

LANDSCAPE INFRASTRUCTURE
Case Studies by SWA
Second and Revised Edition

The Infrastructure Research Initiative at SWA (ed.)

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Second and Revised Edition

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EDITORIAL SUPERVISION: RIA STEIN, BERLIN
COPY-EDITOR: MELISSA VAUGHN, BELMONT, MASSACHUSETTS

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P.O.BOX 4009, BASEL, SWITZERLAND

PART OF DEGRUYTER

PRINTED ON ACID-FREE PAPER PRODUCED FROM CHLORINE-FREE PULP. TCF ∞

PRINTED IN GERMANY

ISBN 978-3-0346-1272-2

WWW.BIRKHAUSER.CH

9 8 7 6 5 4 3 2 1

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PRE FACE

by Gerdo Aquino

THE ROLE OF PUBLIC INFRASTRUCTURE in our cities and towns is changing. The integration of clean energy, mass-transit alternatives, and changing attitudes about water conservation and air quality has created a new set of performance criteria for existing and proposed infrastructural corridors. As large, contiguous systems, these corridors are networked across a vast scale of public and private lands, serving the historic (and oftentimes, monofunctional) purposes of moving vehicles, electricity, gas, water, and oil. The primary aim of this book is to question the ongoing viability of these single-purpose corridors by proposing that a multifunctional approach is more in tune with the needs of contemporary society. Two landscape-based systems seem appropriate as programmatic overlays to these infrastructural systems. The first is a ubiquitous pedestrian system. As residential densities increase, so does the need for improved transit and equal access to open space for social and cultural activities. The second is natural systems—water, vegetation, soil, and habitat and their latent potential to operate within a broader, more connected distribution network. Landscape becomes the medium by which to formulate and articulate solutions for the integration of infrastructure with viable programming that can address the pressing issues facing many cities around the world. In effect, landscape plays a more structured role in the development of new infrastructure, raising the question: can landscape itself be considered infrastructure, when acting as a kind of conveyance or distribution network capable of moving people and supporting a variety of living systems?

This book, *Landscape Infrastructure: Case Studies by SWA*, now in its updated and revised second edition, includes an essay by Pierre Bélanger as well as updated case study diagrams and photos of recently completed work. The content within this book continues to draw substantial inspiration from conferences, symposia, and university research studios of the past ten years that argue for a unique kind of landscape that can reposition itself as a complex, instrumental system of essential services, resources, and processes. This kind of landscape underpins contemporary urban economies and acts as a performative hybrid infrastructure whose

results are as much about culture as they are about engineering. Findings overwhelmingly indicate that a fresh point of view is needed to plan and manage cities with outdated infrastructure and that a focus on infrastructure is the key to a more vibrant and functional 21st-century city. The City of Chicago's Green Alley Program of 2007, for example, seeks to transform an unprecedented 3,057 kilometers of poorly drained public alleyway infrastructure into 14.16 square kilometers of permeable surface area to reduce flooding and heat-island effect, while maintaining access for service vehicles and creating a viable medium for plants. What is compelling about this example of repurposing infrastructure is how a simple material like porous paving can yield substantial ecological benefits such as groundwater recharge, support phytoremediation and habitat creation efforts, and simultaneously result in a contiguous recreation framework for people.

The Infrastructure Research Initiative at SWA (I.R.I.S) was created by Ying-Yu Hung and myself as a testing ground for engaging and redefining infrastructure in the context of future growth in our cities and towns. This book seeks to position the future of infrastructure as an integrated alternative for improving mass transit, enhancing public accessibility and ecological performance, while remaining economically sound. Further objectives of the book are to merge relevant topics in hydrology, natural systems, density, transit, pollution, and public health with infrastructure and program. A series of critical essays explore the potential of landscape infrastructure as a means to debate, discuss, and dialogue. Case studies collected by I.R.I.S represent the work of various SWA studios and are offered, not as a definitive collection, but rather as a broad outline positing a set of principles and strategies with which to explore the potential of this topic and the various contexts that can nurture further investigation, research, and analysis. As an integral part of our daily regimen, infrastructure must be reimaged for the advancement of our culture, ourselves, nature, and the lifestyles we hope to sustain now and in the future.

Reading the Recent Work of SWA

CHARLES WALDHEIM

WHAT CAN ONE SAY WHEN CONFRONTED with the recent work of the SWA Group, as presented in this publication? It would do well to clarify the work's origins and attributions—to locate it in relation to swa's origins, historical iterations, and diverse contemporary identities. This reading would also allow one to situate the work of swa in the broader design milieu and disciplinary discourse of landscape architecture as a form of urbanism.

This publication and the "Infrastructure Research Initiative" that initiated it are largely the intellectual and practical work of Gerdo Aquino and Ying-Yu Hung in the Los Angeles office of swa. Aquino and Hung formed a studio of swa in downtown Los Angeles in October 2004. Given swa's historic footprint in California, and the proximity of its Laguna Beach office, one would read the formation of this new studio as motivated by something other than simple market share; the formation of the LA studio has at once reinvigorated swa Group's historic commitments to studio culture and—reinforced the autonomy of its principals. It is possible to view the recent work of the LA studio (we may efficiently refer to the speculative studio within the corporate body as Aquino/Hung et al.) as forming a contemporary alternative to the popular perception of late swa as a large, multinational, corporate landscape architecture and planning firm. This particular form of a smaller studio within a larger practice is relatively well established, often referred to as a "boutique" design studio operating within the structure of a large corporate design consultancy. The economic and cultural logics supporting this arrangement are not uninteresting and might be fairly generalized as affording a desirable combination of seemingly irreconcilable attributes

for a design practice. Among the perceived benefits are financial stability, cash flow, and general name-brand reputation on the business side of the ledger, combined with an agility, flexibility, and openness to new ideas traditionally associated with younger, smaller, and less well-capitalized design shops. Although this formation has many precedents, the work of Aquino/Hung et al. presents specific aspects that deserve attention. swa, originally formulated as Sasaki Walker Associates in 1957, was conceived around the development of a distinct studio culture of multidisciplinary collaboration, decentralized autonomy, independent decision-making, and design innovation. The formation of the LA studio, and Aquino's direction of it, could then be read in two ways: as an attempt to expand swa's practice in the context of increasing competition for brand identity, market share, and critical distinction among its peer institutions, and as a vigorous extension to swa Group's origins in a commitment to autonomous studio structure and decisive design direction. Perhaps it was viewed equally as a means for recruiting and retaining the next generation of design leadership, who would find the downtown LA location reflective of a newfound cosmopolitanism in the practice of landscape architecture and planning. Whatever the motivations, the rhetorical shift associated with the foundation of an LA studio was significant, both in locational and linguistic terms. Among the related rhetorical moves would be the formulation "Infrastructure Research Initiative"—the impetus for this publication. The use of the term "initiative" places Aquino and Hung on the offensive, carefully setting apart this effort from the "collaborative studio" format that swa had made its calling card. The use of "initiative" further distinguishes



**CENTRAL OPEN SPACE
IN MAC COMPETITION,
CHUNGCHEONGNAM-DO
PROVINCE, SOUTH KOREA.**

*This 2007 strategic plan
by SWA Group (LA Office/
Aquino/Hung et. al.) for
the International Design
Competition proposed a
new concept of "Park as
City" for the Multifunctional
Administrative City (MAC).*

the activities of the LA studio as addressing more broadly the culture, identity, and core values of the swa Group brand. By describing the activities of the studio as "research" (as opposed to practice, work, or projects), Aquino and Hung aspire to build a space for experimentation, risk-taking, and the production of landscape projects as cultural forms. Aquino/Hung et al., as well as the supportive senior leadership of swa, may have intended to use the LA studio as a kind of design think-tank. One could also imagine that they hoped to speculate on future forms of cultural production to reposition swa Group's work as relevant to design and planning professions increasingly focused on design leadership. This is not to say that swa Group's impressive half century of landscape design and planning work was not without its historic contributions to the disciplinary discourse and professional aspirations of landscape architecture, urban design, or planning. Rather, it seems possible that the swa Group found that while they had been extraordinarily successful with global relevance and reach, they were increasingly

perceived by some as having grown beyond their origins as a studio-focused, design-driven shop. This brings us to the first rhetorical clue, and the central claim of the work presented here, in the very title of this publication itself: "infrastructure." By choosing infrastructure as the object of study, Aquino/Hung et al. enter contemporary discourse on landscape as a form of urbanism. This is a crafty move, one not without its ironies, particularly given that swa has historically had more to do with infrastructure as an element of contemporary landscape and urban design than could be summed up in this modest publication. Of course the swa Group came to prominence at a moment when landscape architecture was fundamentally committed to the design and construction of urban environments as shaped by infrastructure. In describing the activities of the LA studio as research into infrastructure as an element of urban order, Aquino/Hung et al. consciously appropriated one of the most resonant of contemporary topics in landscape research, one that would simultaneously inform a reading of swa Group's

current commitments as well as shed light on a rereading of the firm's history.

One reading of Aquino's aspirations in rebranding swa through the LA studio is evident in his identification of infrastructure as one dimension of recent interest in landscape as a form of urbanism. The disciplinary discourse and design methods associated with landscape urbanism emerged over the past decade as a critique of the disciplinary and professional commitments of traditional urban design and an alternative to "New Urbanism." The critique launched by landscape urbanism has much to do with urban design's perceived inability to come to terms with the rapid pace of urban change and the essentially horizontal character of contemporary automobile-based urbanization across North America and much of Western Europe. It equally has to do with the inability of traditional urban design strategies to cope with the environmental conditions left in the wake of deindustrialization, with increased calls for an ecologically informed urbanism, and with the ongoing ascendancy of design culture as an aspect of urban development. The established discourse of landscape urbanism is seemingly enjoying a robust middle age, at once no longer sufficiently youthful for the avant-gardist appetites of architectural culture yet growing in significance as its key texts and projects are translated and disseminated globally. The discourse on landscape urbanism, while hardly new in architectural circles, is being absorbed into the global discourse on cities within urban design and planning, nowhere more rapidly than in the East Asian context of urbanization, particularly through international design competitions for new cities in China and South Korea.

It is no coincidence that over this same period of time, landscape architecture has itself enjoyed a relative renaissance within design culture. This well-documented resurgence of what had been described by some as a relatively moribund field of intellectual inquiry has been particularly fruitful for discussions of contemporary urbanism. In addition to its relevance for describing the contemporary urban field, might landscape have potential to resonate with the larger territorial subjects of urban planning? Ironically, the potential for landscape to inform planning comes from its newfound ascendancy within design culture and the deployment of ecology as model or metaphor rather than through the longstanding historical project of ecologically informed regional planning. As this point is a potential source of confusion and is likely to be a topic of debate, this essay offers a provisional reading of how landscape might profitably inform the present and future commitments of urban planning.

Landscape's renewed relevance as model for contemporary urbanization was first highlighted by European architects and urbanists describing North American cities such as Los Angeles (Kenneth Frampton), Houston (Lars Lerup) or Atlanta (Rem Koolhaas). It has come to stand for a profound critique of the perceived failures of urban design to effectively respond to the spatial decentralization, neoliberal economic shifts, and environmental toxicity found in those cities. Equally, it promises an alternative to the reactionary cultural politics of traditional urban form, in which environmental health, social welfare, and cultural aspiration are no longer mutually exclusive. Although landscape architects may not have been the first to make such claims, the discipline has mounted spirited support for its expanded agency as the field diversifies and grows in design literacy.

Meanwhile, over the course of the past decade, the discipline of urban design has been largely preoccupied with traditional urban form, and has been relatively slow to appreciate the import of landscape's newfound cultural relevance. These developments are not unrelated to the rapprochement between the design disciplines; they have been informed by calls for interdisciplinarity with respect to the challenges of the contemporary city as well as in design education.

It is in the context of urban design's unrealized promise that landscape urbanism has emerged in the past decade. Landscape urbanism has come to stand for an alternative within the broad base of urban design historically defined. Incorporating continuity with the aspirations of an ecologically informed planning practice, landscape urbanism has been equally informed by high design culture, contemporary modes of urban development, and the complexity of public-private partnerships. Although it may be true that the urban form proposed by landscape urbanism has not yet fully arrived, it would be equally fair to say that landscape urbanism remains the most promising alternative available to urban design's formation for the coming decades. Landscape urbanism offered a culturally leavened, ecologically literate, and economically viable model for contemporary urbanization as an alternative to urban design's ongoing nostalgia for traditional urban forms. One evidence of this is the number of internationally prominent landscape architects who have been retained as lead designers of large-scale urban development proposals in which landscape offers ecological function, cultural authority, and brand identity. Another would be the fact that swa Group has invested in Aquino/Hung et al. the task of rebranding their global enterprise along the lines of contemporary interests in landscape as a form of urbanism.

Yet SWA has been engaged in planning projects concerned with urban infrastructure for a long time. This fact has much to do with SWA's origins in a specific moment of design culture, when the new field of urban design was being invented. At that time, the professional practice and academic study of landscape architecture had much to do with the description and delivery of urban form. The invention of urban design as a design discipline effectively happened at a conference in Harvard on that subject in 1956. It coincided more or less precisely with Hideo Sasaki and Peter Walker forming SWA (1957) and with Sasaki's appointment as Chair of Landscape Architecture at Harvard (1958). In this milieu, and in the institutional context of Harvard's Graduate School of Design, one proposal for the development of the Urban Design program at Harvard (founded in 1960) was that it would be administered by the Department of Landscape Architecture.

This intriguing historical possibility was recently documented by Richard Marshall in the Harvard Design Magazine's issue on the history and future of urban design.¹ It would have rehearsed nearly exactly the origins of urban planning at Harvard, which was itself hatched and housed for a time in the Department of Landscape Architecture. In the cultural context and pedagogical profile of landscape architecture at Harvard during the period 1956–1958, urban infrastructure was rightly considered a disciplinary domain associated with landscape architecture. In this regard, one could read Sasaki Walker Associates, SWA, and subsequent iterations of the firm as having stemmed from an ethos based in collaborations across disciplines, in which landscape architects played a central role in the shaping of urban form. In the economic and social contexts of the late 1950s and 1960s, the firm first rose to prominence through servicing a range of design and planning clients, largely in sites of rapid urbanization and growth. This tendency continued with increasing international engagements for corporate clients, private developers, and public-sector actors engaged in urbanization. From the late 1960s through the 1990s, however, design culture and the discipline of landscape architecture shifted dramatically in favor of smaller design offices, increasing disciplinary and professional distinctions between landscape architects, urban designers, and architects; a simultaneous development was the increasing role of civil engineering and land planning professionals in competition for the management of urbanization. During this transition—one that has been described as a shift from a Fordist to a post-Fordist economy—landscape architecture and planning firms transformed themselves from studio-based collaboratives formed

around professional identities and often held as partnerships into larger multidisciplinary organizations increasingly organized around integrated project delivery and mirroring the corporate structure of their clients. This transition found many firms moving internationally to insulate themselves and balance the risk of turbulent domestic business cycles. During this time, SWA transitioned to its third generation of leadership and reorganized itself as an employee-owned firm. SWA was poised to deliver urbanization virtually anywhere on the planet, but design culture and the disciplinary construction of landscape architecture had changed radically in favor of “starchitects,” brand-name designers, and celebrity landscape architects. By the late 1980s and early 1990s, as economic imperatives and media culture pushed the design disciplines to embrace an explicitly branded form of design authorship associated with design excellence, SWA had successfully smuggled a collaborative, studio-based form of landscape practice into an ever more globalized marketplace for urbanization. They found themselves in demand globally, frequently called upon to synthesize the effects of multidisciplinary design teams including the work of land planners and civil engineers responsible for urban infrastructure. They were not, however, well positioned to market themselves as an idea-driven, research-focused design studio closely associated with the design philosophy (read style) of a singular figure in the field, as were increasing numbers of their competitors. The challenge of generational transition from founders to next-generation leadership has haunted design practice in North America over the past century. By some, the model that SWA committed to in Aquino/Hung et al.—of a boutique design practice operating within a larger firm—has a long lineage. In architectural practice, the equivalent example could be Skidmore, Owings & Merrill in the 1950s and 1960s. In Chicago, Walter Netsch developed a boutique studio practice, bringing his own clients and staff to bear on a range of award-winning design projects under his name but with the benefit of SOM's support infrastructure and brand name. The combined economic and cultural forces on contemporary practice produce a hybrid in which the individual design talent (and all that it promises in marketing or media) is embedded within the larger service firm (and all that it affords in terms of project experience, market capitalization, and support staff).

So the question persists: what can one say when confronted with the recent work of the SWA Group, as presented in this publication? As this brief introduction is far too limited to aspire to anything synthetic or comprehensive, a rereading of three featured projects might be apt. All three display

ANNING RIVER NEW SOUTH TOWN, MIYI COUNTY, CHINA.

The scheme by the swa Group (LA Office/Aquino/Hung et. al.) was conceived in 2010 for a site in the Chinese province of Sichuan.



an appetite for an ecologically leavened urbanization in the context of massive social, economic, and cultural transformations associated with global processes of urbanization.

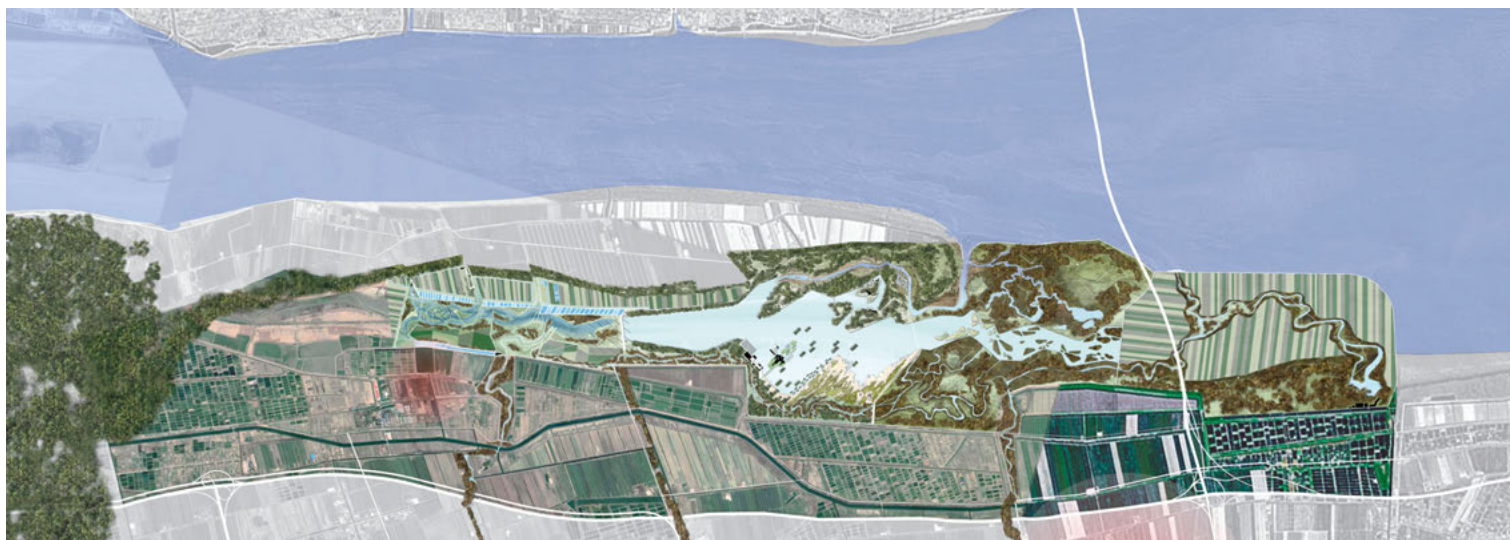
In their June 2009 entry for the Anning River International Design Competition in Miyi County, Sichuan Province, China, swa proposed the organization of a new town through a reading of the site's historic ecologies and contemporary hydrologic networks. The project, "Future Historic Ecologies," proposes the introduction of a range of ecological agents including bio-film matrix strips to stimulate the activation of functioning wetland ecologies. These synthetic agitations of the existing river ecology are situated within an historical and interpretive reading of cultural landscape and ecological heritage. These aspects of the Anning River

proposal point to emergent fields of research, particularly the intersections of river hydrology, synthetic habitat construction, and landscape or agricultural ecology as elements of cultural heritage. The scale, ecological potential, and historical literacy of this proposal illustrate the range of commitments and areas of research fostered within the space of swa's LA studio and the Infrastructure Research Initiative there.

In their entry for the Chongming Island International Design Competition of June 2008, in Shanghai, China, the studio asks two provocative questions: can we farm habitats? Can the city improve nature? Their project "Cultured Ecology; Ecological Culture," implies that these are relevant questions for contemporary urbanists to consider, but the more probative dimension of the proposal revisits the hybridity of historic ecologies with synthetic environments seen in their Anning River project. In Chongming Island, we see this uncanny twinning of cultural heritage (formerly the province of preservation-minded architects) with highly engineered wildlife habitat (formerly the province of restoration-minded landscape architects). This project proposes a third approach between putting back the city or putting back nature—a synthetic hybrid of infrastructures, urban and ecological. This hybridization and multifunctioning of urban infrastructure form recurrent themes in the work of swa Group's LA studio.

A third example of the Infrastructure Research Initiative's ongoing concerns can be found in their entry for the "Multifunctional Administrative City" (MAC) International Design Competition of 2007, in South Korea. Here, a conceptual inversion was proposed through which the city is fundamentally reconceived as park—a reformulation of the basic arguments on behalf of landscape as urbanism. The proposal can also be read as an historical reinterpretation of the western tradition of urban landscape understood through urban infrastructure. This historical literacy regarding urban type, block structure, and landscape design reveals the studio's deep affection for landscape history as a medium of city-making, whether in the tradition of Olmsted, Alphand, or others.

These three projects from Aquino/Hung's LA studio adapt contemporary tropes of landscape urbanism practice and reshape them to the service of massive ongoing urbanization. They form an interesting hybrid between the contemporary avant-gardist aspirations of much design practice globally and an enlightened rereading of the histories and traditions of regionally informed ecological planning practice. They rehearse much of the discourse around landscape urbanism



**MASTER PLAN FOR THE
NORTH LAKE REGION
OF CHONGMING ISLAND,
SHANGHAI, CHINA.**

This 2007 design by SWA Group (LA Office/Aquino/Hung et. al.) addresses global issues of sustainable development, carbon sequestration, and wetland restoration, while providing for the educational and recreational needs of the residents of Shanghai.

from the past decade or more while formatting themselves to the repetitive standardization of the international design competition. Although North American discourse on urbanism and landscape has tended to maintain a distinction between larger corporate service firms and design-driven boutiques, the list of competitors to these urban design competitions reveals the strong structural symmetries between the celebrity design firms and their corporate counterparts.

First, virtually all competitors represent flexible teams built from a range of international consulting practices. The design firm built around the identity of a single architect or landscape architect and the firm built on a collective corporate identity are converging rapidly on a model of collaboration. Second, it is no longer a safe assumption that the firm identified through a single principal designer is less well-capitalized than its corporate cousin, nor can one make easy assumptions regarding their forms of ownership or profitability. Third, the celebrities and their corporate counterparts are often engaged in joint ventures, partnerships, and buyouts. The design fields in general, and large multidisciplinary urbanism firms in particular, are trending toward a state that has existed in advertising for many years in which a stable economy is found between a few large, global brands that act as holding (and trading) companies for a countless number of boutique design shops.

It is no coincidence that Aquino/Hung et al. identified the discourse around landscape urbanism generally, and infrastructure more specifically, as an entry point into contemporary readings of landscape as a cultural form. Over the past decade, an adjectivally modified form of urbanism

(be it landscape, ecological, or other) has emerged as the most robust and fully formed critique of urban design and planning's failure to produce meaningful, socially just, and environmentally healthful cities. The structural conditions necessitating an environmentally modified urbanism emerged precisely at the moment when European models of urban density, centrality, and legibility of urban form appear rather remote and when most of us live and work in environments more suburban than urban, more vegetal than architectonic, more infrastructural than enclosed. In these spaces, the work of the SWA Group's LA office and its Infrastructure Research Initiative proposes infrastructure as a medium of design informing both landscape and urbanism. Although the LA studio may have begun as an initiative by Aquino/Hung to correlate design and research practice with the City of Los Angeles, while attempting to recruit and retain the next generation of design leadership, it has recently come to portend the future direction of the firm more broadly: Aquino has been named SWA's new president. The scalability of his accomplishments from an insurgent studio in downtown LA to the global scale of SWA Group at large remains to be proven; this publication is timely, revealing both the objects and subjects of contemporary design culture as it continues to transform in relation to urbanization driven by mobile international capital.

NOTES

- 1 Richard Marshall, "The Elusiveness of Urban Design: The Perpetual Problems of Definition and Role," *Harvard Design Magazine*, no. 24, Spring/Summer 2006, pp. 21-32.

Landscape Infrastructure:

SYSTEMS OF CONTINGENCY, FLEXIBILITY, AND ADAPTABILITY

YING-YU HUNG

LANDSCAPE ARCHITECTURE IS A DISCIPLINE of diverse interests, scales, and territories. In this regard, the field of landscape architecture is vague and requires clarification. Landscape architecture as a profession in the United States, however, is traditionally recognized as engaging two general areas: landscape planning to integrate sensitively natural resources and development, and landscape design as a cultural and economic construct serving people's needs. These two broadly defined areas are at times addressed separately due to scale and site complexities, leading to a fragmented point of view of "landscape."

Over the last 20 years, new trends in landscape architecture have sought to define the practice from a more holistic vantage point, one that is not limited by what we create but that reflects an integral part of our philosophy—our way of life. This new worldview stems from our realization that we, as a society, have contributed to the deterioration of our environment. Landscape architects and urbanists can help reverse the process, cognizant that even with our best intentions, the landscape we create may yield unpredictable results, and that the aspect of "change" is the underlying factor in everything we do.

This philosophical understanding suggests a new way to think about landscape architecture, a way that furthers the dialogue between ecological process and design. To that end, landscape architecture is crossing disciplines; the physical framework from which landscape architecture operates has no boundaries, and the purposes it serves are becoming more infrastructural, sociopolitical, economic, and environmental. In addition, the practice of landscape architecture today is more closely aligned with architecture, urban

design, and planning than ever before. Many successful infrastructural projects often involve landscape architects' full participation with engineers and scientists from the outset. Among many leading practitioners, the convergence of these practices shares a common outlook: the global landscape is mosaic-based, where edges are permeable and the boundaries between cities and countryside are in flux. Within this "mosaic" landscape, there exists a complex set of networks or systems that are highly interconnected and interdependent. The systems cannot be approached in isolation, as even the smallest intervention affects the larger whole. Landscape architecture today offers the means to analyze, synthesize, and provide an organizational framework toward an integrated urban design strategy. At the same time, the landscape architect possesses the unique ability to address a project at multiple scales—to think big and small at the same time, to give form and beauty and create identity and memory in a place.

IDENTIFYING THE TREND: LANDSCAPE URBANISM

"Landscape urbanism" is a term coined 12 years ago by Charles Waldheim, who stated that "landscape has become a lens through which the contemporary city is represented and a medium through which it is constructed."¹ Further, Waldheim contends that landscape architecture has in fact replaced architecture and urban design as the primary discipline that establishes the framework for contemporary city-making. The premise that architecture and urban design have become commodities used to further the economic needs of the city through branding and rebranding has put these professions at risk of becoming irrelevant. In contrast,



landscape architecture seeks to take on the context itself, the infrastructure and the “spaces in between” within urban environments, to instill purpose, legibility, and cohesiveness, so that the city as a whole is healthy and robust.

The tenets of landscape urbanism as described by Waldheim clarify a series of conditions that commonly exist in our practice of landscape architecture today.

1. *The practice of landscape architecture involves the acceptance that ecological and social processes in an urban environment cannot be determined. Modest investment and control at strategic moments during the design process may yield greater richness and complexity in the end.*
2. *As a means to educate the public about the role of nature in the urban context, ecology has largely assumed a performative role as a public spectacle that can be easily understood and appreciated by any person. The same could be said about landscape architecture as environmental art, a medium through which artists and designers reveal the ephemeral forces of nature by visually recording these subtle changes over time.*
3. *By leveraging the public’s basic interest in ecology (“ecological literacy”), the landscape architect today is able to create a new development paradigm that is ecologically viable, culturally relevant to the identity of the place, and financially profitable.*
4. *Translating the principles of landscape urbanism into physical form increasingly relies on the use of parametric*

processes, in which a set of variables or parameters is given to a design problem. By manipulating the variables (which may be ecologically driven), alternative solutions are generated, such as varying degrees of building density, or configurations of building massing yielding optimized open-space networks.²

Waldheim’s elucidation of these critical points on landscape urbanism prompted a renewed focus in the profession and reaffirmed the significance of landscape architecture. It is clear that the role of landscape architecture begins at a pre-policy level and where public and private interests establish rapport for a common cause. This common cause forms a physical blueprint for which subsequent policies are adopted into planning guidelines for future projects. SWA’s Anning River master plan project in the province of Sichuan, China, best illustrates this process. This 330-hectare project was conceived in a competition to solicit nontraditional strategies toward integrated ecological planning. As the selected winner, the project identified valuable features that would be part of a future infrastructural framework, including 56 hectares of agricultural land, irrigation canals, and a hydro-electric power plant (as an education tool for public outreach). The project further developed innovative technologies to clean the murky water of the Anning River, using bioremediation to make clean water available for passive recreation, wetlands, and forests, to increase biodiversity. This strong ecological planning approach gives the government the tools to apply for public funding, to give the city a unique identity, and to set up control guidelines for future developments.

BROWNWOOD MARSH RESTORATION, BAYTOWN, TEXAS.

The boundary between nature and human habitation is constantly in flux, where human action may easily tip the balance as in the case of a new housing subdivision in Galveston Bay, Texas. The industrial ground water withdrawal caused more than 15 feet of subsidence, bringing the entire development down to sea level. As part of the Superfund project, swa and Couch Environmental converted the neighborhood into a 60-acre saltwater marsh, creating a rich habitat for wildlife, including 275 bird species, fish, and crustaceans.

IN FOCUS: LANDSCAPE INFRASTRUCTURE

Within the framework of landscape urbanism, infrastructure offers the next step for further inquiry as a city's development and economic future is in direct proportion to its ability to collect, exchange, distribute goods and services, resources, knowledge, and people across vast territories. A city with a well-capitalized infrastructural system provides for an efficient, fluid operation hence maximizing its productive power and regional influence. Funded by powerful public and private ventures, North American cities developed from the 18th to the 20th century were outfitted by a robust system of railways, highway networks, ports, and terminals. The fierce competition for resources, technology, and commerce in the 21st-century global economy necessitates a close reexamination of America's infrastructural viability, to evaluate systems' current capacity, ability to meet expectations, and to repurpose these systems as potential future resources.

The U.S. Interstate Highway System is an example: it was initially developed for national defense purposes—distributing ammunition and wartime vessels and dispatching military personnel efficiently throughout the country. Over the last 50

BALLONA CREEK,
LOS ANGELES, CALIFORNIA.

A channelized waterway isolated from the rest of the urban context by chain link fences. On one side of the channel is a 14.5-kilometer-long bike path which connects the City of Los Angeles to Marina Del Rey.



years, this road system has been re-appropriated for civilian use, carrying 40 percent of all highway traffic, 75 percent of heavy truck traffic, and 90 percent of tourist traffic.³ Due to overcapacity and lack of funding for improvements and maintenance, the infrastructure is in disrepair. This situation requires that we reevaluate the 75,440 kilometers of contiguous freeway system, to explore alternative means for transportation that are more energy-efficient and to recalibrate the current system into a multimodal strategy, as an ecological conveyance and a resource and energy redistribution mechanism throughout the United States.

WHAT IS INFRASTRUCTURE?

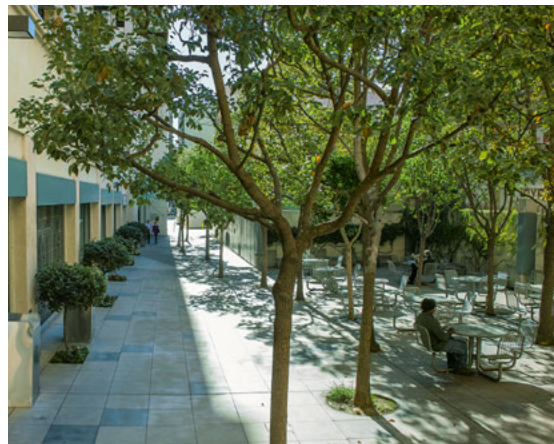
Infrastructure, classically defined, is “the basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public

institutions including schools, post offices, and prisons.”⁴

This essay focuses on land-based infrastructure and not public institutions and building facilities, simply because the practice of landscape architecture is inseparable from the realm of transport and utility infrastructure.

Our current infrastructural system has several defining characteristics. First, the system is often hidden from view, its logic and functional attributes are not immediately apparent, which breeds unhappy surprises and mounting frustration when the system fails.⁵ A case in point was the burst water mains in Los Angeles (part of the city's aging water system), resulting in massive flooding, damaged vehicles and housing, and water outage.⁶ Second, the design and engineering of infrastructure was historically conceived in isolation, independent of the overall urban vision. An uncoordinated infrastructural system often leads to conflicts and incompatibility between the infrastructure and its context, resulting in compromise measures such as mitigation, camouflage, and sometimes deactivation of the system, as opposed to the creation of urban parks and plazas that are places of celebration and civic pride.⁷ Last, the U.S. as a society, has traditionally placed a high value on the design of monofunctional infrastructural systems, engineered to maximize efficiency at a given time to fulfill a single purpose, but failing to provide a consistent level of efficiency throughout their lifespans. Such a singular approach produces serious impacts on the way infrastructure contributes to urban life. Parking lots, transportation corridors, transit hubs, and channelized waterways are left idle between peak hours, creating voids and barriers in the city. The “rivers” of Los Angeles are channelized waterways, including the 14.5-kilometer-long Ballona Creek corridor, which has an average peak flow of 107 cubic meters per second.⁸ During a particularly heavy winter storm in 2010, the entire channel was emptied within two hours, with the discharge directed into the Santa Monica Bay.

These infrastructural systems operate in the background; people know that they exist, but would rather forget about them. We are reminded of their existence when health and safety are at risk, such as in the case of BP's oil spill in the Gulf of Mexico and the 2010 deadly coal mine explosion in West Virginia.⁹ When such disasters make headlines, we are suddenly awakened to the cold reality of how infrastructure can threaten our lives, strip us of our livelihoods and diminish our enjoyment of life. As the interaction between countries has become more fluid and the perceived geographical distances between places have been significantly reduced due to immediacy of digital technology and ease of transcontinental flights, the infrastructure as we know it has ventured into uncharted territories—we are at risk of losing our ability to control and manage what we have created.



WHAT IS LANDSCAPE INFRASTRUCTURE?

The recent writings and discourse held among major universities and the professional community at large point toward the undeniable fact that “once married with architecture, mobility, and landscape, infrastructure can more meaningfully integrate territories, reduce marginalization and segregation, and stimulate new forms of interaction. It can then truly become ‘landscape.’”¹⁰ The integration of the infrastructural system within the landscape framework requires one to redefine the old system within a new set of paradigms, one that is more aligned to natural systems of ecology.

First, the nature of infrastructure today is successional,¹¹ where modes of infrastructure may quickly become obsolete, redistributed, and reinvented, subjected by global geopolitical and economic forces. The contingency of today’s infrastructure necessitates the system to be designed for flexibility and adaptability.¹²

Second, traditional infrastructure was conceived as a centralized, single-purpose system; the trend for today’s infrastructure system is to become decentralized, where the need to address, for instance, stormwater runoff, energy, farming, or transportation are resolved at a local level.¹³ Aside from performing its intended functions, the multifunctional variations of these vital systems can be a catalyst for urban revitalization through open-space augmentation, habitat creation, community revitalization, and transformation of urban blight into urban destination.

Last, infrastructure such as roads “are required to perform multiple functions: they must fulfill the requirements of public space and must be connected to other functioning urban systems of public transit, pedestrian movement, water management, economic development, public facilities, and ecological systems.”¹⁴ The multifunctional aspect of infrastructure also speaks to the importance of diversification as a general principle in city-making, leading to an optimized condition in which the city and its infrastructure are one and the same—where infrastructure informs how the city is

organized and built. A classic example is the Back Bay Fens in Boston, designed and engineered by Frederick Law Olmsted. The site was formerly a saltwater marshland tainted with untreated raw sewage from the city’s growing settlement. Land-reclamation projects in the 1820s began a series of dedicated efforts to improve water quality, control floods, and allow a tidal ecosystem to be reestablished. Today the Back Bay Fens is part of the 445-hectare chain of parks, parkways, and waterways forming the Emerald Necklace, bringing improved air quality, urban runoff retention and remediation, wildlife habitats, trails, sports venues, and a 107-hectare arboretum to Boston residents.

In addition to the temporal, decentralized, and multifunctional characteristics that define landscape infrastructure, landscape infrastructure is further comprised of a set of attributes relating to form, function, and time, outlined below, all of which have a cumulative effect benefiting the greater whole. A landscape infrastructure project may contain all of the attributes described, with one more dominant than another given varying degrees of scale, scope, and influence.

1. **Performance.** *As a nonisolated system, landscape infrastructure has the ability to adhere to a set of requirements and achieve measurable results.*

Infrastructure has traditionally been engineered to meet a set of expectations, while the benefits of landscape have often been undervalued due to its inability to produce quantifiable results. By adopting the infrastructure model, the performance of a functioning urban ecosystem can be evaluated and adjusted to achieve maximum results. Chicago, for example, has the world’s largest surface area of green roofs for an urban center.¹⁵ The performative nature of green roofs could be quantified through the system’s ability to reduce heat gain, collect stormwater, and provide urban wildlife habitat.

LEFT:
Service alleyway in downtown Los Angeles at Broadway and 5th Street.

CENTER AND RIGHT:
Biddy Mason Park in downtown Los Angeles, a pocket park and alleyway between Broadway and Spring Street near the historic Bradbury building. This urban respite is one of the “Art Walk” sites, with interpretive art and sculptural fountains celebrating Los Angeles’s multicultural history.

2. Aggregate. *Landscape infrastructure is often seen as piecemeal objects. When consolidated, the collective whole has the ability to remediate and sometimes even reverse negative impact.*

As a car-obsessed country, the United States builds its infrastructure around cars—a complex web of roads and tunnels, car dealers, parking structures, gas stations, and

car-wash facilities. Tremendous resources and government incentives have been put toward research of fuel-efficient cars, alternative fuels, waterless car washing, and green parking lot design. These seemingly uncoordinated efforts, if implemented within a given time frame, could help reverse the negative impacts of global warming.

3. Network. *Infrastructure is a connective tissue that brings together disparate elements, instilling cohesion and purpose. The sheer scale and vast resources spent on network infrastructure present tremendous opportunities to leverage unrealized potential in the urban environment.*

U.S. cities that depend on freeways and automobiles as the primary means of transporting goods and services are increasingly being retrofitted with public transit. The

transit corridors function as a giant network linking neighborhoods. Neighborhoods and local businesses along the transit nodes grow and benefit from greater exposure to the public, making them more identifiable and valuable.

Los Angeles has 822 kilometers of freeways, 82 kilometers of channelized waterways, 11,265 kilometers of power lines, 10,299 kilometers of streets, and much more infrastructure hidden all over the city that has not been accounted for.¹⁶ The latest survey conducted by the City Council shows that infrastructure improvements rank at the top of the list to improve Los Angeles's neighborhoods. The city's alleyways are narrow corridors nestled between city blocks, typically designed for service-oriented vehicular circulation: parking, loading zone for delivery trucks, and solid waste collection. All together, the alleyways in Los Angeles account for more than 1,448 kilometers of pavement and cover about 777

hectares—about half the size of Los Angeles's Griffith Park and twice the size of New York's Central Park. These alleyways could be retrofitted with bioswales, exploratory bicycle trails, and pedestrian greenways and pocket parks, in addition to being service corridors. As a collective system, the alleyway infrastructure, when operated at a city scale, can reduce stormwater runoff, increase tree coverage, and offer health benefits through outdoor exercise.¹⁷

4. Increment. *The incremental nature of infrastructural projects bears directly on a city's ability to sustain growth through a measured period of time.*

Most public infrastructure projects are realized and put in full operation over many decades, mostly because of the astronomical cost, the availability of public funds, and the political forces at play. In the San Francisco Bay Area, the Bay Area Rapid Transit (BART) system was introduced in 1946, but the extensions to the three Bay Area counties were not completed until the mid-1990s, including the connection to the San Francisco International Airport. Further extension to Silicon Valley and South Bay remains to be realized.¹⁸ Similarly, the protection of our natural resources such as national parks and significant urban parks takes forethought and unwavering determination, and the benefits are cross-generational. Central Park in New York City was envisioned by Andrew Jackson Downing and William Cullen Bryant as a way to address the ills of society: crowded streets, poor immigrants, and crime. For a rapidly growing city such as New York in the 1830s, it was necessary that the park be large enough to anticipate the needs of its populace. As a significant landscape infrastructural project, the completion of the 341-hectare park in 1860 brought forth unanticipated benefits to the local economy through tourism, increases in property and land values, and increased revenues for the government.

In February 2009, the U.S. Congress passed the American Recovery and Reinvestment Act of 2009 in an effort to stimulate the economy, in its deepest recession since the Great Depression. The stimulus package provides \$787 billion in appropriations for crisis investments, including \$80.9 billion for infrastructure investment (including roads, bridges, railways, sewers, high-performance green buildings, wastewater treatment infrastructure improvements, drinking water infrastructure improvements, electric vehicle development),



BUFFALO BAYOU PROMENADE, HOUSTON, TEXAS.

Aerial view oriented westward toward the bayou with I-45 Interchange in the foreground and uptown Houston beyond. The bayou functions as an ecological, recreational corridor, as well as a detention basin that holds excess flood waters caused by frequent hurricane events.

\$15 billion for supplemental investments (including Bureau of Reclamation, National Park Service, Forest Service, National Wildlife Refuges), and \$45.2 billion for energy (renewable energy, smart grid, electric vehicle technologies, and brown-field land remediation).¹⁹

To counter the effects of the global financial crisis, China also approved a multibillion-dollar package for infrastructure projects. China's Eleventh Five-Year Plan (2006–2010) focuses on infrastructure investments in central and western regions, including road networks, railways, power grids, and irrigation systems, as the rising middle class in these areas demands an improved standard of living on par with the rest of the country. The ongoing South-to-North Water Diversion project, a daunting feat of mega-engineering delivering water from the water-abundant southern provinces to the water-scarce Beijing region, offers the greatest potential for landscape infrastructure.²⁰

We live in a historic moment in which many lawmakers and government officials share a vision for sustainable global development. For individuals who convert their diesel cars to biofuel, urban farmers who replace lawns with organic vegetable gardens and chicken coops, and academics who teach that the most efficient way toward carbon sequestration lies in the preservation of our forest habitats, bogs, and wetlands, the future of landscape infrastructure projects is in plain view.²¹ Our cities need this kind of infrastructural approach that extends beyond perceived boundaries and connects various sites to other sites, people to places, communities to communities, people to people, nature to city, and city to nature. With the rapid growth of our metropolises and the shortage of available open space, however, it has been discovered that infrastructure is an untapped resource with the capacity to effect positive change. Through the employment of ecological and social principles, the urban infrastructural systems can play a multifaceted role that actively contributes to the betterment of urban life.

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Infrastructural Ecologies

FLUID, BIOTIC, CONTINGENT

PIERRE BÉLANGER

ONCE THE SOLE PURVIEW OF THE PROFESSION OF CIVIL engineering, infrastructure—the management of water, waste, food, transport, and energy—is taking on extreme relevance for the design practices in the context of the changing, decentralizing structures of urban-regional economies. Food production and energy networks can no longer be engineered without considering the cascade of waste streams and the cycling of raw material inputs. Industries, landfills, land farms, and logistics areas can no longer be designed without their wastesheds. Highway networks, sewage systems, and subdivisions can no longer be planned without their watersheds. Simply put, urban regions cannot shrink or expand without employing the geographies and climates of continental landscapes that eventually shape them—hurricanes and their devastating impact are a prime example for natural forces of this type. Designation of territories, zones of intervention, and modes of organization become design processes that eventually lead to the formation of new spatial morphologies and performative ecologies.

Over time, we can engage infrastructure as a landscape with strategic interventions that span extremely short and immediate intervals, sliding across different scales. At the exact moment construction ends, when blueprints are implemented, the penultimate objective of design management can begin. More often than not, design should be under-detailed thus leaving raw, open, and often incomplete the assembly for unknown site circumstances and social change, where the beauty of the project lies in its banality and openness to change. As a medium, time becomes a dimension of design management and superintendence that is slow but enduring.

Design becomes telescopic, sliding across different scales, systems, and strategies that are no longer defined by professional or political boundaries but rather by trans-disciplinary, trans-boundary collaborations. In contraposition to the hard, fixed infrastructures, this interpretation provides the room for the design of softer, looser ecological systems, with a concentration on the effects at macro and micro levels. Born from performance and productivity, newly recognizable morphologies and topologies of the infrastructural landscape—*meshes, webs, nodes, conduits, gardens, and fields*—are most often hybrids of invariable types molded by additional processes of flow, trade, exchange, conveyance, mobility, and communications. Through this lens, we can begin to open a territory of new scales, systems, and synergies, upstream or downstream across the gradient of urban economies.

Invoking the unfinished project of landscape¹ as a geospatial and geobotanical practice with the softer, more fluid field of ecological systems pioneered by Sauer, Odum, and Bailey,² the double-entendre of the *landscape infrastructure* project maintains an operative, polyfunctional objective dedicated to urban contraction and expansion through land-use dualization and biophysical dynamics. Sponsoring trans-boundary crossover, this nascent field implies a dual identity for single-use infrastructure along corridors of movement, where a synthesis of ecology preconditions the detail of implementation, where long-term resource management is as important as the short-term mobilization of capital, and where the commonwealth of public systems presides over the uncoordinated guise of self-interests, requiring the sustained engagement from public and private motives. Transcending jurisdictional boundaries,