

# Changing Landscape, Changing Climate: Bangkok and the Chao Phraya River Delta

Danai Thaitakoo and Brian McGrath



As ecologists and urban designers, our research suggests that climate change will require a radical shift within design practice from the solid-state view of landscape urbanism to the more dynamic, liquid-state view of waterscape urbanism. More than a change in language, this shift will require a new way of thinking about place. Instead of embodying permanence, stasis, solidity, and longevity, liquid perception will emphasize change, adaptation, and the continuous reproduction of locality as a cultural practice.

New forms of waterscape urbanism may be inspired both by the philosophical concept of liquid perception and by the emerging ecological practice of monitoring urban systems

through watershed frameworks. This article examines greater Bangkok, Thailand, as a critical case study of this position. Bangkok is currently one of the most at-risk cities in the world in the face of rapid and unpredictable climate change, and it has already begun to experience severe effects.

Bangkok and its environs originally grew in harmony with the predictable cycles of monsoon rain and wet rice cultivation. But for the last fifty years it has developed in ways that have largely contradicted such a water-based urbanism. Though currently degraded, Bangkok nevertheless remains a potentially vibrant model of the ways in which resilient new forms of water-based urbanism might emerge.



### Contemporary Ecosystem Science

The science of ecology began by examining the relationship between individual species and landscapes; in particular, ecologists sought to understand the workings of island ecosystems, preferably ones far removed from disturbances by invasive or migratory species.

Contemporary ecosystem studies, by comparison, frequently seek out more diverse sites, where complex interrelationships can be monitored and modeled. Such work began at the Hubbard Brook Experimental Forest, in New Hampshire, where for more than fifty years small streams have been continuously monitored to understand the impact of larger changes in air quality, land cover, temperature, and species diversity on local water biochemistry.<sup>1</sup> Recently, researchers have been able to scale up results from such small subcatchments to begin to understand the ecological dynamics of larger regional watersheds.

Ecological studies of species and landscape interrelations have also attempted recently to include the presence of humans and cities. Thus, novel landcover and social-

ecology factors have been incorporated in efforts like the Baltimore Ecosystem Study (BES). The goal of such work is to integrate research in the biophysical and social sciences with urban design.<sup>2</sup> BES has, for example, discovered that accepted urban management practices such as buffering riparian systems are inadequate in controlling the capture and release of nitrogen. This discovery has led to proposed new urban design and management regimes

**Opposite:** The lower Chao Phraya River delta and the city of Bangkok. Watery Bangkok sprawls over an urban agricultural market landscape dominated by fruit orchards to the west, rice fields to the east, shrimp farms along the coast, and fish farms in the lowlands.

**Top:** Old and new water-based urbanism in Bangkok. The Chao Phraya River is lined with both traditional dwellings, markets and monastery complexes, as well as luxury hotels and condominiums.

**Bottom:** Under an expressway flyover, a new public beach has formed at the entrance to Khlong Bangkok Noi (left). Historic canals (*khlongs*) now face the backs of buildings, instead of serving as the face of the city (right).



circa 1935



circa 1955



circa 1975



and the evaluation of area residents' preferences relative to their effect on nitrogen retention.<sup>3</sup>

The advantage of studies like BES is that, like the scaling up of research findings at Hubbard Brook, they open the possibility that small design changes, applied broadly, can positively affect an entire ecosystem. For example, one aim of the BES nitrogen research is the revitalization of Chesapeake Bay, because excessive releases from sources such as sewage and fertilizer, unmitigated by the dynamics of urban streams, are a significant source of eutrophication in coastal waters.<sup>4</sup>

In urban areas, however, one of the frequent challenges to such an approach is perception. To appreciate

how small changes can have large effects, homeowners need to be encouraged to trade their "solid-state" perceptions of home and neighborhood for a more multiscalar, liquid perception. Urban designers can make a significant contribution to shifting perceptions toward such a watershed awareness.

The difference between liquid and solid perception is certain to also have a direct affect on the work of architects, landscape architects, and urban designers. For example, landscape urbanism has to date based its proposals for the sustainable redevelopment of postindustrial North American cities on the creation of large parks as ecological islands.<sup>5</sup> The watershed view suggests a more integrated

approach that emphasizes smaller private actions applied more systematically.

Watershed science and its implied liquid-state view challenge normative ideas about place. Instead of being discretely bounded, situated, and local, sites are caught in larger systems of flows, the complexity of which we are just beginning to recognize. Moreover, climate change is beginning to demonstrate that even the most local of sites is vulnerable to global as well as regional processes and events.

### Liquid Perception

The French philosopher Gilles Deleuze has described the filming of water in the pre-World War II French school of cinema as offering a new state of perception, one which allows the solid, material world to dissolve to matter-flux. Citing the work of filmmakers Jean Renoir and Jean Vigo, Deleuze wrote:

*(W)hat the French school found in water was the promise or implication of another state of perception: a more than human perception, a perception not tailored to solids, which no longer had the solid as object, as condition as milieu. A more delicate and vaster perception a molecular perception, peculiar to a “cine-eye.”*<sup>6</sup>

Our research in Bangkok has uncovered evidence of a long history of such liquid perception. It has influenced both the way we see and document the city in the present and how we understand its history of water-based urbanism. Such liquid urbanism was present for hundreds of years, before new forms of land-based urbanism came to dominance during the last half of the twentieth century.<sup>7</sup>

Bangkok is situated on a slight rise in the predominantly flat terrain of the lower Chao Phraya River delta. The area was developed during the Ayutthaya period (from the fourteenth to the eighteenth centuries) as a vast, productive landscape of mixed fruit orchards.<sup>8</sup> Small delta settlements supported an elaborate network of market towns joined by natural and constructed waterways, which also connected to the great Siamese capital and international entrepôt of Ayutthaya.<sup>9</sup>

During this period, settlements along the banks of rivers and canals (*klongs*) and on flood plains were subject to seasonal surpluses and deficits of water without serious problems. Excess water was a part of life, and it was considered benevolent and nourishing. People adapted to the rhythms of the monsoon by directing water through small capillaries, which fed the orchards and flooded the rice fields that served as efficient retention basins.<sup>10</sup>

The traditional water-based urbanism of the lower Chao Phraya delta first saw change and modernization at the end of the nineteenth century. At first, this transformation relied on new canals that functioned as highways, radiating outward and providing access both to the new capital of Bangkok and to outlying market towns.<sup>11</sup> Legislation enacted in 1880 granted rice-growing land to private companies which constructed canals; beginning with Rangsit, a vast planned area of irrigated rice fields developed by the Siam Land, Canals and Irrigation Company, this policy transformed a locally managed system of subsistence rice farming and created a new class of citizen merchants. During the twentieth century it also enabled the Chao Phraya delta to become one of the great rice-producing and—exporting areas of the world.

It is important today to recognize that this early modernization was achieved not by encouraging road building, but by providing incentives to private developers to expand upon centuries-old water-based practices. By contrast, Bangkok’s rapid urbanization and population boom since World War II has been predicated on new forms of building and land-based infrastructure at the expense of cultivated land and its former hydrological matrix.<sup>12</sup> In particular, the swift expansion of industry and suburban development in the late 1960s and 1970s caused the city to sprawl eastward into former paddy fields.<sup>13</sup>

Rapid urbanization seriously damaged greater Bangkok’s canal network, which was quickly eclipsed as a means of transportation by paved roads.<sup>14</sup> Many canals were filled in for development or paved over as roads, while others became stagnant, non-navigable drainage ditches or sewers. Even though these changes created great hardship for remaining farmers, the ecological services provided by the older waterscape were not widely appreciated in the face of the demand for modern landscape-based urbanism.

**Opposite top:** Since 1950, road building has far out-paced the canal digging which was the dominant transportation infrastructure for the previous centuries of delta inhabitation (adapted from Sternstein 1982). The result is a two-level transportation network where the land-based infrastructure dominates and comprises the ability of the hydrological network to operate. In rainy season, the opposite is often the case as annual floods slow and stop traffic in much of Bangkok.

**Opposite bottom:** Active canal with waterfront shophouses on the urban fringe (left). Remnant drainage canal in a central commercial area (right).

**Solid and Liquid Perceptions and Practices**

Faced with seasonal monsoon rains and daily tidal fluctuations, greater Bangkok now faces the threat of catastrophic flooding each year. From May to October the combination of elevated river flow from the Chao Phraya basin and rapid local runoff often puts many sections of the city and its environs under water. And when a high tide slows the flow of the river, it is impossible to drain the city without the help of floodwalls and pumping stations. River flow, tidal surge, and sudden torrential rain have prompted some to refer to Bangkok as “the city of three waters.”<sup>15</sup>

With the example of post-Katrina New Orleans in mind, the question Bangkok faces is, which form of urbanism can better equip it to confront the uncertainty of climate change: solid or liquid? Our analysis, presented in the accompanying table, suggests that a liquid perception will provide a better basis for resilience and adaptation than hard solutions based on protective engineered systems. It will ultimately be futile for the city to fill in lowlands and refuse to adjust to changes of water level. Being part of the water and adjusting to its fluctuations provides a more reasonable approach.

Solid Perception	Liquid Perception
Rigid flood-protection structures inhibit the natural flow of water.	Flexible and open traditional structures allow the natural flow of water.
Life behind flood barriers is ecologically static and stagnant. Manmade structures separate daily life from the dynamics of water flow.	Cultural and social life is tied to the dynamics of water. Social and economic patterns are adjusted to it.
Resists any change of water level or quantity.	Resilience and adaptation evolve through time with the seasonal level change of water.
Incoherence between land and water.	Coherence between land and water.
Water is a hazard that needs to be eliminated/mitigated.	Water is a part of vulnerability and it is manageable.
Disjointed—separation among land-water-human.	Joined, linked, connected land-water-human.

It is important to recognize that such a view does not imply a return to a premodern, locally controlled model—only restoration of a functioning canal network and hydrological matrix. Dynamic local flow management using locks and adjustable check dams and water gates can interact with a system of small polders to create an effective system of watershed management.

According to this model, not all parts of the city would

need to be transformed; it would be necessary to maintain or restore waterscape or waterscape urbanism only in existing lowlands and canalways. Therefore, certain areas of the city could be flooded periodically, in areas where housing would continue to be built, but on raised platforms rather than landfill. This change would allow space both for overflow during the wet season and water storage during the dry season. As in the BES example, water-catchment mapping, monitoring, and modeling can build a new perception of the city as a waterscape rather than a landscape.

By contrast, contemporary landscape urbanism, which relies on solid-state perception, will never work in Bangkok. Combined with the effects of climate change, the amount of rainfall the city receives in short periods, the amount of water that flows through it from upriver areas of the Chao Phraya basin, and the effect of high tides will eventually overwhelm any rigid, engineered defense the city may erect.

**A Radical Shift**

Rapid climate change will further complicate the already complex relationship between Bangkok and the ecosystem of the lower Chao Phraya delta. Predictions for Bangkok’s near future include more hot days, longer summers, higher rain intensity, more rainwater, and sea-level rise.<sup>16</sup> These effects will compound existing problems such as an increasing urban heat-island effect, flooding during the rainy season, drought during the dry season, loss of land due to coastal erosion, and land subsidence due to groundwater withdrawal.

The delta and the city will continue to threaten each other if natural hydrological processes are not respected and if the lessons of older, indigenous ways of living in concert with the cycle of seasons are ignored. As older forms of waterscape urbanism continue to vanish and new forms of landscape urbanism come to dominate popular images of inhabitation, the perception of natural processes will continue to change, causing further dislocation between expectation and reality.

We suggest a radical shift of emphasis in greater Bangkok away from a “solid-state” view of landscape urbanism. As a new model for urban design, waterscape urbanism could be combined with the concept of liquid perception and ecological monitoring to promote a more resilient urban ecosystem in the long-term.

**Notes**

The authors would like to thank the Thailand Research Fund and the National Science Foundation and Baltimore Ecosystem Study’s Long-Term Ecological Research program for their partial support of this research.



1. Gene E. Likens and F. Herbert Bormann, *Biogeochemistry of a Forested Ecosystem* (New York: Springer-Verlag, 1975).
2. Brian McGrath et al., eds., *Designing Patch Dynamics* (New York: Columbia University Graduate School of Architecture, Planning and Preservation, 2008).
3. Mary Cadenasso et al., "Exchanges across Land-Water-Scape Boundaries in Urban Systems: Strategies for Reducing Nitrate Pollution," in Richard S. Ostfeld and William H. Schlesinger, eds. *The Year in Ecology and Conservation Biology 2008* (Millbrook, New York: Cary Institute of Ecosystem Studies, 2008).
4. See "Processing of Nitrogen in Urban Streams," at the BES website, [www.beslter.org/frame4-page\\_3f\\_02.html](http://www.beslter.org/frame4-page_3f_02.html).
5. Juila Czerniak and George Hargreaves, eds., *Large Parks* (New York: Princeton Architectural Press, 2007).
6. Gilles Deleuze, *Cinema 1: The Movement Image* (Minneapolis: University of Minnesota Press, 1986).
7. Brian McGrath and Danai Thaitakoo, "Tasting the Periphery: Bangkok's Agri- and Aqqa-Cultural Fringe," in Karen Frank, ed., *Food and the City* (London: John Wiley & Sons, 2005.)
8. Yoshikazu Takaya, "Agricultural Development of a Tropical Delta: A Study of the Chao Phraya Delta," trans. by Peter Hawkers, Monographs of CSEAS, Kyoto University, Japan.
9. Terdsak Tachakitkachorn, "A Comparative Study on the Transformation Process of Settlement Developed from Orchards in the Chao Phraya Delta," Ph.D. Diss., Kobe University, 2005.
10. A trip along the Bangkok Noi and Bangkok Yai canals by long-tail boat is popular today with tourists who want to see living fragments of this old waterscape urbanism. However, following the unprecedented and devastating floods of 1995, flood protection walls were constructed along portions of these canals by the Bangkok Metropolitan Administration. Orchards have also recently been abandoned, houses raised, and land filled in by property owners.
11. Takaya, "Agricultural Development of a Tropical Delta."
12. Bangkok Metropolitan Administration, General Information, [www.bma.go.th/bmaeng/body\\_general.html#geography](http://www.bma.go.th/bmaeng/body_general.html#geography). Viewed December, 2004.
13. T. Jarupongsakul and Y. Kaida, "The Imagescape of the Chao Phraya Delta into the Year 2020," in Proceedings of the International Conference: "The Chao Phraya Delta: Historical Development, Dynamics and Challenges of Thailand's Rice Bowl," Kasetsart University, Bangkok, Thailand, December 12-15, 2000.
14. T. Jarupongsakul, "Chapter 2: Geomorphology Aspects Affecting the Occurrence of Floods and influencing the Drainage in the Lower Central Plain, Thailand," in T. Jarupongsakul, ed., "Analysis and Preparation for Flood-Risk Map in the Lower Central Plain, Thailand," Center for Disaster and Land Information Studies, Chulalongkorn University, Bangkok, Thailand, 2000.
15. Ibid.
16. "A Decade of Climate Change Research in Thailand," South East Asia START Regional Center, Chulalongkorn University, Bangkok, Thailand, 2007.

All photos are by the authors unless otherwise noted.

**Above:** A comparison between solid-state perception and liquid-state perception in Thailand. The house on the left was raised on a platform of rubble and soil to provide a defense against high water, but this stability is illusory, and would be self-defeating as a general policy. By contrast, the house on the right has been adapted for changing water levels by allowing natural flow and providing space for temporary high water volumes. While the house on the left is braced for flood, it creates a new environment, land-scape instead of water-scape. There is always vulnerability and risk in relation to water in the Chao Phraya delta, but excess water is manageable as a part of life in the house on the right.