


Figure 5.38
Folly Farm. Diagrammatic plan of garden showing key vistas and ordering lines.

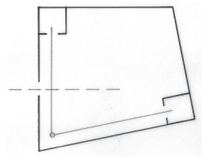


Figure 5.39
Route and focus.

Sissinghurst

By the beginning of the twentieth century much domestic architecture in England had become stifled by rules and codes of behaviour demanding that each room should have a particular function. It indicated a way of life bound by the empty formality and routine of the established patriarchal family. Even modestly sized houses had a proliferation of rooms that were organised by gender, class and function.[17] The conversion of Sissinghurst Castle and its grounds was conceived to challenge these rigid ideas. It was bought by Vita Sackville-West and her husband Harold Nicolson in 1930 when it was no more than a series of ruined buildings. It became a project that gradually brought the site to life over the next five years, and is now one of the most influential gardens of the twentieth century. Sissinghurst questions how we use domestic private space, showing that rooms can be reinvented as the setting for experimentation and self-expression. It challenges conventions of class, social hierarchy, gender and sexuality.[18]

The entire plot at Sissinghurst was conceived as a series of rooms with designated activities. Vita had her writing room in the tower, the sitting room and library were combined within the Big Room in the North Wing. Breakfast would take place in the South Cottage where Harold had his workroom and where he and Vita had their bedrooms. Eating took place outdoors whenever possible. Dinner would be amid the scent of the roses in the White Garden at the end of the day and through the dusk when the white flowers were at their best, their whiteness standing out against the fading light.[19] The pattern of the day necessitated walking outside to get from one activity to another through an orderly layout of outdoor rooms, each with their own distinct character.[20] It was achieved through both the structuring of the spaces and the planting, to elicit moods through colour, texture, scent and seasonal variation, all appealing directly to the emotions. This was a radical step in garden design. Although it was a private garden, the Nicolsons opened it to the public in the late 1930s, a garden art gallery, and it has been visited ever since.

The footprint of the old sixteenth-century Tudor manor house has been used for locations for walls and hedges that now make up the site and divide it into separate areas. A disproportionately tall tower, all that is left of the manor house, which now stands apart from any other buildings, dominates the entire site. The long ascent up the tower is rewarded by a view of the entire garden, clearly showing its sculptural shaping (Figure 5.40). Not only is it a landmark, its central archway is the threshold to most of the garden. Once through, if you walk halfway across the Tower Lawn you are confronted with a choice. Small openings in the surrounding walls and hedges allow glimpses and arouse anticipation of three very contrasting journeys.

Figure 7.34
COOKFOX office. Employees gathering honey.

The garden fulfils three functions: first, it adds a pleasure garden for all who work there; second, it is a display for potential clients and contractors; third, it is a 'laboratory' for testing ideas. There is a continuous reassessment of the planting, which provides the firm with information for new planting schemes. In collaboration with the Gaia Institute,[47] they monitor soil content of the sacks and the growth rates and water retention capacity of the plants with a view to the reduction of storm water run-off and the cooling effect of a green roof on top of the building. Data is being collected for the promotion of more rooftop schemes. The system of soil sacks is versatile and can be moved to other locations. When the office moves they will be able to pack up their garden as well as the furniture and install it on another roof.

Regaining a sense of place

Visiting Crossrail Place Garden, in the middle of London's financial district, is a very twenty-first century experience. It appears to be floating in a dock like a futuristic cruise-ship, covered by a huge canopy, waiting to disembark. It is located on one of the old docks that would have been teeming with imports and exports in the nineteenth century and sits on top of a seven-storey building designed by Foster and Partners, completed in 2015.[48] Most of the building is submerged and reaches down through a band of floors devoted to retail, connecting down to the new underground station below.

Although the access bridges are visible, it is not always easy to find their points of entry (Figure 7.35). Once inside the building, you are quickly

Figure 7.35
Crossrail rooftop garden as seen from the street.

taken up escalators, through darkened spaces lined with glistening marble, to the top level. At last you are thrown into the light. The city sounds are soft and muffled and surprisingly, there is birdsong, loud and clear. The plants look intensely green after the monochrome of the high-rise city you have just left. You are enticed to walk around the garden along sensuously curving paths that promise more than you can see. Benches are placed along the paths at intervals that allow a degree of privacy for conversation, or just for sitting on (Figures 7.36 and 7.37).

The garden is partly glazed over and partly open. The roof structure, a timber latticework construction, forms a 30-metre arch over the whole of the garden. The framework at each end is filled with a covering of highly

Figure 7.36
Cross rail rooftop garden. Open panels to part of the roof intentionally let the weather in.

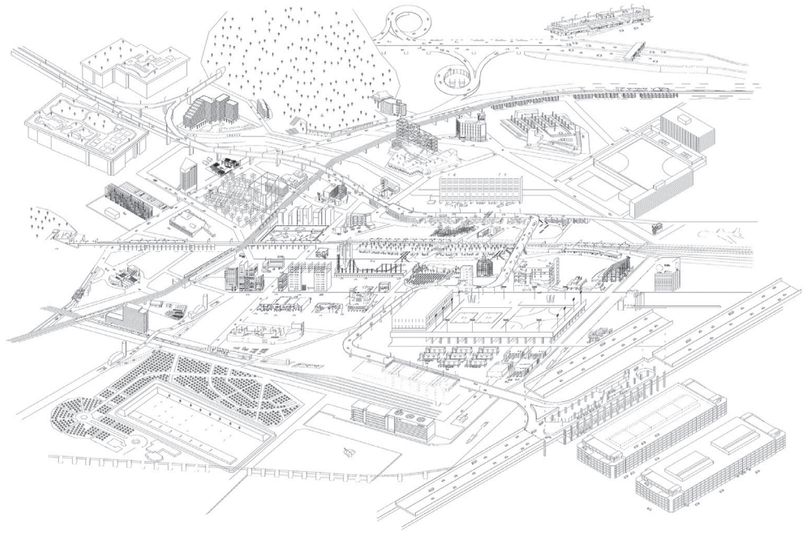


FIGURE I.11 Atelier Bow-Wow, Made in Tokyo Guidebook, 2001. © Atelier Bow-Wow. Atelier Bow-Wow's research focuses on the micro-environments of city spaces, working with high densities and vernacular architecture and their evolution over time (Kuroda and Kaijima, 2001). They examine new hybridised conditions within the city, focusing on utilising small, awkward urban spaces and creating social spaces – 'it is not people who creates space, but social spaces that use people to bring themselves into being' (Bow-Wow Architects, 2010, p. 251).

in the natural sciences, a different form of mapping from the aerial. Though relational, repeat photography captures diverse aspects in the landscape from focal time points, comparing those points and constructing trajectories of the landscapes future – 'the first photographers captured a landscape in the first stages of being rolled over by a wave of change' (White and Hart, 2007, p. 2). Following on from this basis, digital perspective montages or composites are elaborated upon, discussing their time-based distortion through multiple image sources, and a possible design deceit. In contrast to this trajectory, sources are illustrated that represent the changing nature of their sites. The composite is then referred to the principles of perspective and strategies for 2D time-based imagery, developing James Corner's ideas of the positive agency of photomontage through its juxtaposition of disassociated elements which provide new imaginings (Corner, 1999b, pp. 153–154).

Chapter 4 discusses digital 3D modelling and a brief history of computational developments including Paul Cerruzi's four computational future paradigms, the digital paradigm, convergence, solid-state electronics and the human interface (Ceruzzi, 2003). The layering of complexity through big data, parametricism and BIM is also discussed. Two divergent outcomes develop in the form of 3D model generation, script-sculpted mathematical novel architectural imaginary forms and surfaces, and

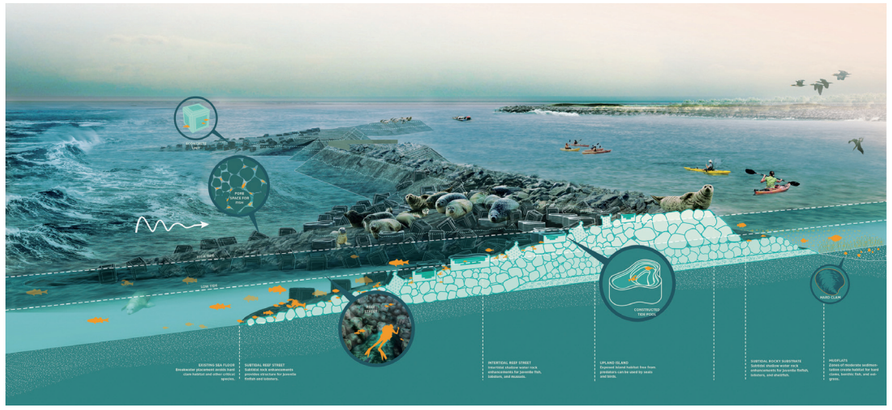
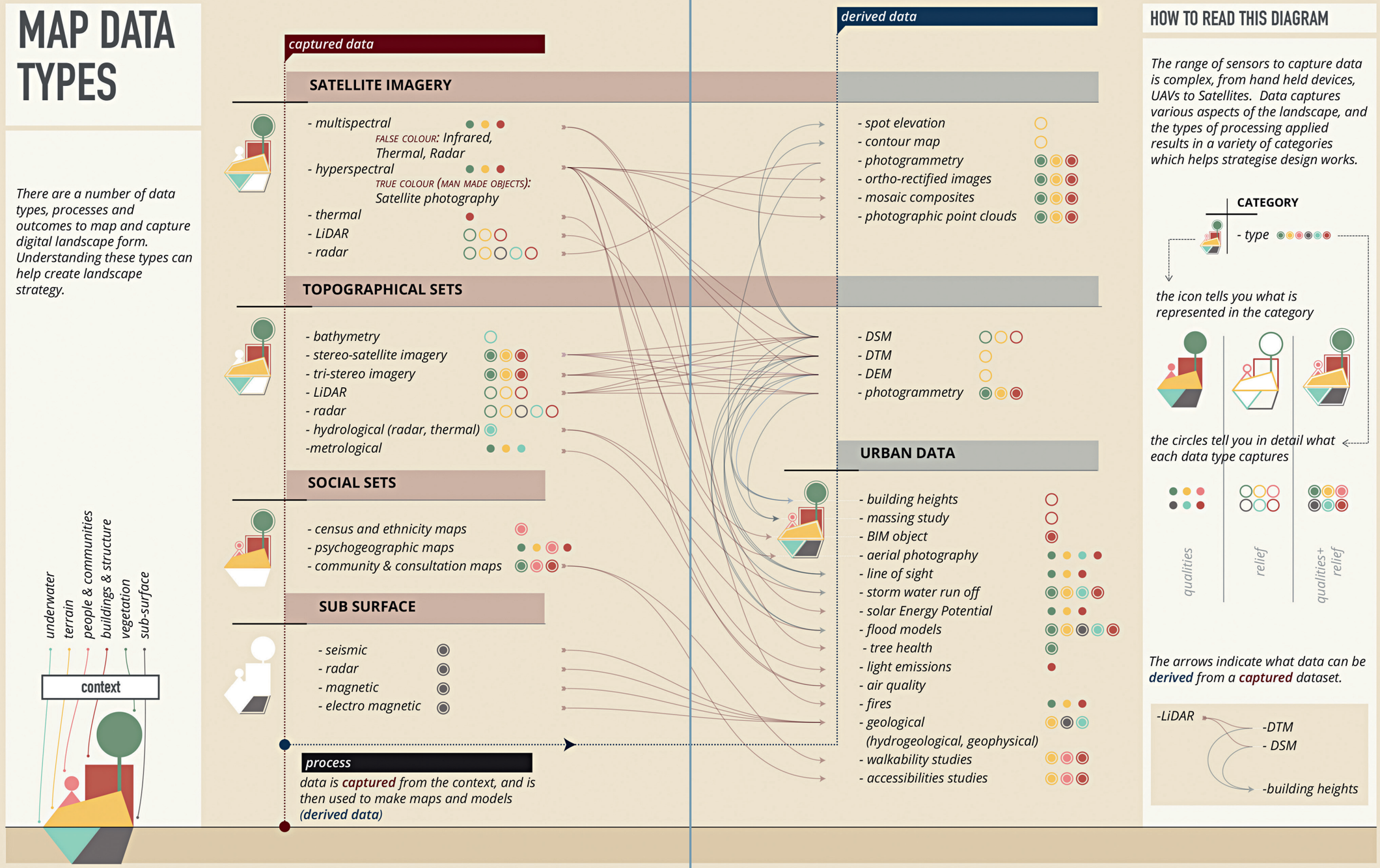


FIGURE I.12 The SCAPE Team, The Living Breakwaters project, Staten Island, New York, US Department of Housing and Urban Development's Rebuild by Design Initiative, 2015. The Living Breakwaters project reduces risk, revives ecologies and connects educators to the shoreline, inspiring a new generation of harbour stewards and a more resilient region over time. The SCAPE Team designed 'reef street' micro-pockets of habitat complexity to host finfish, shellfish and lobsters, and also modelled the breakwater system at a macro scale to understand how and where they can most effectively protect communities. This living infrastructure will be paired with social resiliency frameworks in adjacent neighbourhoods.

MAP DATA TYPES

There are a number of data types, processes and outcomes to map and capture digital landscape form. Understanding these types can help create landscape strategy.



HOW TO READ THIS DIAGRAM

The range of sensors to capture data is complex, from hand held devices, UAVs to Satellites. Data captures various aspects of the landscape, and the types of processing applied results in a variety of categories which helps strategise design works.

*The arrows indicate what data can be **derived** from a **captured** dataset.*

FIGURE 1.10 Serena Pollastri, Imagination Lancaster, Lancaster University, mapping data typology, 2016.

An enquiry into atmosphere

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Computational design methodologies

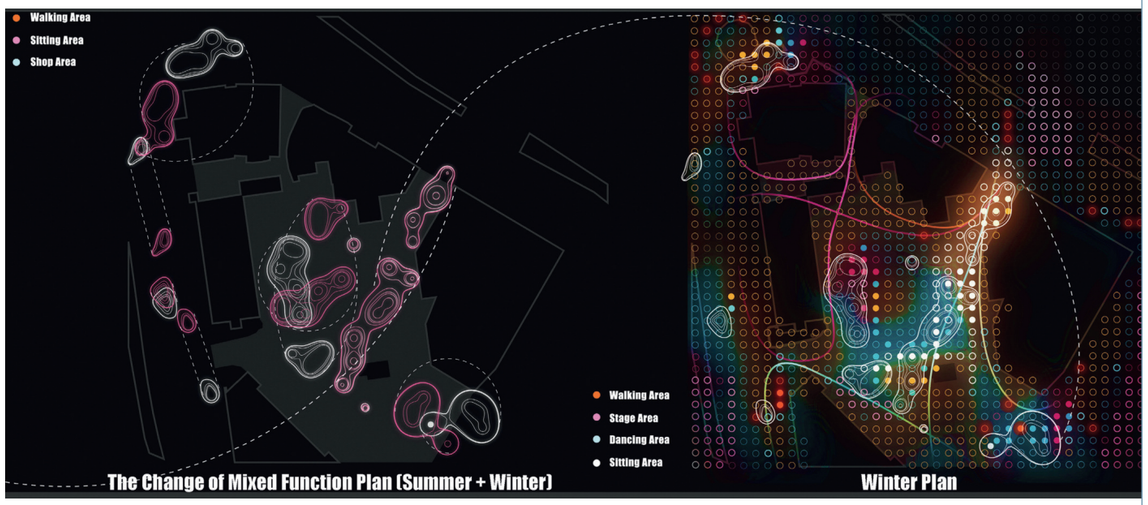

FIGURE 2.1.1 ***New atmospheric conditions for inserting program***
Source: Tengxiao Liu, Yaxi Ye, Yingxuan Huang, Zheichen Tang

Unprecedented temperatures have occurred regularly over the past three years, with the global temperatures experienced in the northern and southern hemispheres during 2016 declared the hottest on record. While the longer-term effects of climate changes remain largely undiscernible to human perception and senses, the magnitude of these changes manifest noticeably in data that highlight temperature peaks and intensities. Vast volumes of real-time temperature readings are increasingly informing the future planning and design of our cities, central to both understanding the implications of climate change and establishing the solution. This climatic information contributes to what is considered big data, an extensive collection of dynamic information that is continuously being generated.

Accompanying the production of big data are new epistemological approaches for analysing data and defining problems. Big data offers landscape architecture great potential for engaging with dynamic systems and processes, supplementing the limitations of representational techniques such as mapping and the diagram. However, to work effectively with data requires an interrogation of how this unprecedented access to information shifts design processes and methodologies. While landscape architecture has a long history of spatial analysis, it is less positioned to work effectively with systems and data.

With a focus on heat and atmosphere, this essay discusses the potential of big and small data explored through the computational to inform transformative research-driven design techniques for engaging with climate change. This is demonstrated through the outcomes of design studios run at the University of Melbourne and RMIT University over the summer of 2015–2016, which challenged students to move beyond the application of generic mediation techniques to produce novel material, spatial and programmatic interventions.

Drawing on selected work, we highlight the value of computational design methodologies in offering time-based investigations in which change is implicit through the active composition of behaviours and relationships. In this new context, the designer adopts an experimental process, establishing interdependencies and relationships between information, phenomena and systems across micro and macro scales. Rather than prescribe solutions, these research-driven design methodologies present 'a controlled discovery,' offering productive techniques for engaging with the unpredictability of climate change.[1]

A new data-driven epistemology for landscape architecture

Considered a 'disruptive innovation', the era of big data has radically altered epistemologies across all disciplines. Big data refers to rapidly evolving data sets characterised by volume, velocity and variety,[2] which have been made possible through technological innovations such as cameras, the Internet and remote sensing. Big data, often generated in real time, offers a variety of medium such as images, text and statistics, and most importantly is unfiltered. Access to this volume of information is unprecedented, and therefore demands new ways of thinking about data.

In his insightful 2014 essay 'Big Data, new epistemologies and paradigm shifts', Kitchin offers a valuable critique of how this new form of empiricism, driven by big data and data analytics, is reconfiguring research within science and the humanities.[3] For science, the phenomenon of big data has inspired some to declare the emergence of a fourth science paradigm, premised on the potential of data to reveal new knowledge free of theory. In a challenge to the traditions of scientific deduction, this paradigm claims that empiricism highlights patterns and relationships beyond the prior knowledge of the researcher, thereby producing new knowledge without guidance from theory,

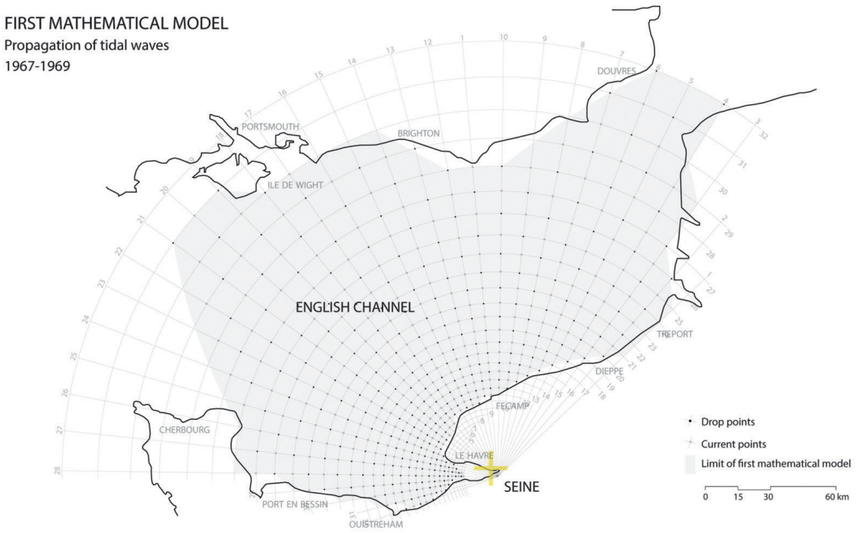

FIGURE 2.0.3 **Diagrams showing the scope and limitations of the numerical (digital) models**
Drawn by Justine Holzman and Marianne Lafontaine-Chica

(1895–1925), and the effects of the infrastructure on the continued evolution of the estuary (1925–1953). The first trials effectively proved the model to be capable of reproducing the cyclic evolution of the natural process through channel variations which included accurate representation of both global and micro evolutions of the channel systems.[19] The ability to reproduce historical circumstances in a scale model advanced the efficacy of the practice as well as the mathematical theory required for numerical modeling.

International Institute for Sustainable Development's Experimental Lakes Area

> There is every reason to believe that the use of small isolated lakes for experimental purposes will immeasurably enhance our knowledge of lakes and the efficacy of specific pollution abatement measures.[20]
>
> Wally E. Johnson and Jack R. Vallentyne

In response to the increasing pollution of the Great Lakes, a pristine area of Kenora District, Ontario, Canada, encompassing 58 freshwater lakes and their respective watersheds, was set aside in 1968 by the Province of Ontario and the Government of

FIGURE 2.0.4 **An aerial view of an algal bloom in Lake 227 (Lake 305 in the background) in the Experimental Lakes Area, Kenora District Ontario, Canada**

FIGURE 2.0.5 **An aerial view of an algal bloom in Lake 226 divided by a curtain in the Experimental Lakes Area, Kenora District Ontario, Canada (right)**
Photos courtesy of the IISD Experimental Lakes Area

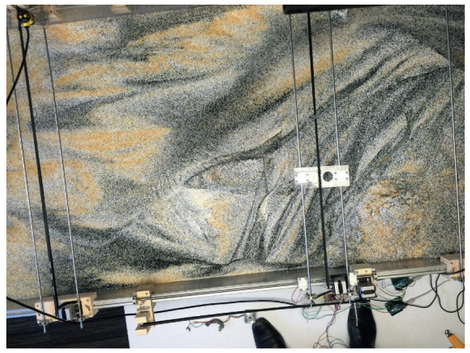

FIGURE 4.3.1 **Image of the geomorphology table—utilized as the site of intervention for multiple experiments**

Photograph: Bradley Cantrell

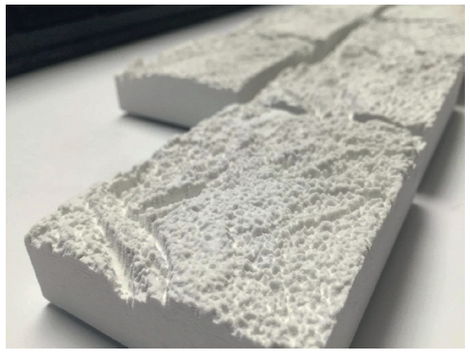

FIGURE 4.3.2 **Temporal 3D-printed soil samplings scanned from the geomorphology table, which were produced at an instant creating a neo-nature**

Models: Leif Estrada; photograph: Robert Tangstrom

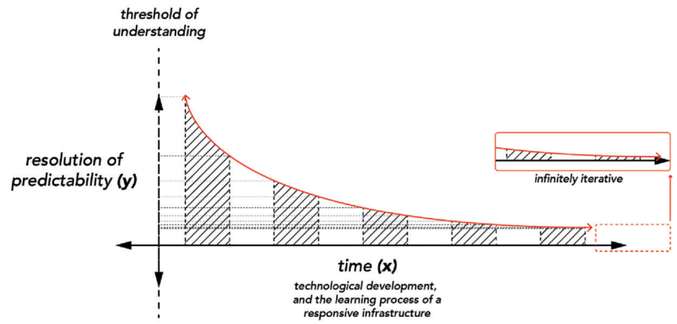

FIGURE 4.3.3 **A conceptual diagram, based upon the idea of an *asymptote*, showing the resolution of phenomenal predictability in relation to time (the development of technological precision and a responsive infrastructure's understanding of its context)**

Diagram: Leif Estrada

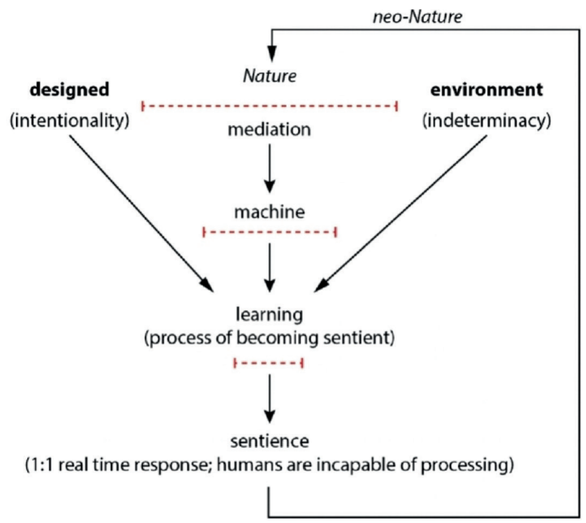

FIGURE 4.3.4 **Feedback loop diagram showing the machine's learning, narrowing the gap between intentionality and indeterminacy**

Diagram: Leif Estrada

Through the introduction of new imagined sensor systems the emergence of new forms of construction and maintenance within the landscape are enabled, which has never been possible without the machine's new dimensions of sentience. Such manifested forms created by the compounding process of the neo-nature would further bring upon a disorientation as to what was once natural. This phenomenon would cause the rejection of the current dichotomy created by "man-made" technologies and "idealized" notions of idealized and untouched natural processes.

Our ability to conceptualize and create hybrids of biotic and abiotic systems facilitates the evolution of neo-natures. Technological design is consistently introduced to "tame" biologic systems to human will. To legitimize these interventions, humans find and extract any economic and practical capacities. However, despite levels of human control, there is always a moment in which a system will reach its limitations. As such, these limitations will produce our new perceptions of nature. A shift concerning ecology and nature in what has been the accepted norm is inevitably upon us.

FIGURE 4.3.5 **Depositor, an experimental real-time responsive model programmed to interrupt the flow of water, instantaneously redirecting it to percolate down a new fluvial direction, affecting its geomorphology**

Model and temporal images: Leif Estrada, https://vimeo.com/152837202

A R C H I T E C T U R E


Neut


F-House


Ring


S House


House Y


House NK


RoomRoom


House in Mishuku II


Crystal Bricks


Noh House


Designer House


Stacked House


Cave


Climber's House


Life in Spiral House


House House


Saso House


House NA

Monoclinic

Riverside House

Small House

Stacked House