RESILIENT INFRASTRUCTURES

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Throughout the history of architecture, the role of the Architect has been to determine lines that ordered the world. In the past two centuries, however, as cities have rapidly expanded into vast urban territories that are organized through the negotiation of politics, economics, ecosystems, and cultural values, the ability to determine such lines has become progressively more complex and suspect. Such suspicions stem in part from the fact that architecture traditionally deals with determinacy, permanence and form—characteristics that are increasingly difficult to reconcile with the rapidly transforming metropolises.

On the one hand, this has sparked a disciplinary identity crisis characterized by a yearning for architecture’s opposite—flexibility, dynamism, immateriality and indeterminacy, in response to such emergent variegations. Moreover, the transformative nature of these systems acts as a fundamental disturbance to architecture, which traditionally thrives in stasis. If resilience is defined as the ability to return to an original state after a disturbance, this is typically achieved in architecture by neutralizing difference or accounting for extremes. Architecture, however, has renewed agency by adopting a soft resilience into its very structure—evolving and transforming with the contemporary metropolises.

To understand how architecture and urbanism can operate with a soft resilience, it is useful to begin by framing architecture as oscillating between ecological poles. The definition of ecology in both an organism’s relationship to other organisms—the “human ecology” (i.e. our political, economic and social spheres), as well as an organism’s relationship to its environment—the “natural ecology” (including the design of landscape, infrastructures, urban form, as well as the impact of environmental conditions such as geology, weather and ecosystems, to name a few). Architecture has always been a negotiation between the ‘human’ and ‘natural’ spheres, operating with a soft resilience, it is useful to begin by framing the dialectic of our ‘distinct-ecology’ and positioning it at the core of the public sphere:

Human plurality, the basic condition of both action and speech, has the twofold character of equality and distinction. If men were not equal, they could neither understand each other and those who came before them nor plan for the future and foresee the needs of those who will come after them. If men were not distinct, each human being distinguished from any other who is, was, or will ever be, they would need neither speech nor action to make themselves understood.3

Ar decent’s characterization of this complex and seemingly contradictory public sphere is perhaps best summarized through her analogy of a group of people sitting around a table. For Arendt, the table is the common world—it simultaneously connects and bonds those around it while preventing them from falling over each other and assimilating belief systems.

The disappearance of the table would leave strangers in a space that lacked a common bond—this would be the fall of the public realm and its associated reality and stability.4

In essence, the metaphor of Arendt’s pluralism is embedded within Giacometti’s City Square, wherein distinct individuals are tied together on a common platform. Extrapolating from Arendt, the political project of the city is to reconcile the collective (equality) and individual (distinction). Surely, Arendt is not alone in this quest—think about the tension and similarities on various philosophical and design debates over the past two centuries: objective vs. subjective (Enlightenment vs. Romanticism); collective vs. individual (CIAM); exterior vs. interior (Team X’s Doorstep Analogy); control vs. choice (Archigram); frame vs. pod (megastructure); determinacy vs. indeterminacy (hard vs. soft system); etc. None of these debates, however, was able to mediate such a dialectic that is at the core of a politically empowered metropolis. Increasingly comprised of a grouping of various constituencies, a scan through the current metropolis provokes the ultimate question of where the common object of collectivity presently exists? The issue of diversity? is even more pronounced today, with more than half the population of some cities consisting of visible ‘minorities’. This growing situation prompts a design interrogation of how one can provide unity in diversity, reconcile the individual and collective, and accommodate distinction and equality. It is a political ecology rooted in pluralism that can produce a collective agency, capable of restructuring our economic and socio-cultural territory and its relationship to the natural environment.

Form and the Emergence of Soft

An attempt to reconcile such issues reached a fatalistic apogee in the typology of the megastructure. Le Corbusier, who repeatedly stressed the importance of the individual and collective in the C.I.A.M Athens Charter, planted the seed for the megastucture in his Plan Obus (1933) in Algiers. In his project, a continuous linear form merged architecture, infrastructure and topography, while subdividing into multiple dwelling units. Within such a framework, Corbusier left the dwellings “open”...
to be designed by their individual occupants and revealed the diversity that he envisioned through his sketches. Thirty years later, in the 1960s, the megastructure had fully bloomed and its basic characteristics were exemplified in Yona Friedman’s Ville Spatiale (1958). The Ville Spatiale was organized by a universal frame of infrastructure descended from Enlightenment values—it was permanent, deterministic, and provided order to the collective. Within this frame, a series of indeterminate, mobile and flexible pods were to empower the individual. The megastructure oscillated between control and choice and was invocated for being a mere illusion of choice disguised behind controlled variations. Emerging as a reaction to the heavily deterministic and hard projects of CIAM, the megastructure was attempting to shed the ‘hard’ and such criticism resounded behind controlled variations. Emerging as a reaction to the heavily deterministic and hard projects of C.I.A.M and the New Monumentality (not to mention WWII), the megastructure disguised behind controlled variations. Emerging as a reaction to the heavily deterministic and hard projects of C.I.A.M and the New Monumentality (not to mention WWII), the megastructure was attempting to shed the ‘hard’ and such criticism resounded behind controlled variations. Emerging as a reaction to the heavily deterministic and hard projects of C.I.A.M and the New Monumentality (not to mention WWII), the megastructure was attempting to shed the ‘hard’ and such criticism resounded behind controlled variations.

With such a focus on the soft unit, few examples of urban projects stemming from the pod exist from this era. Archigram’s Instant City (1968-72) is often cited as an emblematic soft urban project. In Instant City, a temporary, nomadic, event metropolis (which also happens to be an airship—the largest soft pod of all) plugs into an existing city, utilizing it as hardware. The dependence on the existing city’s framework revealed the difficulty in providing overall resilience. This is critical because it allows disturbance to be absorbed by the units, which can reconfigure the framework, or by the frame itself, forecasting an alteration to the organization of the units. Soft resilience can therefore be achieved through a distributed, differentiated and networked system that can respond at a multiplicity of scales. In this sense, the system is simultaneously ‘bottom-up’ and ‘top-down’. Perhaps even more important than feedback is the need for a communal goal, which serves as the impetus for the collective. While this goal may evolve in time, it continually links the individual and collective and makes the city more than a mere grouping of buildings.

ii. The Natural Ecology—Soft Infrastructures

The photograph Earthrise® taken by the Apollo space shuttle framed the globe as a unified, yet differentiated object and provided an image for a new global collective in a moment of increasing socio-political fragmentation. In the current era of environmental crisis, the natural environment is perhaps the only issue that affects all of humanity equally and requires the formation of a new collective to be addressed. This emphasis on the collective natural environment repositions the role of infrastructure as the foundational spatial format, as it allows for the interconnection between the human and environmental spheres—constantly negotiating the boundary between landscape, urbanism and architecture. As the notion of the ‘public’ continues to parcel into various niche groups, infrastructure, as one of the few spatial categories that is funded and utilized by the entire public, remains the last vestige of publicness in the contemporary metropolis.

Equally important to the framing of a collective, Earthrise depicted the globe as a vast and complex series of dynamic systems and made it apparent that the globe’s stability was rooted in such dynamism. These systems could be characterized as ‘soft’ in their complex negotiation through feedback of the XSI and XL scales. The renewed soft project stemming from such understanding has evolved beyond materiality to a system of organization. Infrastructure is implicated here once again as it oscillates between the local and global as well as the natural and artificial. Typically emerging from the top-down, infrastructure traditionally operates in the framework of resistance instead of resilience. In essence, infrastructure has been deployed as a machine over the larger landscape, which thrives from its subcomponents conforming to its logic. While sub-networks of infrastructural systems offer a form of contingency, the essential conception and deployment has been to mitigate and eliminate disturbance. Although infrastructure supports almost all aspects of our daily lives—water, waste, mobility, energy, food, etc.—it has rarely been


15. For more in depth discussion of the ‘soft pod’ project in the Vienna context, see: Jon Cummings, “Oil Ship and Prosthesis: Vienna, 1965-72” in this almanac.


Magic Carpet and Brunhilda’s Magic Ring of Fire, Michael Webb (1968)—soft field of air tubes that suppresses the notion of the collective framework. (Drawing by Alicia Hergenroeder)
thought of holistically or symbolically. The critical project that this new collective must undertake is a paradigmatic shift in the role and development of infrastructure, such that it operates symbolically between the human and natural spheres as a soft system that provides resilience through the continual negotiation of ‘top down’ and ‘bottom up’ organizations within the ecological poles.

**Soft Fields and Frameworks**

While the soft pods of the 1960s and 70s typically operated at the limits of material properties and were therefore scaled to the individual, there are some examples that provide cues on how infrastructure could be deployed or conceived with systemic symbiosis or offer resilience. A project that differentiates itself from the typical inflatable bubble is Michael Webb’s Magic Carpet and Bhuvnidesh’s Magic Ring of Fire (1968). In Webb’s speculative project, a field of air tubes function as a reverse hovercraft, which can adapt to the transforming positions of the body. What makes Webb’s project unique from earlier experiments such as Cushicle (1966) or Suitaloon (1967) was the abandonment of a singular pod envelope for a field condition of air jets. Blowing air at varying pressures, the tubes are in constant renegotiation to support the body in different positions. As a distributed, non-hierarchical network of individual components, the enclosure is able to actively respond to its user’s local circumstances while also having overall continuity from the gridded matrix. While it is conceivable that a framework would need to exist to hold the field in place and host the mechanical equipment, Webb completely omits this information from the drawings. Representing the tubes as emerging from the landscape, and suppressing the notion of the framework, Webb’s project examines the limits of dematerializing the frame while still providing collective unity to the field. His ‘mini-structure’ depicts how a field that privileges its unit and their local relationships can, on the one hand, reconcile the individual and collective, and on the other, absorb and adapt to disturbance.

This frail line between the individual and collective also finds a form of reconciliation at the scale of urbanism in Black Rock City (BRC). Conceived as a temporary settlement, BRC is organized on the ancient lacedak in the Black Rock Desert for the eight-day annual event, Burning Man. With modest beginnings of twenty friends in 1986, the event has grown to host over fifty thousand participants. The current urban plan, which formalized a spontaneous organization, was put into place for safety, municipal, and social reasons. The planner of BRC, Rod Garrett, stated that before the plan was instituted:

> We got to a point where I saw people becoming irrationally angry with each other and with the city… It occurred to me that this might be an effect of overpopulation, and that we’d hit some tipping point where no one was anymore comfortable.19

Garrett had noticed that the collective was dissolving as the populace overtook the city’s framework and lost its coherence and organization. Yet, the notion of a ‘top-down’ planning regime was antithetical to the concept of the festival, which revolved around the symbolic burning of the “man.” Within such a seeming paradox, Garrett explored the notion of a soft framework to organize the public and harness collectivity without suppressing individual expression or identity. Garrett’s plan is based on a radial grid that is etched into the desert landscape. These concentric rings are centered on the “burning man,” a legible orientation device (as well as symbolic icon) that unifies the collective. The grid is cut transversely into roughly Manhattan sized blocks, with streets occurring every 7.5 degrees. Not only do these streets all orient to the burning man, they are spaced to align with hands on a conceptual clock (located every fifteen minutes). Main promenades are thirty feet wide and occur on the 3:00/9:00 and 6:00/12:00 axes. Secondary streets at 7:30 and 4:30 widen as they reach the plays to provide nodes for art installations. The concentric streets are ordered alphabetically, with their names changing each year depending on the theme of the event. The one hundred and sixty blocks (and growing) are zoned to host both art installations and residences in the form of trailers, tents, and other temporary shelters. The horsehoe plan was purposely not enclosed into a circle, as Garrett had witnessed through empirical study that the circle lacked overall directionality, disorienting participants into fragmented groups and shattering the notion of collectivity. Garrett’s soft framework links legibility and collectivity—materializing through symbolic markers, mental mapping, and territorial organization—allowing the individual to continuously understand their relationship, and thereby participate in the collective.

Black Rock City is an experiment in the coupling of an unplanned bottom-up organization within a top-down framework. This presents a form of ‘mega-architecture’, wherein the framework itself can adapt to needs of the unit and vice versa.20 This allows the system to evolve in the event of disturbance, providing for resilience that operates at the intersection of the individual and collective. This soft framework has proved remarkably resilient to growth; for instance, in 2010 a record population of 51,525 participants attended Burning Man, initiating the fabrication of two concentric streets during the middle of the week.21 The same conceptual plan, which accommodated nine thousand participants in 1998, now hosts over fifty thousand inhabitants. Each year the plan is updated based on observation, allowing for feedback into the framework’s organization, as stated by Garrett:

> As our plan has grown, we have learned how to differentiate and separate various specialized, and potentially conflicting uses. This involved an empirical study of our social needs as they’re naturally emerged from an increasingly sophisticated social reality.22

As stated by Garrett:

> “Soft Progressivism in a Wasteland of Urban Contingency/Resilience”, The Design Observer/Places


20. For further discussion on the relationship of platform and application, see: Scott Coleman, “Soft Progressivism in a Wasteland of Urban Code” in this almanac.21


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Informal aggregations in Black Rock City, organized by a soft frame. (Image from Flickr user Tobo, Creative Commons)
In October 1976, Amory Lovins, a consultant physician and British representative of Friends of the Earth, published the article “Soft Energy Path: The Road Not Taken.” Lovins’ paper outlined an alternative “soft path” to conventional energy policy, announcing that sustaining energy growth was not the answer. The hard path—technologies—high-energy nuclear and centralized electric energy—resulted in excessive waste of resources, which could not continue given rising costs, adverse environmental impacts, safety concerns, and the proliferation of weapons. A significant social change, Lovins reasoned, was necessary to transition from the hard to soft energy path. The goal was to shift industrial societies to lower-energy, fusion-free, and decentralized sources that would match energy supply and quality to user demands.

The “Soft Energy Paths” article brought a storm of controversy that culminated with a congressional hearing on energy in December 1976. Beyond its historical significance in contemporary policy circles, the debate on the hard and soft paths has had an important historical significance in contemporary policy circles, the debate on the hard and soft paths has had an important historical significance in contemporary policy circles, the debate on the hard and soft paths has had an important historical significance in contemporary policy circles, the debate on the hard and soft paths has had an important

The Soft as a Critique of the Fossil Fuel Energy System

In the words of Dr. Pickering, one of Lovins’ critics and a professor of social theory, Lovins deserves more critical attention because he is trying to generate a sense of alternatives, and because he does pose, howeverback-handedly, the problems of social change which are necessary in any serious discussion of the future of our energy needs or the future of democratic institutions. On a basic level, Lovins proposes to expand the narrow disciplinary framing of energy, and by extension the ground on which debates over energy are published in Hugh Nash, ed. The Energy Controversy: Two Projects, Soft Path Questions & Answers (San Francisco: Friends of the Earth, 1979).

4. Ibid., 36.

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