Ecological Urban Design Visuality and Landscape

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ABSTRACT

This essay describes a research project that aims to shape ecological urban design practice in two Asian Mega Deltas. This is important because many important ecological concepts such as urban heterogeneity become more abstract when considered in relation to everyday life. However, these concepts are key to meeting sustainability goals through supporting the components of resilience. The research project engages heterogeneity through the type of democratic visuality and spatial imaginary afforded by aerial photography and satellite imagery. This inter-referenced visuality, created by airplanes, satellites, sensors, interfaces, and handheld devices, is new. It operates differently from older models of cartography, map, plan and master plan making in ways that are important to understand, and to use. In order to describe the two Asian Mega Deltas, this essay uses inter-referencing not only along a visual dimension, but it is also engaged as a syncretic mode of comparison that aims to bring Indian and Chinese people who live in and from the deltas toward a closer understanding of their differences. Therefore the two Asian Mega Deltas, the Ganges-Brahmaputra-Meghana and the Yangtze, are aligned in the drawings that illustrate this essay not only in relation to nation states, but also in relation to shared experiences and practices that explore oceans, rivers, and city making in a mega delta environment.

Keywords: shape ecological, ecological, spatial imaginary, culturally

INTRODUCTION

Geographers Dodge and Perkins argue that the use of satellite imagery is part of a new type of visual culture with a new viewing practice as well as a new critical social agenda.[1] They explain, "As a product, satellite imagery shares much in common with other visual media forms, including 'still' photography and landscape painting that can capture extensive geographic spaces in a single frame. This framing shapes and defines what can be seen and what is out of view." They continue, "It also shares some characteristics with cartography as a mode of representation, most particularly the predominance of the vertical, planar view onto the world and its ability to provide a spatially consistent referent between visual signs and ground features."[2] They then explain how these earlier forms of media are mixed and inter-referenced in new ways. "On some Internet mapping portals the distinction between satellite imagery and aerial photography is blurred; as one moves through scales of time and space the display can switch between difference sources."[3] In this viewing practice satellite imagery "conveys a

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1   Martin Dodge and Chris Perkins, "The 'View from Nowhere'? Spatial Politics and Cultural Significance of High-resolution Satellite Imagery," Geoforum, 40 (2009): 497–501.

2   Dodge and Perkins, "The View from Nowhere," 498

3   Dodge and Perkins, "The View from Nowhere," 498

heightened sense of pictorial realism, heterogeneity of colorful patterns, and a sense of apparent naturalism."[4] Viewing in this inter-referenced way has an indexical attribute, and it is this unstable, immediate and immanent yet deeply personal view that is a uniquely powerful spatial imaginary.

This research project explores the possibilities of this spatial imaginary to describe adaptive reorganization and meet sustainability goals through supporting local mechanistic drivers of resilience. It will trace and learn from the use of aerial photography and satellite imagery a type of visuality and spatial imaginary for urban design practice in India and China, and globally. The first reference point is from France and its colonies. The second and third examples draw on examples of aerial imagery familiar to the author, which is from the East Coast USA context. There are surely many more appropriate and culturally relevant Indian and Chinese examples that the author is not aware of. For example apparently a set of aerial imagery was taken of Kolkata in 1905-1907 and is stored in the Kolkata Municipal Corporation archives.[5] Why it was commissioned and what it was used for is unknown, however these images were used by the US planning expedition in their process of creating the Kolkata Basic Development Plan of 1966, and some of those trained people still work for the municipal corporation today.

In addition to promoting the democratic engagement of the aerial image and its visuality, this research project also aims to advance ecological urban design theory and practice. Ecology will be defined and an arguments for new types of interaction between ecologists and urban designers in cities will be made. It is important to view ecological urban practice as a socially engaged *design* practice that occurs in already existing cities. Therefore, for context, we will trace some historical moments where urban practice that engages ecology has slid toward aspirations of being policy or scientific. The essay is illustrated with

an example of an ecological urban design practice in Asia, informed by and hopefully advancing the work of the Baltimore School of Urban Ecology, which this author is a part of. Urban design practice when viewed through this aerial photography and satellite imagery lens can be seen as being part of a more widely shared "information array."[6] Urban design visual culture and practice in cities globally is increasingly intertwined with everyday communication modes of sharing, measuring, monitoring, and positioning. How might this "metacity"[7] spatiality support resilient mechanisms in Asian constructed environments?

DEFINITIONS

In this research project there are two terms that are used in a specific way, which differ in their use in landscape ecology, and in the call for proposals for this journal issue. These terms are landscape and resilience. According to Forman and Godron, their idea of landscape ecology emerged in 1978.[8] They saw landscape as a distinct object for research and practice and offered a spatial language for its analysis based on structure, function and change. They titled this an "ecological perception," or "ecological perspective" of landscape. While this research project shares a common interest in spatial and temporal heterogeneity, it is the definition of landscape that is considered an open topic, and not a given. This is because landscape is both an artifact as well as a cultural idea. It is "an ongoing medium of exchange, a medium that is embedded and evolved within the imaginative and material practices of different societies at different times."[9] In other words landscape contributes to culture. For example consider the relationship of landscape with power (as a colonial project or a symbolic instrument of the state), as a commodity, a nostalgic escape, as sustainability, as well as an object of scientific and social research.

[4] Dodge and Perkins, "The View from Nowhere," 498

[5] Conversation with Santosh Ghosh Director of Center for Built Environment, Kolkata November 31st, 2013.

[6] Brian McGrath, "Digital Modeling for Urban Design," (Wiley: London, 2008) p?.

[7] Brian McGrath, S. T. A. Pickett, "The Metacity: A Conceptual Framework for Integrating Ecology and Urban Design," Challenges, 2 (2011): 55-72

[8] Richard T. T. Foreman and Michael Godron, "Landscape Ecology" (Wiley:USA 1986) xi.

[9] James Corner, "Recovering Landscape: Essays in contemporary Landscape Architecture" (Princeton Architecture Press: New York, 1999) 5.

The ecological perception of landscape as described by landscape ecology in the late 1970s is linked to the ideal and advancement of sustainability. However the ecological perspective as described by landscape ecology is a distancing device and it does not take advantage of the possibilities of landscape as a medium of exchange as described above. For this reason the term landscape in this essay will be reserved for its projective and socially active role and the term constructed environment will be used to describe the "object for research and practice" that science, in particular urban ecology, needs in order to advance its field. This is not a goal of disruptively breaking apart a common understanding; it is simply a goal toward being inclusive of other ideas about the term landscape. It is too much of an important idea to apply narrowly in the Asian context.

Learning from the Baltimore School of Ecology, the theory of resilience is understood within the science and practice of ecology, in particular urban ecology. Within this perspective "ecological science helps identify components of resilience that can favor transformations that are more sustainable."[10] The definition of resilience engaged in this research project follows ecological or evolutionary resilience. "Resilience, in the ecological sense, refers to the ability of a system to absorb external or internal shocks and still retain its fundamental form and function."[11] However "Ecological resilience does not ask whether a complex system returns to a previous or equilibrium state. Rather, it asks about the changes that a system can experience and still persist in the same dynamic form. This is an evolutionary kind of resilience since adaptation is a central feature. So ecological and evolutionary resilience are concerned with adaptive capacity and adjustment to change, and not with return to a stable point." Therefore there is an emphasis on urban transformation in this essay rather than say restoration or recovery however these may be a part of transformation.

As mentioned above, this research project shares with landscape ecology a common interest in urban heterogeneity. The project described here aims to support adaptive reorganization through the medium of landscape; toward a goal that spatially and temporally heterogeneous constructed environments might meet sustainable goals through locally supported resilient dynamics. Therefore it doesn't make sense to describe existing resilient landscapes in Asian contexts, but rather it aims - through an exploration of other definitions of these terms – to create tools for practice, such as landscape and drawing, that might shape the mechanisms of resilience. The ecological perspective in this paper is strategically located not as a distancing device to see the whole, but rather as an inter-referencing and indexical device that is simultaneous and inclusive of multiple perspectives. It is a process of becoming in order to inform design and science theory and practice, as well as governance, planning and policy decisions and social innovations. Maybe this is a new way of seeing the world? Or maybe it is more mundane. Could it be that through a careful interrogation of existing and new tools, our close and important disciplinary fields might align better for the people whose environments we research and in turn empower us to ask their most important ecological research questions with them?

VISUALITY

Importantly, Dodge and Perkins also note the complex cultural processes underpinning the production of all satellite images. The ability to view imagery is itself unequal and "space is differentially viewed from satellites and it is presented in unequal ways in online mapping portals (with their variable update cycles, uneven depth of coverage depending on demand, variable scale and ease of access)."[12] In order to explain how this research project is engaging aerial photography and satellite imagery for urban design visual culture and practice in this elated and contested context, we will explore three reference points. First is the social space view and its shadow, the idea of a sinister aerial perspective that contains hegemonic intent. The research on the view from above (*Vued'Ensemble*) by historian Haffner is helpful here. She examines the role of aerial photography in the emergence of social space

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[10]   S. T. A. Pickett, et al. "Ecological Science and Transformation to the Sustainable City," Cities, 32, (2013): S10-S20.

[11]   "Resilience," BES Urban Lexicon. (Accessed July 18th 2014).
http://besurbanlexicon.blogspot.com/2013/05/resilience.html

[12]   Dodge and Perkins, "The View from Nowhere," 499.

as an intellectual category and an object of scientific research in France in the 1970s.[13] Second is the measuring view, and the book *Taking Measures Across the American Landscape* by Corner is valuable.[14] Learning from Hoskins and Conzens,[15] and collaborating with aerial photographer Alex McLean, Corner uses a post-modern sampling approach in order to reveal modern land measures – "to turn the gaze of instrumental reason upon itself, and take its measure."[16] Third is the pixel view, which marks a change in media from emulsion to data, and airplane to satellite. Here the research by Kurgan is strategic as her engagement in the process of aerial imagery collection itself marks a shift in the position of the designer.[17] Her work opens the possibility to not only explain what the image represents, or measures, but also how satellite data collection; processing and display are an environmentally active practice.

Haffner describes the early mid-war French experiments with aerial photography, how they constituted a dialogue between the colony and the metropolis, and later became focused on the problem of housing and the suburbs of postwar Paris. She gives the example of Chombart, who studied the Tonkin Delta in Vietnam and later, with his colleagues, developed the term social space that was concerned "with the outline of *form* of the city and the social and economic structures that this form implied."[18] He "used a top down technique to develop a bottom up approach that in turn helped to promote sociological perspectives in government and planning circles in postwar Paris."[19] This approach Haffner explains "provided an alternative to the dominant functionalist perspective in architecture

at the time as outlined by the "Congrès Internation aux d' Architecutre Moderne (CIAM)" and its main publication, the Athens Charter of 1943, which classified the main human needs as dwelling, works, leisure, and circulation."[20]

After WWII the meaning of the view from above changed. By the late 1950s the question of social space shifted from "not only why socio economic populations were divided in space, but also why such divisions had persisted for so long"[21] There was also a societal mood shift away from technology. Aerial views were taken from increasing distance and in new ways – "most notably, for aerial bombardment during World War II and the Algerian War. Whereas in the 1930s the practice of aerial photography explored spatial habitation at the scale of the neighborhood or the village from a distance of hundreds of feet in the air, aerial photography in the 1960s and the planning that supported it had scaled up to the analysis of entire regions from tens of thousands of feet above. Unease at the increasing distance would reach its peak as the first French satellites went into orbit in 1965, and images of the entire earth as a pale blue dot were sent from the moon."[22] Haffner explains, "The view of the whole offered by aerial photography – which had been central to the technique's utility since its development during World War I - now signified not the humanistic, Enlightenment-inspired promise of global unity through technology, but rather the voyeuristic viewpoint of colonialism, the spectacle capitalist consumerism, and the repressiveness of state-controlled urban planning."[23] Consequently, the social space concept, originally inspired by the view from above, now stood only for the view from below.

[13] Jeanne Haffner, "View From Above: The Science of Social Space," (MIT Press: Cambridge, 2013) 4.

[14] James Corner and Alex S. McLean, "Taking Measures of the American Landscape," (Yale University Press: New Haven, 1996).

[15] W. G. Hoskins, "The Making of the English Landscape," (Hodder and Stoughton: UK, 1955).
Michael P. Conzen, "The Making of the American Landscape," (Unwin Hyman: London, 1990).

[16] Richard Weller, "Between Hermeneutics and Datascapes: A Critical Appreciation of Emergent Landscape Design Theory and Praxis Through the Writings of James Corner 1900-2000 (Part One),"Landscape Review 7(1), (2001): 17.

[17] Laura Kurgan, "Close up at a Distance: Mapping, Technology, and Politics," (Zone Books: New York, 2013).

[18] Haffner, "View From Above," 92.

[19] Haffner, "View From Above," 138.

[20] Haffner, "View From Above," 93.

[21] Haffner, "View From Above," 106.

[22] Haffner, "View From Above," 109.

[23] Haffner, "View From Above," 109.

This break or separation into two views was also part of a rhetorical project. The early experiments with aerial photography were qualitative and aimed to be objective: to make legitimate a new science of social space, the formation of a new academic discipline, and to have authority within urban planning and governmental circles. For example the French sociologist Lefebvre believed that social space – as the view from below - formed a scientific, rather than a philosophical basis for a theory of practice, arguing, "a radical change in spatial relations and organization was an essential component of any successful revolution."[24] Haffner nevertheless considers social space a powerful and persistent spatial concept for urban designers, one that no longer needs to be defined by the separation of the two approaches, above and below. Her understanding and the position advanced by this research project therefore aims to inspire "a post-dichotomous moment"[25] because today our viewing practices have diversified; our spatial understanding is sophisticated, and inclusive of many co-existing and contested dispositions.

The book *Taking Measures across the American Landscape* by landscape architect Corner brings us to the end of the twentieth century. While admiring the sublime synoptic view in a way that invites the moral critiques described above, his work here is nevertheless read as "intentionally vertiginous and not heroic."[26] It engages measure as a metaphor to advance landscape architecture practice between what Weller describes as the poet and the planner.[27] The chapters are sorted according to measures: land, control, rule, fit, and faith. Each chapter includes vertical and oblique aerial photographs, maps, collages and texts. Each measure is therefore an image-collage-text combination, which reveals a type of pattern sampling or framing. His selection of frames, many taken from a commissioned low flying aircraft, mostly privilege constructed environments whose patterning can be best seen from aerial imagery. That is they reveal measures that can best be understood from above such as the arrangement of a pivot irrigator field, or the distorting effect of a

geological formation on the regularity of the survey grid. Other measures are more micro such as the overlay of game markings on a play surface, and the dimensions of a cliff face Hopi village in relation to the sun.

As a collection, these measures function as a sort of catalog or source atlas of measures. While they celebrate some of the anti-democratic tools of empire, such as the land survey, and the nationalism that is linked to very large dams, the book is not aimed toward decision makers within the frame he selects or those that represent the state. Corner explains that the book "might encourage imaginative forms of measure" for designers.

The nature of the project is being provisional. Its limits lie with how these measures might repeat over time. For example "urban morphologists look for the emergence of … characteristic linkages between activity and spatial patterns in human settlements. Such linkages when repeated over time, form islands of local order structuring the larger patterns of global, ecological and economic flows."Or described in another way, "a common ground [measure] is useless without people to activate it and to surround it, to make it part of their commons."[28] While this call for new measures later turned into a sort of disciplinary hegemony against urban design practice of the town planning tradition, his idea of creating new and real, and metaphorical measures that hybridize past and present in new ways is considered an important tool in this essay. In addition his big frames and micro-measures are prescient of an increased on-the-ground understanding of urban patterns, best seen from above, augmented by hand-held devices, and sensors linked to satellites.

The final reference point and disposition is an artwork of architect Kurgan and this marks the shift to the satellite as a site for critical inquiry, rather than the aerial photograph. Her project is titled "Monochrome Landscapes" and it has been exhibited several times, can be found online, and was recently published in a

24   Haffner, "View From Above," 115.
25   Haffner, "View From Above," 138.
26   Weller, "Between Hermeneutics," 17.
27   Weller, "Between Hermeneutics," 18.
28   Grahame Shane, "The Emergence of Landscape Urbanism," in Charles Waldheim, Landscape Urbanism Reader, (Princeton Architectural Press: New York, 2006) 63.

book.[29] She explains how she directed two satellites to capture images for her. She turned them into her drawing tools:

"I wanted a series of monochrome landscapes, and so I asked for pictures of places on earth primarily characterized by one of four basic colors: white, blue, yellow, and green. The rules were simple, and generically, there were not many choices: snow, water, sand, and trees. The satellites had been, or had to go, looking at the Arctic National Wildlife Refuge in Alaska, the middle of the Atlantic Ocean, the Southern Desert in Iraq, and the Cameroonian rain forest. For each of these places, I purchased the image/data corresponding to an 8 km by 8 km square of the earth's surface. Two were already in the Digital Globe archives (Alaska and Iraq) and two required new tasking (Ikonos over Cameroon, Quick Bird over the Atlantic). The results evoke questions that are at once aesthetic and geo-political, mapping some of the most vulnerable landscapes of our time — the largely uninhabited, resource-rich other sides of globalization. The color fields are strangely abstract, even minimalist: formal, sheer information, but a little ominous."[30]

These ominous images are also data, "each of the 755 million pixels in each scene can be described in terms of a number (latitude and longitude) corresponding to its singular position on earth. The heat value of each position is also expressed as a number, which in turn is assigned a standard color and rendered, finally, as a pixel of a certain measure. Now they are photographs: information, surface, pattern, chance encounter, event, memory, field of color."[31] Her careful and political engagement with the logistics of the satellite industry holds no belief in the role of technology as a solution, but rather her project ends up revealing the architecture of it - the edges of the imaging technology itself. Beyond searching for color within the 8km x 8km data set she isn't really looking for anything. A good example here is the relation between the pixel and the zoom, "Every pixel looks pretty much alike, [and] makes looking for or emphasizing something

in particular rather complicated. It's hard not to look for something, though, even if it's just the pixels themselves. The vector of the zoom is highly codified: the camera seems to travel relentlessly, in a straight line, nearer and nearer, until it freezes on the objective it seeks. Often the sequence of images demonstrates its reliability by its reversibility: zoom in, zoom out."[32] Much satellite data today is free; in addition there are do-it-yourself methods for creating your own aerial photography using, balloons, kites, and drones.[33] Kurgans work reveals the edges, and through this she demystifies those satellites up there in outer space, and opens up the potential for creatively engaging this type of visuality and spatial imaginary.

These are three reference points and dispositions toward aerial imagery by different disciplines: ethnography, landscape architecture and architecture. Each is a type of viewing of rural, urban, industrial and wilderness areas, and using cameras, fieldwork, satellite data and imagination they explain a creative and experimental attitude toward ecological urban design practice described in this research project. There is no adherence to the idea of a split between the view from above and the view from below. Nor is there an ideal of a perfect urban activity or pattern form. The goal is to see and create new and equitable measures that meet sustainability goals through supporting local resilient dynamics. In addition it is important to view satellite imagery not as only a military or statecraft tool, but rather to engage the creative use and invention of satellite imagery by the tech savvy, low-tech, do-it-yourself and open source communities for environmental and social justice.

COLLABORATION

This section, learning from the Baltimore School of Urban Ecology, links the three views described above with the theory and practice of ecosystem science. This is important because, as noted above, "ecological science helps identify components of

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29   Kurgan, "Close up at a Distance."

30   "Monochrome Landscapes," LOOK Laura Kurgan Design, (Accessed July 18th 2014). http://www.l00k.org

31   "Monochrome Landscapes" http://www.l00k.org

32   "Monochrome Landscapes" http://www.l00k.org

33   "Public Lab," (Accessed July 18th 2014).http://publiclab.org

resilience that can favor transformations that are more sustainable."[34] In order to provide context this research project traces some historical moments where urban practice that engages ecology has slid toward aspirations of being policy or scientific. This section then expands the definitions of heterogeneity, resilience and landscape. Finally an idea of landscape, that links the new forms of visuality introduced in the previous section, is explained though drawings to inform and aid collaboration between ecologists, urban designers and others. This section is illustrated with examples from the two Asian Mega Deltas – the Ganges-Brahmaputra-Meghana and the Yangtze.

Ecology is "the scientific study of the processes influencing the distribution and abundance of organisms, the interactions among organisms, and the interactions between organisms and the transformation and flux of energy and matter."[35] This inclusive definition is derived from the Cary Institute for Ecosystem Studies, which references three pervasive definitions of ecology, " The first definition stems from the Haeckelian form -- the study of the relationship between organisms and environment. The second definition, which is perhaps the most commonly repeated, considers ecology to be the study of the distribution and abundance of organisms [Andrewartha and Birch, 1954]. The third definition focuses ecology on the study of ecosystems [Odum, 1971]. The three kinds of definitions each has their limits and advantages. The hallmark of ecology is its encompassing and synthetic view of nature, not a fragmented view. Our definition of ecology is a blend of the second and third definitions. This new overarching definition attempts to bridge the spectrum of ecological approaches, with the goal of promoting synthesis and integration."[36] This research project also engages this synthetic view of ecology.

How do ecologists practice? Pickett in his lecture at the India China Institute explained how scientists work.[37] "First are some expectations about how the world works. Then we put in place observations, experiments, models, and long term studies to figure out if expectations are right and if they are not, why. To do this we use conceptual constructs, concepts or theory if you will, that's what specifies what our expectations are."He then notes that "each environmental concept and all of our theory have embedded in them three dimensions: meaning, model and metaphor."He then gives the example of the ecosystem as an example of a core idea, or meaning. "It is one of the simplest ideas in ecology: organisms and environment in a specified volume of earth, interact with each other and transform energy and matter and information in the course of that interaction – that's it – that's an ecosystem – it can be big, small, self supporting or exploit resources from outside. That basic idea - that we can measure and we can apply everywhere – not fixed by scale – does not assume anything about good or bad." He then explains models as " the tools we use to take the general idea, which doesn't have assumptions - say how closed or how persistent a system is - and we specify what the boundaries are, what the components are, how the components are interacting, over some time span that we specify, and over some spatial arena that we specify. Then we can ask, on the basis of that model, or those models, as there are often alternative models that apply a situation - questions that play out different assumptions. That's how ecologists work, that's how scientists work."

Pickett concludes with the power of the metaphor, and he shares an example of how he made a link between science and design when he heard the term metacity as introduced by Brian McGrath. This is a term, developed by Janice Perelman and used by the UN to explain very big cities, those bigger than megacities. However "bigness doesn't really explain much about these very big cities." For Pickett "as an ecologist who is used to thinking about meta dynamics, meta populations, meta communities and meta stability in landscapes. That word [metacity] was a very engaging metaphor, which pointed me to new models of cities that go beyond just thinking about cities. How rural and urban are enmeshed in new ways. It is beyond size, it's about a spatial

[34]   S. T. A. Pickett, et al. "Ecological Science and Transformation to the Sustainable City," Cities, 32, (2013): S10-S20.

[35]   "Definition of Ecology," Cary institute for Ecosystem Studies, (Accessed July 18th 2014). http://www.caryinstitute.org/discover-ecology/definition-ecology

[36]   "Definition of Ecology," http://www.caryinstitute.org/discover-ecology/definition-ecology

[37]   "Session 1 Ecology," ICI Environment in India and China(Accessed July 18th 2014). http://www.youtube.com/watch?v=JDcFztudWmk

mosaic, wild, built, farmed, abandoned, productive, neglected, dynamic, changing, open-ended, porous, digitally connected."[38] Learning from Pickett and McGrath this essay also engages the model, ecology and theory of the metacity.[39]

In Pickett's blog he describes an example of flawed use of a metaphor. In the 1920s and 1930s sociologists of the Chicago School in their goal to advance their discipline erroneously borrowed a superficial metaphor from ecology that informed the policy that led to urban renewal. He explains, "They saw the city as a series of rings surrounding downtown, in which new immigrants invaded near the commercial core, and through competition moved outward. Like the first theory of plant succession, the sociological explanation of spatial pattern was considered to be a set life cycle. However, one important difference was that the sociologists substituted a blighted community as the end point as opposed to the idealized diverse, tall, and spatially complex climax forest. The sociologists were apparently unaware of problems that were emerging with the theory of succession in biology." He concludes, "The real mechanistic complexity that was emerging from scientific research in biological ecology was not apparently known to the Chicago sociologists. The metaphor was established in sociology through reading of ecological texts, but apparently not through conversation with practicing bio ecological researchers. The complexity, the controversy, and the alternative models of vegetation change did not become part of the toolkit of the social science deployed to understand rapidly changing cities. Nor were these features of understanding community and spatial dynamics available to those who shaped federal policy of urban life cycles – the policy that supported urban renewal."[40]

Here is a brief introduction to the Baltimore School of Urban Ecology. The Baltimore Ecosystem Study (BES) has recently reflected on a decade of research, and from this, the notion of a Baltimore School of Urban Ecology emerged as way to advance the shared body of knowledge and practice created between the ecosystem scientists, social scientists and urban designers. There are three interlinked parts to the Baltimore School of Urban Ecology as it relates to urban design.[41] First is the nature of the collaboration, which is multifaceted. Second are the two ' beginnings' of teaching, and professional practice in which shared concepts evolved into the third part, which is the idea of ecological urban design as a meta discipline operating within the patterns and processes of social and biophysical dynamics. "BES brings together more than 45 researchers, educators, and community specialists from Baltimore and beyond, and coordinates the activities of members from not-for-profit research institutions, universities, federal agencies, local jurisdictions, and non-governmental organizations to answer the question: What are the effects of adaptive processes aimed at sustainability in the Baltimore socio-ecological system?"[42] Unlike a single client, the team works within shared research questions, frameworks and theories. This research project therefore explores the question: how might shared ecological research questions form the base of an ecological urban design practice in the Asian context, specifically, in two mega deltas in India and China? And might new forms of visuality assist in this?

According to Cadenasso and Pickett there are three steps toward understanding spatial and temporal heterogeneity.[43] First, spatial heterogeneities can be mapped, for example as patches.[44] However "the fact that heterogeneities can be mapped may lead to a false sense of completion from that exercise." The second step is to acknowledge, "That connections and flows determined by the patches, their boundaries, and any networks present are an outcome of spatial heterogeneity." In other words

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[38]   "Session 1 Ecology," http://www.youtube.com/watch?v=JDcFztudWmk

[39]   S. T. A. Pickett, et al. "Ecological Science and Transformation to the Sustainable City," Cities, 32, (2013): S10-S20.

[40]   "Urban Ecology: use and Abuse," Baltimore Ecosystem Study Director's Web Log (Accessed July 18th 2014). http://besdirector.blogspot.com/2010/12/urban-ecology-use-and-abuse.html

[41]   Brian McGrath, and others, "Ecological Urban Design Theory, Research, and Practice Baltimore," in S. T. A. Pickett and others, Science for the Sustainable City: Insights from the Baltimore School of Urban Ecology, (in preparation).

[42]   http://www.beslter.org

[43]   M. L. Cadenasso, et al.,"A Theory of Urban Heterogeneity," 5.

[44]   M. L. Cadenasso, "Designing Ecological Heterogeneity," in Brian McGrath ed., Urban Design Ecologies, (Wiley: London: 2012) 266-275.

"Heterogeneity is more than mere pattern … it is both a driver and outcome of social processes, biophysical processes, and the intertwining of those social-biophysical processes."[45] Third, "various different kinds of heterogeneity must be related explicitly to each other to expose the actual and potential mechanisms that structure and drive urban systems and their dynamics." In this essay an example of mapped spatial heterogeneity has been created from 1999 - 2009 Google Earth historical imagery. As noted above this is one type or *dimension* of heterogeneity, however it is considered a very powerful one because it is relatively easy to draw and to see land cover change – the author has written about how to do this elsewhere.[46] Might this way of drawing be expanded to explain and communicate shared ecological research questions, and to make visible aspirational measures?

Pickett and others explain that, "sustainability is a socially negotiated set of goals for a human ecosystem or jurisdiction, [and] resilience is the underlying mechanism by which sustainability might operate."[47] In addition "Feedbacks, learning, genetic adaptations, natural selection, and cultural adjustment then become the most important features" and to illustrate this he offers a roster of twenty six adaptive processes that are sorted under the following categories: social adaptive processes, social conditions favorable for adaptation, biophysical adaptive processes, biophysical conditions favorable for adaptation.[48] While the adaptive cycle is usually shown as a Mobius strip in a conceptual space, Pickett's version highlights "resilience as a capacity to respond in four different ways depending on the environmental conditions and operation of disturbance events. Resilience is shown in the center of the model, indicating that the capacity to respond to shocks and disturbances is flexible relative to capital and connectedness."[49] What is important for this essay is the understanding that ecological science can create the ecological information, or can identify what they call the mechanistic drivers of resilience that can favor transformations that are more sustainable. However research questions need to be formed and priorities set in order to address one adaptive capacity, and one of its four directions at a time. This is an approach that acknowledges that cities create novel ecosystems and that best management practices might not always apply.[50]

Landscape is an idea and an artifact. What if a patch were to be viewed as landscape? As a built environment that has a "capacity to contain and express ideas and so engage the mind."[51] This doesn't mean that every patch is landscape. It points toward a community design project where the people who want it, create landscape. These are people who live in, and are from a place that shares a similar pattern of spatial heterogeneity, and want to find the mechanistic drivers of resilience. A landscape defined in this way has boundaries that are temporal, particular in rapidly changing cities which fluctuate with monsoons, In addition the the size of a patch depends on the capacity of the people engaged to contain it within their shared imagination and often conflicting domains of interest. For example, landscape might be a garden, street corner or a block. The pixel view created from a camera on a kite or balloon is of interest here [figure 1]. This form of representing and creating landscape is not only very social in itself because the act of launching a charismatic balloon in a crowed street captures peoples attention and imagination. It is also social because the images collected are easily geo-referenced and are easily sharable. In addition, when repeated, it is possible to view change over time. The pixel view is also a social view because it is a perspective that captures the interactions and transactions of everyday life, such as eating, washing, driving, selling, working, sleeping, and more eating. In the intense street life of Kolkata, for example these material practices also form types of moving boundaries.

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[45] M. L. Cadenasso, et al.,"A Theory of Urban Heterogeneity," 2.

[46] http://www.thenatureofcities.com/2013/04/14/aerial-reflection-for-urban-ecology/

[47] Pickett, "Ecological Science and Transformation," 13.

[48] Pickett, "Ecological Science and Transformation," 15.

[49] Pickett, "Ecological Science and Transformation," 15.

[50] S.T.A. Pickett and M.L.Cadenasso, 'Meaning, Model and Metaphor of Patch Dynamics,' in Brian McGrath, Victoria Marshall, M.L. Cadenasso, J.M. Grove, S.T.A. Pickett, Richard Plunz, and Joel Towers, eds., Designing Patch Dynamics: Baltimore, (Columbia University Graduate School of Architecture Planning and Preservation: New York, 2007).

[51] James Corner, "Preface" in Recovering Landscape, James Corner ed., (Princeton Architectural Press: New York, 1999) 1.

A second landscape might be inclusive of bigger and or more diverse commercial, institutional, and individual co-operations. Sometimes a patch of a similar pattern of spatial heterogeneity can be very large. It can be bigger than a para or a neighborhood, and include a diversity of different types of people. Vast districts that include urban enclaves such as high-rise housing estates, factories are often mixed with clusters of fields such as rice paddies or fish farms, and include villages. The social view created from low-flying aircraft is of interest here because this form of aerial imagery is commissioned [figure 2]. In delta regions much urbanization happens in disjunctive or diffuse ways. Many people are now living with quite new neighbors who exploit previously shared resources such as dirt roads, soil, forests, and importantly ponds and canals, which are used for irrigation, as well as bathing, raising fish, or washing vegetables. This landscape is political and brings adjacent patches together. It is an idea of landscape as an active space of negotiation, imagination and adjustment. The commissioned flyover implies an investment from a third entity this might be a local government initiative or sponsored by local institutions such as universities or a group of NGOs. The social view is also a measuring view because it is a perspective that can capture convoluted and intricately contested boundaries, for example. Much ecological and social research would need to be done in order to measure the mechanistic drivers of resilience over time of that boundary, and orient this toward new forms of co-operation or ways to leverage power.

A third landscape is a type of accumulation of the previous two. It is an idea of landscape that privileges the measuring view. This is the view that brings larger measures, best seen from satellite imagery, into an experience on the ground [figure 3]. In the examples illustrated this landscape is expressed as a line, and titled in an aspirational way as a new *Shoreline.*[52] The two mega deltas included in this essay both have long histories of human water interactions that have shaped the shoreline. In the case of the Yangtze mega delta, successive projects of dike building have separated the salt from the fresh water, forming an inland canal, island and seawall system of water-land

[52] For a longer discussion on Shoreline see Victoria Marshall, "Designing Delta Interactions for Social Innovation" in Environmental Sustainability from Himalay to the Ocean: Struggles and Innovations in China and India, Eds. Drs. Dong Shikui, Jayanta Bandyopadhyay, Sanjay Chaturvedi (Springer Science + Business Media: New York, in preparation).
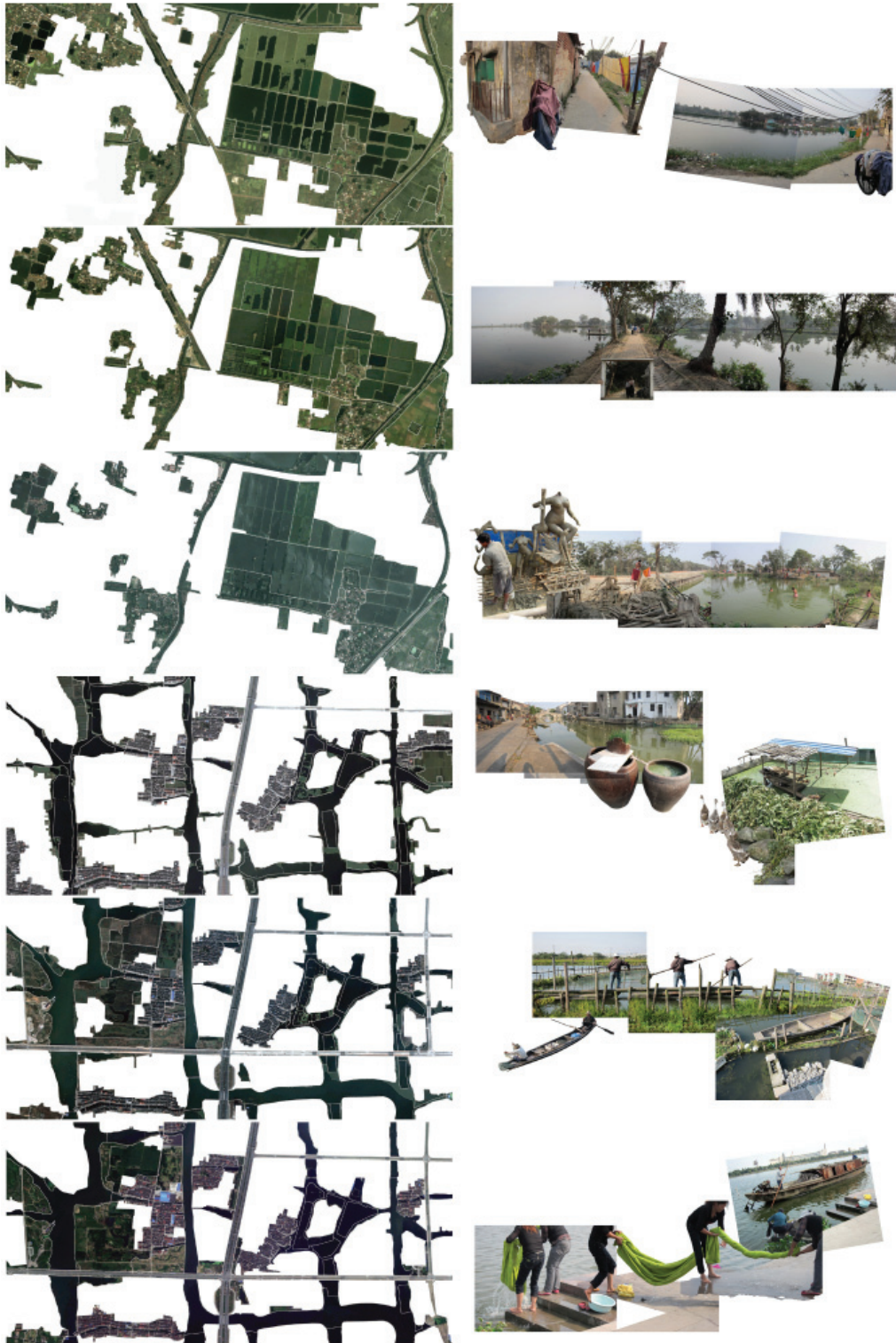

Figure 1:
Balloon mapping Kolkata, India and Beijing, China
Credit: Sanjeev Chatterjee, Gautam Bose, Laltu with Dr. Dhrubajyoti Ghosh
Li Hu and Huang Wenjing of O.P.E.N. Architecture 开放建筑, with Jenny Chou.
Also http://publiclab.org/

Figure 2:
Above and ground study of Kolkata and Shaoxing 2007, 2009, 2011
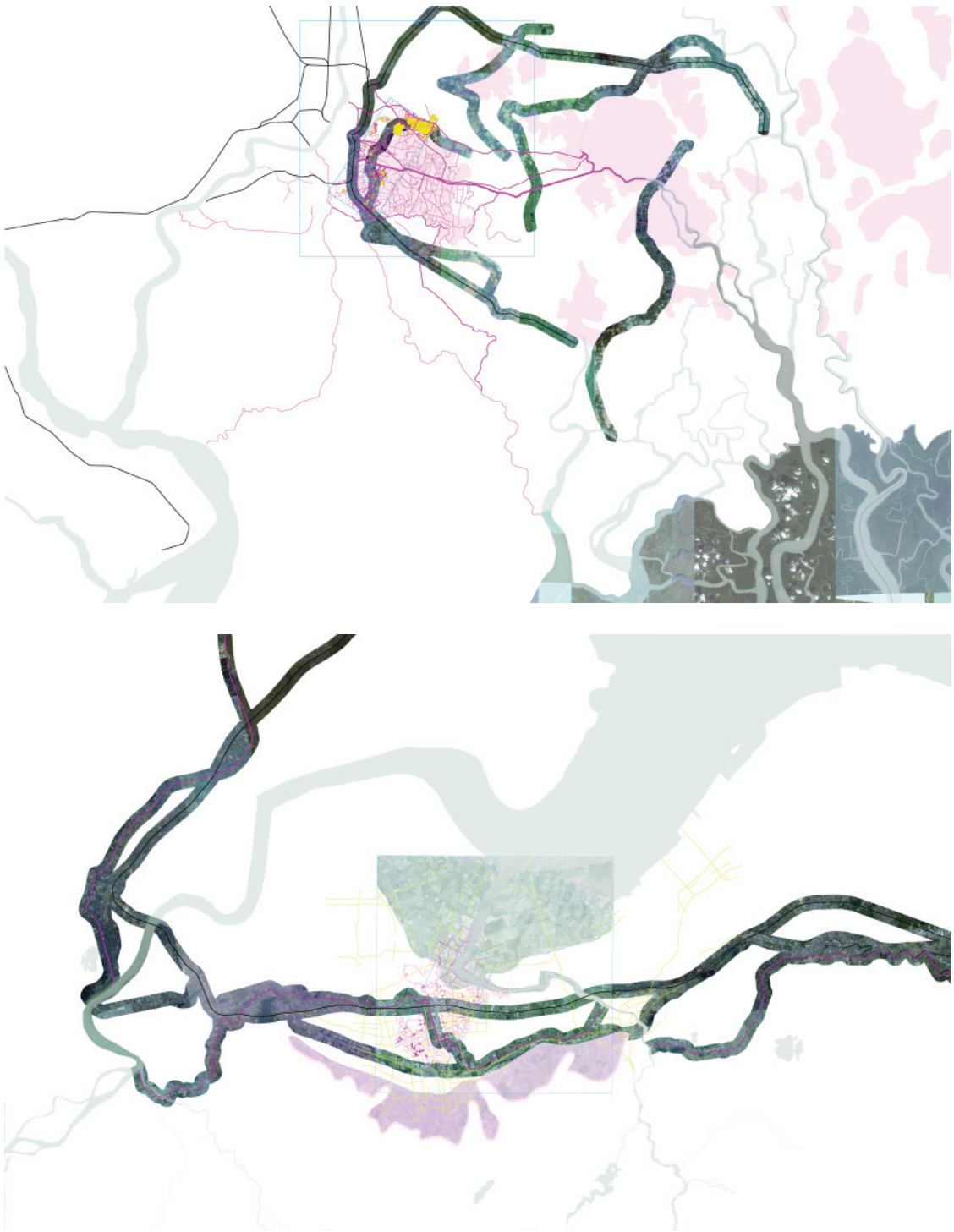*Credit: Victoria Marshall*

Figure 3:
Kolkata Shoreline and Shaoxing Shoreline study
Credit: Victoria Marshall

management. In the Ganga-Brahmaputra-Meghana mega delta, the tide is much more present in the water-land management system. Salt water moves differentially in the groundwater as well as along creeks. Freshwater is redistributed along canals and into and between ponds and fields. In addition the dispersed patterns of forested villages reveal subtle geomorphologies and topographies of ancient levees that are hard to discern on the ground because the transitions are so subtle.

Learning from these measures the *Shoreline* in Kolkata aims toward a landscape that is culturally and ecologically productive, and that encircles the East Kolkata Wetlands (EKW) an acclaimed as an innovative sustainable-city waste-recycling eco-park and RAMSAR Wetland of International Importance.[53] However this *Shoreline* is not singular, because the wetlands east of, and surrounding Kolkata are actually part of a much larger delta system that extends north to where the Hooghly branches off from the Ganga and to the west in Bangladesh. This area is rapidly urbanizing and it is doing so underneath the radar of official categories of what constitutes a city, for example the fertile river valley from Kolkata to Patna actually constitutes a vast urban corridor of city-villages.[54] At present the East Kolkata Wetland has many encroachment issues, and the boundary itself has changed, and continues to churn the power dynamics surrounding land issues in East Kolkata. It has become the area for new mega developments, such as a new road, new town, many fancy hotels, a heavy industry estate, big box retail, malls, office parks, and high-rise cluster tower enclaves. *Shoreline* aims to find the mechanistic drivers of resilience in order to mitigate this uneven development, and to bring forward a geographic and cosmic imagination that the eastern waterfront of Kolkata and other wetlands in the delta are important portals to the ocean.

The *Shoreline* in Shaoxing is a linear landscape, however rather than forming a loop it is a fragment of a much longer linear element; the Hangzhou-Ningbo Canal, which is currently being upgraded following the Zhejiang Inland Waterway Renaissance Action plan 2011 -2015. In addition the Hangzhou-Ningbo Canal forms the southern extension of the famous Grand Canal, which the Chinese People's Political Consultative Conference is currently seeking UNESCO World Heritage Status as a property of outstanding universal value.[55] The emperor and his entourage moved between their summer and winter palaces along the canal. Today the abandoned Grand Canal is being renovated to form symbolically significant scenic experiences for mass Chinese tourism. As a complement to the official project *Shoreline* aims to find the mechanistic drivers of resilience toward landscape that is inclusive of local transportation and salt-water incursion. It also aims to provide a site for legitimate residency options for people who have to leave their children far away, in order to find work in coastal cities, for example. It is important to expand the nostalgic landscape spectacle into deeper realms of the future for old and new to mix. And be self-supported as a cultural system capable of self-organizing meaning.

Ecological explanations of urban heterogeneity will fail if they lack a multiplicity of layers to link, and sufficient time for the interactions to play out through indirect links or in unexpected ways.[56] *Shoreline* has a reach similar to and greater than the master plan, however there is no final image, but rather images as patterns emerge all the time. This is therefore a porous approach, it is an urban design strategy that affords a space where issues can be defined locally and addressed (or ignored,) continuously reflecting very local "sets of entitlements, priorities, awareness, and belongingness."[57] It permits a diversity of

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[53]   http://www.ekwma.com, http://www.ramsar.org

[54]   Eric Denis et Kamala Marius-Gnanou, "Toward a Better Appraisal of Urbanization in India," Cybergeo: European Journal of Geography [En ligne], Systèmes, Modélisation, Géostatistiques, article 569, Mis en Ligne le 28 Novembre 2011, Consulté le 10 Décembre 2012. URL: http://cybergeo.revues.org/24798

[55]   http://www.chinagrandcanal.com

[56]   Cadenasso, M.L., E.J. Rosi-Marshall, S.T.A. Pickett, et al. "A Theory of Urban Heterogeneity: A Framework to Promote Integration and Hypothesis Generation for BESIV." (TBD) 8. See Discussing Theory as a Path to BES IVhttp://besdirector.blogspot.com/2014/03/april-2014-all-project-meeting.html

[57]   Ayon Kumar Tarafdar and Hans Christie BjØnness, "Environmental Premises in Planning for Sustainability at Local Levels in Large Southern Cities: a Case Study in Kolkata, India and use of the PRETAB Planning Process Model," International Journal of Sustainable Development & World Ecology,17:1 (2010) 29.

research questions to emerge from, overlapping, adjacent and quite similar urban landscapes; it allows for contesting views and practices to co-exist and as Lily Ling suggests, to "chat" with each other, allowing democratic politics to arise quietly and incrementally through urban ecosystem change.[58] This chatting is might also be understood as a pause, or white noise, amidst existing antagonistic India China interactions. It is an idea that allows people to take a breath and be open to other types of coming together. Scaling out and deeper within, the shoreline evokes the ocean as an integrator and a force that links our increasingly spatially repatterned cities.

CONCLUSION

In India and China urban design either does not exist, is often confused with, or actually means urban planning. Professionally trained planners, architects with valuable reputations, government officials, individuals who have access to forms of power, managers of economic development corporations, and banks often carry it out. In addition Indian and Chinese ecologists rarely conduct their research in cities. In this research project an ecological urban designer is someone who bridges architectural and landscape form, ecological theory, and social activism. This research project has brought forward the indexical and personal type of visuality and spatial imaginary created by aerial photography and satellite imagery. It has explained how this might be useful toward advancing a form of ecological urban design practice, and to find and support the mechanistic drivers of resilience.

Social and ecosystem scientists are increasingly developing their research questions *with* communities, not *about* communities.[59] Imagined in this way, scientists and the data they generate are important urban actors in new ways for urban design practice, and for local people. This research project aims to advance how local residents understand their environmental realities, and through experiments in drawing, explores ways in which landscape might be considered as a design project in order to sustain environments and make cities differently. These are drawings and spatial strategies that privilege imagination, but not in a hegemonic way. It is an aspiration toward and urban design practice that is of use for people in mega delta cities who want to change their constructed environments. It is for those who want to advance micro-geopolitics amongst many city delta systems - inclusive of people living in, and making a living from land, sea, and cities. In a context of the fluid spatiality of climate change it is productive to think beyond the box of cities anyway, and to focus on shared interactions across city regions, such as mega deltas.

58   L.H.M. Ling, "The Dao of World Politics: Towards a Post-Westphalian, Worldist International Relations," (Routledge: London, 2014).

59   F. Stuart Chapin and others, "Earth Stewardship: Science for Action to Sustain the Human-earth System," Ecosphere, Aug, Vol. 2(8) Article 89 (2011).