For + Against: Designing for Failure

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NATURE AS REBIRTH

The premise of this paper is based on recent tragic events in Japan following the 2011 tsunami. The incident prompted a rethinking of Tokyo Bay as an ideal test bed for port strategies that adapt to climate changes. This led to revisiting historically relevant precedents of the Metabolist period that make a case for how to combat climatic uncertainty today along our city coastlines. In the wake of World War II destruction and the atomic bomb, Metabolism emerged after a state of crisis that generated newfound goals and ambitions for development in Japan's cities and for the country's relationship to nature. Today, cities and coastlines are faced with new realities, and a different type of catastrophe is propelling us to rethink urban strategies: nature. As devastating as it is, nature can give architects and planners a rebirth in how to reconstruct cities and thwart ecologically disastrous conundrums. A member of the Metabolists, Kenzo Tange, referred to his own work in the sixties as a rebirth of traditional Japanese modernism but with an experimentation that allowed for adaptation to historically significant work. Hans Ulrich Obrist, in Project Japan, refers to cities needing to "adapt, grow, elevate, even float, if they are to survive the dual pressures of rapid modernization and inevitable natural change (usually calamitous)."1 The level of devastation we witnessed in March of 2011, albeit never something one wishes upon a place, can potentially be useful in asking how to reconstruct a place for a more resilient life span.

COMBATING CLIMATE

With over 50% of the world population living in cities and two thirds in cities vulnerable to climate change, leveraging infrastructural and ecological concerns for new architectural prototypes can potentially alter the way we protect our cities. Tokyo is one of the largest populations in the world and one of the top-twenty port cities most susceptible to flood damage high storm surges. It is also one of the leading cities to combat its critical water crisis with the extraordinary G-Cans Project—The Water Discharge Channel. This paper outlines how port cities such as Tokyo can redevelop outdated systems by fusing infrastructure and environmental strategies that combat

catastrophe, demonstrating how catastrophic events can be used productively for protective and public measures.

The famous Tsukiji Fish Market is situated in the center of Tokyo Bay and is historically connected to a site imbued with Japanese aversion to its waterfront. Originally considered an environmental limitation to the city of Tokyo, the bay wasn't considered valuable until the Metabolists saw it as a free zone for growth, and it became a laboratory for design and manipulation. Tokyo Bay became the model urban space for what the Metabolists coined "artificial ground" or a place for adaptation and growth. This is most evident in a map of Tokyo Bay that reveals the growth of artificial land along the bay (see Figure 1). Tokyo Bay is not new to reconstructive surgery, as demonstrated by numerous strategies of re-inhabiting the coast and the waters beyond.

This notion of "artificial ground" that is so prevalent in the Metabolists' rhetoric established Tokyo Bay as the interface between infrastructure, ecology, and architecture. Once again, this notion of artificiality can play a role in how to think more critically about future urban networks that protect port cities from natural disaster. The work shown dissects three original Metabolism strategies for new purposes, and it shows how, if rethought to today's standards, these ideas could revolutionize the way we inhabit and protect the coast. There is potential in referring back to some of the core historical strategies that set Metabolism in motion. This can generate new types of performative architecture that begin to recode the context, embrace catastrophe, and adapt 'for' failure. To protect our cities is to re-examine how new prototypes can reshape public space 'for' solutions that don't combat climate change but design for it.

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Figure 1: 290 sq. km of land has been reclaimed along the Tokyo Bay coastline

ARTIFICIAL GROUND

One defining principle of Metabolism—artificial ground—established a cultural ethos throughout Japan. The relationship to the ground, or lack thereof, fundamentally changes the way one experiences Japanese urban space. The liberation from ground does not necessarily imply floatation or rising above street level. Many of the Metabolism projects in the sixties were about floating or hovering. But today, the artificial ground is even more ambiguous where one continually travels above and below ground. These characteristics can give new productive potential to artificial ground and embrace how one can occupy space above or below the city.

Since the earliest developments, cities were physically shaped by their relationship to ground and the natural environment. Metabolism used mass production and systematic urban infrastructure to become adaptable and responsive. Their approach was for impermanence and flexibility, but today, a more responsive approach would be to create more soft, flexible, and adaptable solutions as long-term strategies. In this current time of crisis, careful consideration for the future of the global economy must look toward architecture and engineering going beyond just the scale of a singular building or a singular use to a more systematic approach. These systems play a key role in addressing the rising ecological challenges that urban areas, such as Tokyo, face as a result of the effects of global warming and growing

densities. The future of our urban environment is relying on more flexible systems that consider untapped resources and hybrid programming that makes our coastlines more adaptable to change.

The response lies in how infrastructure and ecology can inform each other to create a more resilient urban fabric that re-codes its environment—a recharge rather than being reactionary. Alexander D'Hooghe argues that rather than thinking of infrastructure as a "system of transportation planning or engineering," it should be considered as an "object of cultural production with a spatial content not unlike that of architecture."[2] Similar to the framework of Metabolism, infrastructure is going beyond the realm of strictly an "engineering problem" and becoming an integral public and cultural component to urban development. As we begin to take on more ecological complexities within our environment, cities can no longer afford to separate urban space from traditionally liminal sites along the coast but must find a synthesis of integrated systems—a manipulated, artificial ground—that protects the city and brings with it public space and urban potential.

MANUFACTURING TOKYO

Nearly every day, we learn more about sea level rise—one of the most critical impacts of global warming. The issue of sea-level rise is of global importance, and both simple and complex design interventions are needed to sustain quality of life, preserve the environment, and ensure continued economic vitality of shoreline communities. Each year, many coastal cities face the realities of high flood factors taxing not only our infrastructure but also urban quality of life. As Japan is surrounded by water, "how to cope with problems related to sea-level rise caused by global warming is one of the significant issues in Japan's adaptation strategies for global warming."[3] Since 1979, Tokyo faced more than six major floods and is highly susceptible to flood damage. To protect the city, the government designed a flood sewer system—the Metropolitan Area Outer Discharge Channel (G-Cans Project)—built to prevent overflow and minimize 80% of the damage caused by heavy rainfall. But as recently as August 2011, the city of Tokyo encountered more flash floods, one of which had a record rainfall rate of 3.7 inches per hour. Not unlike hurricane Katrina in New Orleans, the flooding turned roads into rivers and many residents were forced to evacuate. The city is progressive in flood mitigation, yet one system and one solution is not resilient enough to remedy the entire problem.

Tokyo is home to the largest, most well-known wholesale fish and seafood market in the world, the Tsukiji Market. The market resides in prime urban real estate along the waterfront and is near major hubs, the Central Business District, adjacent to the well-known Ginza district. With continuous economic growth, there is significant pressure on the market to rethink its location and make way for more lucrative, commercial development. Currently, the majority of the fish brought to the market comes via land, not water. Trucks proliferate the site, shuffling the fish in and out daily to and from the highways and airports. What was once a vibrant, active water edge for fisherman no longer exists. The fish market does not take advantage of its location to the water because it is not a necessity. Most of the market's

connection to the river is comprised of storage facilities only employees have access to enter. The location and proximity of the market to the water is beneficial as potential public space but is still a threatening location. The opportunity to use new ecological strategies for the market and the city at large would signify the site as a viable prototype for rethinking the city's relationship to the water—environmentally and culturally.

In Project Japan, Hans Ulrich Obrist challenges our understanding of what sustainability can be for our cities, "sustainability demands that cultural production today reclaim its old sense of ambition and scale; that it once again embrace the possibilities of total design.... We should borrow from [modernism] ambition in order to form our own dynamic, shifting, and alterable institutions and space of the future."[4] The following proposals use the Market site as a new, manufactured landscape for the city to combat ecological realities but also offer new possibilities for public space—a term rarely used in Japanese culture until the Metabolists.

The Tsukiji Market is an ideal program to investigate infrastructural potential because the market's size and flexible nature. The market is an "economic phenomenon [as well as] a social framework"[5]—a social institution of exchange. Tsukiji as a "marketplace" is a "complex institutional hierarchy of actors—regulators, shippers auctioneers, traders, brokers, buyers"[6] as well as tourists. The market struggles with increasing tourists and the unfortunate result of sanitation concerns, temperature control, and food safety. As a result, the market slowly retreats from being a tourist destination. The following proposals research the market as a cultural influence within the city. The proposals examine the impact of the market as a destination. They provide a framework for understanding a manufactured landscape that could lay the groundwork for new conceptions of artificial ground and coastal protection.

SCAPES AND FORMS

The following projects take a formal and performative position, similar to Metabolism's strategies that bring an ecological response to their position within the city. These projects are categorized into one of two strategies: manufactured landscapes or megaform.

Three factors are at stake in defining the following coastal strategies. One, each strategy analyzes Tokyo as a test bed to grapple with climatic uncertainties. Second, the proposals show a time-based strategy of smaller interventions that adapt to irregularities in the urban fabric as they proliferate the coast. And third, the proposals derive from three Metabolism core strategies: "artificial ground," "group form," and "capsules" as a foundation for how to expand on ideas of adaptability within cities. Speculation is placed on the role of the Tsukiji Market in its current location and what kind of impact infrastructural systems could have on the coast to make it more culturally and ecologically resilient.

Each of the terms is examined through the lens of ecological systems that challenge what form and performance can bring to the cultural identity of Tokyo Bay. The term manufactured landscapes describes a type of

fabricated and performative urban condition by which a "landscape" can emerge. And with this, "landscape" is defined as a type of manipulated territory or ground condition for urban space to be deployed. The term, "megaform as urban landscape:" was conceived initially by Kenneth Frampton in *Landform Building*. Megaform is referred to as a "topographical, horizontal thrust of its overall profile" and is seen by Frampton as a "landmark and place-creating potential."[7] Both of the terms proliferate in the projects most evidently at the urban scale and could translate to multiple sites along Tokyo Bay. The goal is in defining new strategies for coastal protection where "artificial ground" is called into question and "failure" of the system is assimilated in either strategy.

MANUFACTURED LANDSCAPES

[UN]Zipping the Coast

Because of rapid population growth and poor urban planning, Tokyo is one of the most densely populated cities. The waters of Tokyo Bay also suffer from hypoxia, a lack of oxygen, resulting from high pollution caused by land reclamation on the bay. Using this research as a backdrop, Tsukiji Market renders many opportunities for much needed, productive open public space and ways of mitigating hypoxia in the region to strengthen marine life.

To rectify the bay as a thriving ecosystem, hydraulic structures are used to treat the bay water. To aerate "for" failure, the zipper-shaped weir system is comprised of a series of hydraulic structures that work as barriers. The zipper system is designed to alter the flow characteristics of water using a trapezoidal shape to oxygenate the water as it moves through the weir. By aerating the water, this infrastructure provides oxygen to start restoring marine life in Tokyo Bay. The zigzagging provides numerous possibilities for canals, lagoons, wetlands, and aeration areas for the treatment of the water and the growth of small ecosystems. Fifty-meter deep water-tanks, spillways, and wetlands are used for water management and for temporary relief from flooding that may occur. The proposal is seen as an expansion of the already existing infrastructure of the coast. The strategy doesn't expand the already taxed system but retreats and allows the water to seep into the site through waterways and channels.

Similar to the Metabolist Kurokawa's Linear City that creates thin, winding urban corridors and modules efficiently shift people and products, [Un] zipping the Coast consists of repeated zigzag modules that create a network of urban pathways that encapsulate the weirs while moving goods and people throughout the market (see Figure 2). Kurokawa's Linear City grew like a series of bacterial strings that were completely independent of a condensed city center. [Un]Zipping the Coast also becomes an independent series of structures detached from the existing urban edge that invade other waterfronts as it shifts around the bay. As a manufactured landscape, the deep zigzag structures create a buffer that offsets the water edge but this time the string formations protect the city life from future water level rise and failure. The zipper system is viable along the entire coast with the potential for other programs to plug in. The site expands vertically in depth;

thickening below the surface as needed—an edge in constant flux. The entire coast evolves into a 50-meter deep, manufactured landscape for the city that offers productive public space while soaking up the coast when flooding is present and failure ignites.

MANUFACTURED LANDSCAPES

Rooting Tsukiji

Tokyo Bay, once lined with natural tidal flats, has been taken over by industrial growth and an increase in urban population. The elimination of natural tidal flats and the large amounts of pollution from factories and refineries along the coastline, have created serious water quality problems in Tokyo Bay. The bay is no longer able to sustain a quality living environment for the fish population, and highly regarded real estate on the coast is rendered useless. The irony of this situation is that the culture and the ecology, which have historically worked together, seem to be at odds. The water is vital to the marine life; the marine life is vital to the fishing industry; the fishing industry is inherently part of Japan's economy and culture; and ultimately the Tsukiji site is a culmination of all these traits.

Similar to Metabolist Otaka's Harumi apartment buildings that were designed on reclaimed land, Rooting Tsukiji treats the bay as an artificial ground with an underbelly to the market that brings water and humans below the water table (see Figure 3). Instead of simply resting the building on pilings like Otaka's apartments, Rooting Tsukiji embeds buildings into the pilings and uses the walls as a filter "for" failure that soaks up water rather than hovering over it. As a manufactured landscape, the project permanently roots the Tsukiji fish market physically and spiritually in Japan's culture, forming an artificial grotto that elevates the fish market.

By filtering "for" failure, land and water fuse together through a series of pilings or channels that allow water from the estuary to flow directly into the site. Some channels are used for fish-farming purposes, while others allow the slow permeation of water into natural, deep aquifers below the surface. These channels result in spaces that are at times habitable—when the tide is out, and other times inhabitable—during flood conditions or high tide. The walls of the channels work to filter the water, allowing the water that naturally permeates the site to slowly draw its way down into the ground, naturally filtering itself, and replenishing aquifers below. The forms of the walls are a flexible framework of the ecological process that filters and directs water below grade in the case of flooding and failure.

MEGAFORM AS URBAN LANDSCAPE

Shore Stranding

A second form of aeration "for" failure is seen in Shore Stranding where the treatment of water becomes the lifeblood of this urban megaform. Treating water to sustain marine life is a simpler process than purifying water for drinking. Through the process of aeration and clarification, an increase of oxygen in the water allows for bacteria to grow and survive. During clarification, water sits in a cylindrical container where the solids and oils can separate to be removed.

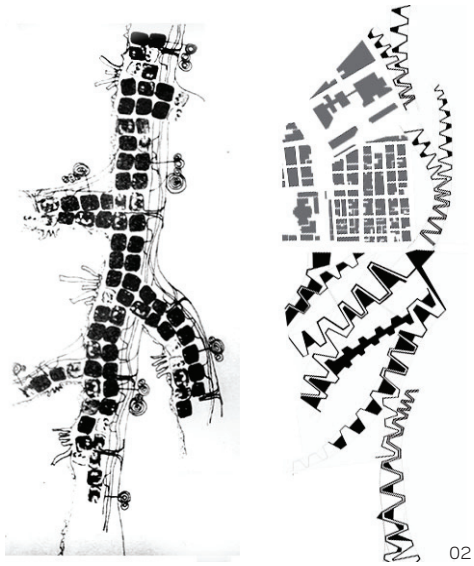
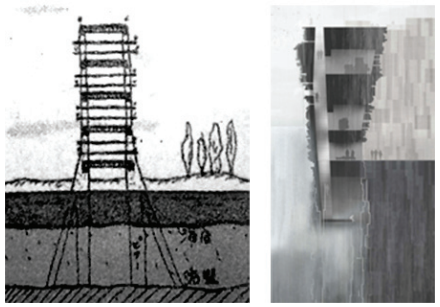


Figure 2: Left: Kurokawa's Linear City..
Right: [UN]Zipping the Coast



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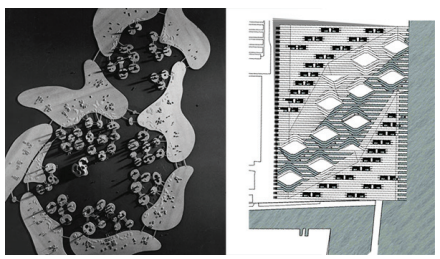

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Figure 3: Left: section of Otaka's Harumi apartment buildings. Right: Rooting Tsukiji section

Figure 4: Left: Kikutake's Marine City. Right: Shore Stranding

Figure 5: Left: Kenzo Tange's Big Roof Expo '70. Right: productivE landSCAPE

Shore Stranding works similarly to Kikutake's Marine City and six other plans for floating cities that engage nature, water, and disaster through fortification. but extends the idea of fortification as a more ambiguous edge. Marine City clearly defines what is habitable land versus water. In the case of Shore Stranding, the megaform allows water to soak into the structure at the river's edge but emerges as an urban form at the street edge (see Figure 4).

The megaform of Shore Stranding delves deep below the surface to capture water through prefabricated concrete tubes that house filtering chambers. The system is a series of hundreds of miniature water treatment plants. Each water treatment container is broken up and alternates between an aeration tank and a clarification tank. Between each tank there are additional filters to help separate the waste from the clean water. This system of tubes protects the city from flooding by absorbing water quickly and releasing it back slowly. Instead of cleaning the water and releasing it back immediately into Tokyo Bay, the system retains the water it collects until each container is full and can release water back into the river at a rate that doesn't tax the city. The volume required to have meaningful impact on the ecology of the river, in effect, establishes this megaform as an artificial ground that blurs the boundary between land and water. This is a solution that not only reacts to the extreme conditions of flooding and failure but the everyday needs of cleaning water.

MEGAFORM AS URBAN LANDSCAPE

productivE landSCAPE

Historically, Japan's extreme flooding disasters and evacuation methods have been significantly insufficient. The urban megaform of productivE landSCAPE responds to two problematic site evacuations issues: environment and culture. These problems require a system that allows for both physical and mental ESCAPE. Many spaces within the city are ill equipped to withstand thousands of people moving upwards to avoid a catastrophic event. The first of the evacuations is simply moving people out or up to avoid a natural disaster. The second "evacuation" comes from observation of the diligent Japanese culture that has a necessity for "relief" space or spaces to escape from reality. The aim of productivE landSCAPE is to design for failure, while alleviating social pressures by providing a new experiential escape in public space.

The seemingly chaotic environment of the Tsukiji Market to an outsider is in fact, a very organized, efficient system that works well on a daily basis. In productivE landSCAPE, the everyday functions of Tsukiji Market are left unaltered. Similar to Kenzo Tange's Big Roof at Expo '70, the new system manifests itself as a parasitic and dynamic three-dimensional space frame structure that fills the site's negative space surrounding the buildings, while allowing existing flows of the market to remain unchanged (see Figure 5). But instead of Tange's plaza that is located underneath the roof with inhabitable capsules plugging in above, the roof structure of productivE landSCAPE inverts this strategy with a space frame roof that becomes a public plaza above the market and serves more as a protective blanket to the coast. Instead of Tange's plugin capsules in the roof, elevated walkways

divert tourists and visitors to the water edge and circumvent the market all together, preserving the market's function and viability while still maintaining a visual connection to activities below.

One is able to escape quickly to the top level of the structure in the case of significant flooding or one can walk up to the floating plaza above on a daily basis to find relief from the chaos below. Reinforcing escape routes are the large punctures in the space frame roof, further slicing away existing buildings creating new public programs at the water such as roller coaster rides, bungee jumping, and ski lifts for winter activity.

CONCLUSION—FOR—FAILURE

The challenge is in knowing if we are simply reacting to existing conditions or expanding our scope beyond what we currently know. If the goal is to protect our cities from natural disasters, the question is how to take on strategies that are not just reacting and solving present problems but anticipate where future "failure" will occur. Ultimately, creating a more resilient system that withstands future catastrophes because it allows them to happen is design that embeds slack into the system. Knowing what is insufficient and reaching beyond it functions as designing for failure because you can embed miscalculation into the strategy. While visiting the G-Cans project, the engineers noted that they designed for approximately 20% slack in the system. Could their system ever reach capacity to the point of failure? Possibly. Their engineers would disagree but the argument is if we begin to think about how our landscapes can be manufactured to soak up rather than resist catastrophe, our cities and coastal regions have a better chance of survival.

Each of the presented proposals becomes a catalyst for how to approach coastlines that combat climatic realities through designing "for" failure, rather than against it. The proposals see infrastructure and architecture as open and flexible systems that must negotiate ground, water, uses, and public space. If the potential is in the—FOR—where reciprocity between systems can emerge, then we can begin to break down the singular uses of buildings or infrastructure into multi-layered, woven patterns of program. Not all landscapes are created equal. How we design FOR failure, with a layering of systems simultaneously brings the potential for manufactured landscapes and megaforms to in[form] our cities more often and, in turn, protect cities. ◆

ENDNOTES

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