Global Garden City: Trans-Territorial Ecologies in Singapore

CONTEMPLATING AN ECO-MODEL

The accelerating growth of the world's urban population has taken on a particular significance since the 2008 pronouncement that the world is "50% urban,"[1] a now almost mythical statistic. But it is not a specific statistic—especially one so ill defined and vaguely measured[2]—that should concern us. It is, rather, the new conditions and problems that urban growth entails, at a time of accelerating global social and environmental crises. From the Niger and Ganges deltas to the Southeast Asian archipelagos, rapid urbanization in the burgeoning cities of the global south is coupled with acute susceptibility to environmental risks. How might we envision urban futures that embrace the reality of relentless urbanization, and, at the same time, transformative social and environmental ends?

The island-city-state of Singapore is often invoked as such a model for urban planning and economic development. Small in stature, it nevertheless boasts of world-class achievements.[3] Singapore appears to have dodged or alleviated the predicaments of its rapidly urbanizing neighbors of slums, overcrowding, and poverty. Its concerted planning has completely transformed the island: Four out of five of its residents are housed in state-managed housing. Two-thirds of the island now functions as water catchment areas, knit together by an elaborate collection system. And land reclamation has retraced the contours and boundaries of the island, adding a fifth of its land area in the last 50 years.

Planners in cities like Bangalore and Dalian have attempted to import the lessons of Singaporean planning.[4] The Singaporean state has as well actively *exported* itself—extended its expertise, labor and capital, and reputation—across territories, beginning with the adjacent Riau Islands of Indonesia and the Malaysian state of Johor as part of a regional growth triangle, in the Suzhou Industrial Park, and now in the ongoing Tianjin Eco-City. Since the publication of its *Green Plan* in 1992, Singapore has also fashioned itself as a "Model Green City,"[5] touting its "high density, high livability" model. Interest in this Singaporean "eco-model" has gained significant traction in the face of mounting global environmental crises. Its direct

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involvement in the Tianjin Eco-City project suggests at least an incipient success in these efforts.

How do we assess the Singapore environmental model, and what can we learn from it? How has the Singaporean state channeled its responses to geographic and political pressures into a model of urban environmental transformation? This paper explores the expansionist outlook shared by Singapore's economic and environmental strategies. It then considers the issue of environmental modeling through the concept of *trans-territorial ecologies*—using three examples to illustrate the multiple relationships between ecologies and boundaries.

A POSSIBLE URBAN FUTURE
Singapore is at once *city*, *nation*, and *island*. It is bounded by coincident political and geographic edges, and governed by a single-tier state apparatus, one that has the political will and power to maintain complete control and management of what is essentially a 100% urbanized environment. The Singapore case poses one possible end-condition to the problematic of rapid urbanization.

The Singaporean urban and environmental landscape is most effectively characterized as a space of articulated differences (comprising *degrees* of urbanization) rather than through traditional distinctions of built/un-built, city/countryside. Therefore, even though the unit of analysis employed here is essentially the city, it is more accurately what a 1963 United Nations report on Singapore calls an "urban complex,"[6] a collection of heterogeneous spaces of varying uses, densities, scales, and materials. As such, the research and analysis here is less about an administrative unit—the city or nation as such. It is about the intersections of spatiality and limits, scale, and governance.

A single party, the People's Action Party (PAP), has governed Singapore in its 47 years of independence. Founding Prime Minister Lee Kuan Yew, who led the nation for 25 of those years, still looms large in the minds of Singaporeans. The PAP itself has never been in danger of losing power. Because of this skewed political environment, and its oft-reported suppression of civil liberties and free speech, Singapore has been called a "non-liberal communitarian democracy,"[7] and a "persistent nondemocracy."[8]

THE SINGAPORE MODEL?
Most scholars express skepticism about a Singapore development model, citing its unique historical contexts, a "blended product of fusing Western modernity with local traditions and characteristics,"[9] "a comprehensive package of inextricably linked ideological, political, and economic practices," a complex amalgam that "developed historically and contingently,"[10] and the "dream of… absolute planning control."[11] Janaki Nair, writing from Bangalore, one of the "targets" of a Singapore model, believes that little would be replicable in India.[12]

But if the overall development model appears difficult, what about the specific environmental one? Skeptics doubt that other cities will have the will,

political power, or financial ability to take on such state-led, centralized control. There is as well strong incentive in the Global South toward privatization in sustainable development.[13] But whether private markets can in fact effectively lead on environmental planning is far from proven,[14] and in fact, scholars have asserted that states often play critical roles in sustainability innovation.[15] The Singapore case offers much to learn in terms of a state-led environmental model. But what, exactly, is being modeled? And how?

FRAMING A CRITICAL POLITICAL-ECOLOGICAL VIEW OF THE DEVELOPMENTAL STATE

"Nature" in Singapore cannot be separated from urbanization. How, then, do we elaborate on (1) a critical political-ecological view, tying together the politics of *urbanization* and environmental transformation, and (2) a socio-political planning view, bringing in the developmental state to questions of urban nature?

The Chicago School in the early twentieth century, including Robert Park and Ernest Burgess, invoked nature as *metaphor,* but ignored two critical aspects of the urban: nature itself, and power.[16] William Cronon's seminal study of Chicago unearthed the critical linkages between "city" and "countryside," urban and nature, but left alone the possibility of an urban nature, nature constructed along with and within urbanization.[17]

Recent urban political ecology (UPE) scholarship reasserts a material nature in the city, and situates this urban nature squarely within social, institutional, and historical power relationships. Roger Keil explains that what is at stake is a "specifically *urban* ecology," the illuminating of a nature that is intertwined within processes of urbanization.[18] For Nick Heynen, Maria Kaika, and Erik Swyngedouw, the urban itself is "a process of socio-ecological *change*."[19] Both Swyngedouw and Matthew Gandy propose the city as hybrid space between (and involving) nature and society, a "cyborg city."[20] They refer not simply to the literal flows of energy and material, but the interrelationships between the social, natural, infrastructural, cultural, and historical. These theories offer an ecological understanding of the neo-Marxian notion of the production of the urban as a site of capitalist accumulation, and contend that nature itself is part of the social realm of production.[21]

This is essential in a place like Singapore, where urban and nature are so clearly wrought together. Where, though, is the *state*? UPE scholars emphasize urban nature as a process in capitalist expansion—in which cities are considered "caught up."[22] As a result, the literature tends to pay little regard to the agency of the state, preferring to see it as a part of overarching socioeconomic processes.

Which brings us to (2) the socio-political planning view: where is the developmental state in the making of a globalized, environmental city? Classic Global City theories expounded by Saskia Sassen and John Friedmann remain insufficient.[23] Scholars like Jenny Robinson, Ananya Roy, and Aihwa

Ong call instead for a counter hegemonic postcolonial urban theory, re-situated from outside western centers of command and control—"worlding," according to Roy and Ong.[24] Ong proposes "postdevelopmentalism" to explain the way that nations have employed cultural unity narratives and neoliberal practices to strengthen ties to global networks.[25] Kris Olds and Henry Yeung illustrate an extended theory of global city-states, calling for attention to *"differential pathways associated with global city formation,"* and the issue of *governance.*[26]

These intersecting concepts allow us to explore the place of nature within processes of (global capitalist) urbanization, and the role of the state in the making of the globalized, environmental city.

A GLOBAL GARDEN CITY

Singapore's development has been dominated by discourses of *scarcity* and *survival.* Unceremoniously invited to leave the Federation of Malaysia in 1965 (after two short years), the island found itself unexpectedly independent, free of its longtime colonizers but isolated and distrustful of neighbors.[27] This prompted Singapore's leaders to seize a rhetoric that both united the population and provided a platform for economic development.

While rooted in the realities of the island, it has also been argued that such discourse is an instrument of societal control—that "a continual sense of crisis" and "maintaining a permanent state of insecurity has helped keep the state free from the challenge of alternative agendas."[28] This is necessary because, as C.J.W.-L. Wee has argued, the rise of Singapore as a nation-state is itself a kind of modernist incongruity, referring to E.J. Hobsbawm's notion that "nations without a past are contradictory in terms." Singapore functions, according to Wee, as a "state that is not a nation," and a "transnational formation using the organizational form of the nation-state." He elaborates: "Lee [Kuan Yew] and his colleagues aimed to make *industrial and capitalist modernity* the metanarrative which would frame Singapore's national identity, and to create a 'Global City' which because of its trading links would escape the restraints placed upon it by history and geography."[29]

What is remarkable is the way that such development discourse is employed toward a national(ist) environmental strategy.

GREEN SINGAPORE

The popular story of Green Singapore starts, unsurprisingly, with Lee Kuan Yew, who launched a tree planting campaign in 1963. The story has Lee and his ministers standing on the back of a truck and essentially designating the form and place of urban nature on the island.[30] Lee believed that a "garden city" would not only contribute to health and wellness, but also would attract international recognition and investment.[31]

The real story of Singapore's environmental transformation arguably begins on a more abstract policy scale. It relies on two factors: (1) control of land, and (2) political continuity to make long-term plans. The first it attained by legislation that allowed extensive state acquisition of land, like the Land Acquisition Act of 1966. The second was more complex, involving a sort

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of political pact between the people and the government—loyalty for continued economic prosperity—well documented by journalists like Cherian George.[32] An official expressed to me how important it was to remind citizens that "[they] are able to enjoy all that comfort because Singapore is able to be relevant to the rest of the world."[33]

Planning strategies based on the control of land and political stability, wrested through invocations of scarcity and survival within constrained boundaries, have radically transformed Singapore in quite specific ways.

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TRANS-TERRITORIAL ECOLOGIES

How, then, might we consider the relationship between ecologies and boundaries? We are familiar with the concept of a "borderless" world, particularly in terms of transnational flows of capital and information. Capital flows, information flows, but nature? Nature is typically considered place-bound. Even though theorists and scholars like Manuel DeLanda and Jared Diamond have presented provocative accounts of the historical flows of biology,[34] the concept and implications of *trans-territorial ecologies* have been given rather little attention. How do we consider the *environmental* in a time of "global ecologies"?[35]

The following examples illustrate the ways in which the transportation, transformation, and construction of ecologies negotiate, conform to, and disrupt political and geographic boundaries. They show how (1) the literal movement of material changes the interface of built and "natural" spaces, (2) the construction of ecologies intersects with the making of transnational economic relationships, and (3) new modes of state-institutional structures attempt to transcend spatial and historical contexts, transporting processes to invent new ecologies.

MODELING TRANS-TERRITORIAL ECOLOGIES EXPANDING ECOLOGIES—MARINA BAY

Gardens by the Bay is a breathtaking urban garden set on a large piece of reclaimed land. Featuring climate-controlled biodomes and artificial 18-storey "supertrees," the garden's hypersurrealist splendor showcases 220,000 species of plants from almost every continent. It is a veritable global garden, and perfectly embodies the island's constructed nature. Gardens by the Bay is part of the Marina Bay urban megaproject. It lies literally in the shadows of the Marina Bay Sands, a hotel-casino-mall designed by architect Moshe Safdie and developed by Las Vegas Sands, and abuts the Marina Barrage, a dam and pump station that holds back the Singapore River, no longer a flowing body of water but a reservoir with a catchment area one-sixth the size of the island.

Marina Bay is perhaps the most high profile of the vast reclamation projects that continue to redefine the boundaries of the island. Such projects have brought Singapore into conflict with its immediate neighbors Malaysia and Indonesia. Land reclamation is a particularly acute example of trans-territorial ecologies in that it (1) transforms and shifts ecological edges, and (2) involves the literal movement of ecological material in the transportation of sand. Both invite political contention. In 2005, Singapore and

Figure 1: Gardens by the Bay, Singapore.

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Figure 2: Marina Bay Sands with ArtScience Museum and Marina Reservoir in foreground.

Figure 3: Bintan Resorts on the Riau islands.

Malaysia settled a land reclamation suit centered on Malaysia's claims that Singaporean reclamation activities were transgressing Malaysian territorial waters and harming marine environments in the narrow Johor Straits.[36] The conflicts over sand, used for reclamation landfilling, are even more pronounced. Malaysia banned the sale of sand to Singapore in 1997. Indonesia followed suit in 2007.[37] And while news reports have asserted that Cambodia is now a key site for Singapore sand, the government there ostensibly banned sand exports as well in 2009.[38] The ongoing shifting geopolitical (in fact, *geomaterial*) landscapes in the immediate and extended border regions of the island quite literally constitute new geographies of globalization.

The larger reclamation projects in Singapore are invariably tied to the global economic ambitions of the island-state, like the Jurong Island petrochemical hub and Changi Airport. However, the prominent Marina Bay project arguably repositions Singapore's global ambitions in a new light. An exhibition titled *Andy Warhol: 15 Minutes Eternal* at the flamboyant ArtScience Museum reflected the physical space around it, unerringly capturing the paradoxes of artifice and substance, wishful thinking and pragmatism. Marina Bay is Singapore's attempt at an "integrated resort." Its casino is Singapore's first, and its mere existence on this straight-laced island is eye opening. Encountering strident debate, the government imposed a SG$100 charge—a discouragement fee—for Singaporean citizens to enter the casino. Foreigners get in free. A Singaporean planner I spoke to was unapologetic. The deal with Las Vegas Sands, she said, got the island a slew of infrastructural projects for little public funds.

Marina Bay not only extends Singapore's coastlines, it represents a new extension in global links, a reinforced pathway to foreign monies and bodies.

CROSSING ECOLOGIES—IMS GROWTH TRIANGLE

For all the rhetoric of boundedness, Singapore has continually transgressed apparent boundaries. The extensive reclamation is simply the most obvious expansionist response to the scarcity of land. Singapore's role in the Indonesia-Malaysia-Singapore growth triangle illustrates both the reality and permeability of economic and political boundaries in the face of disparate transnational power relationships.

The IMS growth triangle was predicated on the promise of regional growth and economic complementarity between the neighbors. In reality it is more a prospect for low-cost production and resource extraction for Singaporean companies.[39] The growth triangle functions as a kind of double-headed environmental hinterland for Singapore—both waste site and eco-tourist destination. On one hand, it is where highly polluting industries go when banished from Singapore, like the pig farms on Bulan Island. On the other hand it is also where well-to-do Singaporeans look for unspoiled sandy beaches, like on the north shore of Bintan Island. Just forty-five minutes away by high-speed ferry, the Bintan Resorts development represents a remarkable new frontier in transnational tourism. One still has rudimentary immigration checks on both sides, but the rest of the trip is a more or less

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seamless journey from Singaporean shores to Indonesian air-conditioned beachfront villas. Bintan Resorts is guarded and fenced off from the rest of the island, featuring what has been called a "Singaporeanization of the … landscape."[40] It serves as a privatized, sanitized, "eco-paradise" fueled by Indonesian service workers and Singapore dollars. Ironically, just as Indonesia bans the sale of sand to Singapore, Bintan Resorts extends a warm welcome to Singaporeans to dip their feet into that same Indonesian sand on weekend vacations.

Singaporean officials seem aware of the growth triangle's limitations. A planning official, in a candid moment of deference, said that it needs to make sense to the private sector.[41] Why such state reticence? Scholars Grundy-Warr, Peachey, and Perry have questioned the prospect of IMS as an economic growth triangle because of the lack of genuinely transnational institutions.[42] Arguably, it is as well limited by the specificity of the environments created, the lack of urban nature hybridity that has characterized Singapore to date.

EXPLODING ECOLOGIES—TIANJIN ECO-CITY

Singapore and China launched the Tianjin Eco-City in 2007, with a first phase opening set for 2013.[43] The Tianjin Eco-City project is particularly remarkable for its governmental partnership structure. Previous sustainable development efforts like Masdar in Abu Dhabi and (now dormant) Dongtan near Shanghai were led by state-held semi-private entities, featuring designs by international professionals and state-of-the-art environmental technologies. The Tianjin project is a true government-to-government collaboration on a new sustainable city, and planned to be replicable at manageable costs.
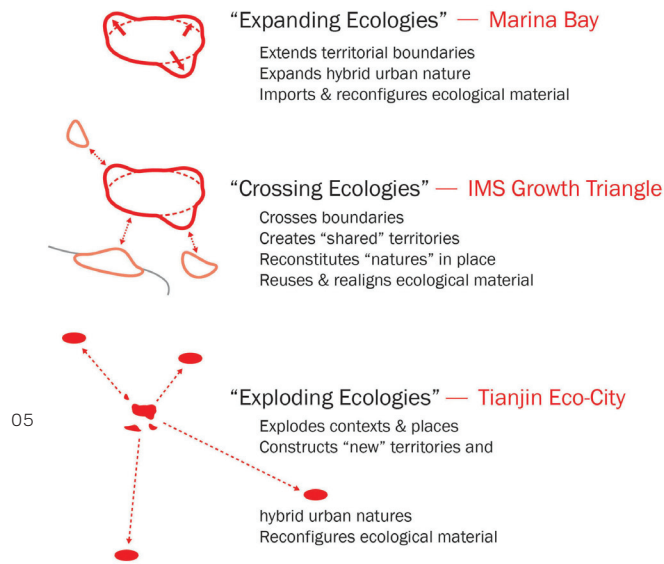
Singaporean influence is visible in Tianjin Eco-City's elaborate plans for "integrated water management" and programs to foster "social harmony." Performance indicators as well reflect a Singaporean ideal, balancing ecological metrics with "lifestyle habits" and economics.[44] In its physical design Tianjin bears some resemblance to the Singapore new town of Punggol. There, on the northeast shore of Singapore island, light rail train cars whizz across a seemingly interminable wall of crisp towers lining a soft-edged canal/reservoir that doubles as a recreation corridor.

Back in Tianjin Eco-City, stretches of the skyline are filled with cranes and half complete towers, looking like so much exurban China. At the time of writing only a couple of towers have been opened, with a handful of residents. Wide streets still hold construction debris, and newly planted trees offer little shade. The promised "Eco-Valley" is not yet evident. It is clearly a work in progress. And yet it is hard not to feel already disheartened. A sales agent showing a model apartment spoke of options, upgrades, finishes, views, but doesn't mention anything eco. She admitted that the planned mass transit system will only take shape sometime after the first phase is complete. In the Eco-City exhibition hall, the plans for natural systems and indigenous planting hold promise, but other warning signs are there. Seemingly typical Chinese superblocks get repackaged as "Eco-Cells."

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Figure 4: Tianjin Eco-City, China.

"Expanding Ecologies" — Marina Bay

Extends territorial boundaries
Expands hybrid urban nature
Imports & reconfigures ecological material

"Crossing Ecologies" — IMS Growth Triangle

Crosses boundaries
Creates "shared" territories
Reconstitutes "natures" in place
Reuses & realigns ecological material

"Exploding Ecologies" — Tianjin Eco-City

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Explodes contexts & places
Constructs "new" territories and

hybrid urban natures
Reconfigures ecological material

Figure 5: Diagram of Three
Trans-Territorial Ecologies.

Castle-like kindergartens alongside swooping modernist architecture exude a kind of theme park atmosphere. And even in the most optimistic of scenarios one wonders how the future residents of Tianjin Eco-City will respond to their new environment, without the 40 years of advocacy and education that is so much a part of the Singaporean built environment.

A Singaporean planner acknowledged that they exercise relatively little control over how residents might use the new city, but asserted its importance as a show project. She called the high-rise, high-density model embraced by Singapore and now implemented in Tianjin a "niche," through which they might insert a little bit of "Singapore DNA" to other places.[45]

AN ENVIRONMENTAL NICHE

That "niche" and little bit of Singapore DNA may indeed be the keys. Singaporean leaders believe that their overcoming of historical constraints in effect constitutes a model for sustainable urbanization. They are well aware of the realities they face. And they trust that this niche they have staked out, and the model they have embraced, will be a resilient link to a global, urban future—their "continued relevance." "Survival," the buzzword of the first forty years of Singaporean development, integrates well into this new world of global environmental crises and rapid urbanization.

In some ways they have succeeded. Singapore held the third World Cities Summit in June of 2012, an event where Singapore champions "liveable and sustainable" cities. The summit is capstoned by the award ceremony of the Lee Kuan Yew World City Prize. In 2012 the prize was given to New York City. Mayor Bloomberg offered Singapore the ultimate praise: "Singapore is like New York City in so many ways … constantly in motion, and constantly rebuilding themselves."[46].

Tracing Singapore's expansionist endeavors here suggests that this rebuilding is not a clear-cut, progressive trajectory. But each represents an

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(increasingly extra-territorial) effort to transcend local constraints and link to global networks. Tianjin Eco-City represents the continuation of a historical arc of territorialization and a globalizing nationalist agenda. Equally importantly, it represents the dissemination of *a specific kind of planning knowledge.* City officials are clear on where their niche leads them. Singapore engages in environmental dialogue with so-called global cities like New York City and new sustainable hotspots like Curitiba. But its "high density, high livability" model is squarely targeted toward the rapidly urbanizing and densifying cities of the global south.

SINGAPORE ECO-MODEL AS PROCESS

One conclusion, more straightforward, is about the role of the Singaporean state. Singapore has identified a niche in which its development experiences make sense in the face of global environmental challenges. Its modeling offers target cities and nations the promise of success and as well expands Singapore's global relevance and foundations for economic development.

But will it work? It is critical to turn to the processes through which Singapore constructs its urban nature and now attempts to export. Here the Tianjin project is a valuable example, both to define better the model itself, and to consider its transportability to other contexts. China, like Singapore, exhibits strong state control. Even so, and with direct Singapore partnership, it is not yet clear that they will be successful. There are possible confounding factors—China has multiple tiers of government that cannot easily attest to being essentially corruption free, and urbanization in China is occurring on a scale that is unparalleled. The success or failure of Tianjin Eco-City, then, might be testament not only to the strength of the nation state but the coordination of its local capacities.

As asserted here, cities are produced through the socio-ecological processes of urbanization. Given such processes, the ultimate test of an environmental model might be the participation of both states and citizens in the making of such hybrid urban natures. If, in Tianjin, the Chinese state perseveres in implementing the requisite infrastructural, technological, and ecological developments and policy frameworks, then the key metric will be the extent to which both the state and residents of the new Eco-City embrace, make, and remake both physical place and accompanying social expectations.

The Singapore environmental model, then, should be looked at not as the delineation of ends—specific forms and objectives—but as *processes* through which such ends are constituted through the interrelated formation of built and natural environments, state, and society.

Finally, there is a question that is beyond the scope of this paper, but critical for further discussion: how much value should be placed on a Singapore model that, to date, has not seriously engaged the issue of carbon footprints? In the context of rapidly urbanizing cities where poverty and ecological risk are widespread, such a metric may not be the most immediate concern. But it must surely be a priority in any model that focuses on true sustainability. ◆

ENDNOTES

1. See UN-HABITAT, "State of the World's Cities 2010/2011: Bridging the Urban Divide" (London; Sterling, VA: Earthscan, 2008). The "50% urban" statistic is well cited in other UN and global NGO literature as well.

2. Neil Brenner and Christian Schmidt, "The Urban Age in Question," manuscript submitted for publication, 2012.

3. With an area of 714 square kilometers, and 5.1 million in population (a 300% increase in 50 years), the city-state measures in the top ten in the world by purchasing power parity and twenty-seventh by human development index. In 2010 it reported 14.5% real GDP growth. See World Bank data tables, 2011, http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD; United Nations Development Programme [UNDP], Human Development Report 2010, http://hdr.undp.org/en/media/HDR_2010_EN_Complete_reprint.pdf; and Monetary Authority of Singapore [MAS], *Recent Economic Developments in Singapore,* 2011, http://www.mas.gov.sg/resource/eco_research/eco_dev_ana/Recent_Economic_Developments.pdf.

4. See Chua Beng Huat, "Singapore as Model: Planning Innovations, Knowledge Experts," and Lisa Hoffman, "Urban Modeling and Contemporary Technologies of City-Building in China: The Production of Regimes of Green Urbanisms," both in *Worlding Cities: Asian Experiments and the Art of Being Global,* eds. Ananya Roy & Aihwa Ong (Chichester, West Sussex; Malden, MA: Wiley-Blackwell, 2011), 29–54.

5. Ministry of the Environment, Singapore [ENV], *The Singapore Green Plan: Towards a Model Green City* (Singapore: SNP Publishers, 1992), 1.

6. Charles Abrams, Susumu Kobe, & Otto Koenigsberger, *Growth and Urban Renewal in Singapore: Report prepared for the Government of Singapore* (New York: United Nations Technical Assistance, Department of Economic and Social Affairs, 1963), 61.

7. Chua Beng Huat, *Communitarian Ideology and Democracy in Singapore* (Singapore: Psychology Press, 1995), 184.

8. Daron Acemoglu and James Robinson, *Economic Origins of Dictatorship and Democracy* (New York: Cambridge University Press, 2006), 43.

9. Wong Tai-Chee and Yap Lian-Ho Adriel, *Four Decades of Transformation: Land Use in Singapore, 1960-2000* (Singapore: Eastern Universities Press, 2004), 143.

10. Chua Beng Huat, "Singapore as Model: Planning Innovations, Knowledge Experts," in *Worlding Cities: Asian Experiments and the Art of Being Global,* eds. Ananya Roy & Aihwa Ong (Malden, MA: Wiley-Blackwell, 2011), 34.

11. Gavin Shatkin, "The True Meaning of the Singapore Model: State Capitalism and Urban Planning," manuscript submitted for publication, 2011, 4.

12. Janaki Nair, "Singapore is not Bangalore's destiny," *Economic and Political Weekly* (2000): 1512–1514.

13. McKinsey & Company, *Charting Our Water Future: Economic Frameworks to Inform Decision-Making | 2030 Water Resources Group* (Munich: 2030 Water Resources Group, 2009).

14. Peter H. Gleick, Gary Wolff, Elizabeth L. Chalecki, and Rachel Reyes, *The New Economy of Water: The Risks and Benefits of Globalization and Privatization of Fresh Water* (Oakland, CA: Pacific Institute for Studies in Development, Environment, and Security, 2002).

15. Martin Jänicke and Klaus Jacob, "Lead Markets for Environmental Innovations: A New Role for the Nation State," *Global Environmental Politics* 4(1) (2004): 29–46.

16. See Robert E. Park, "The city: suggestions for the investigation of human behavior in the city environment," *The American Journal of Sociology* 20(5) (1915): 577–612; Robert E. Park, "Human Ecology," *The American Journal of Sociology* 42(1) (1936): 1–15; and Ernest W. Burgess, "The Growth of the City: An Introduction to a Research Project," in *The City* (Chicago: University of Chicago Press, 1925).

17. William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: Norton, 1991).

18. Roger Keil, "Urban Political Ecology 1," *Urban Geography* 24(8) (2003): 726.

19. Nick Heynen, Maria Kaika, and Erik Swyngedouw, "Urban Political Ecology: Politicizing the Production of Urban Natures," in *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism,* eds. Nick Heynen, Maria Kaika, and Erik Swyngedouw (New York: Routledge, 2006), 2.

20. See Erik Swyngedouw, "Metabolic Urbanization: The Making of Cyborg Cities," in *In the Nature of Cities: Urban Political Ecology and the Politics of Urban Metabolism,* eds. Nick Heynen, Maria Kaika, and Erik Swyngedouw (New York: Routledge, 2006); Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, MA: MIT Press, 2002); and Matthew Gandy, "Rethinking urban metabolism: water, space and the modern city" *City* 8(3) (2004): 363–379.

21. See David Harvey, *The Urbanization of Capital: Studies in the History and Theory of Capitalist Urbanization* (Baltimore, MD: John Hopkins University Press, 1985), and Neil Smith, *Uneven Development: Nature, Capital, and the Production of Space* (New York: Blackwell, 1984).

22. Maria Kaika, *City of Flows: Modernity, Nature, and the City* (New York: Routledge, 2005), 22.

23. See Saskia Sassen, *The Global City: New York, London, Tokyo* (Princeton, NJ: Princeton University Press, 1991); John Friedmann, "The world city hypothesis," *Development and change* 17(1) (1986): 69–83; and John Friedmann and Goetz Wolff, "World city formation: an agenda for research and action," *International Journal of Urban and Regional Research* 6(3) (1982): 309–344.

24. See Jenny Robinson, "Global and world cities: a view from off the map," *International Journal of Urban and Regional Research* 26(3) (2002): 531–554; Ananya Roy, "The 21st-century metropolis: new geographies of theory," *Regional Studies* 43(6) (2009): 819–830; and Ananya Roy and Aihwa Ong, eds., *Worlding Cities: Asian Experiments and the Art of Being Global* (Malden, MA: Wiley-Blackwell, 2011).

25. Aihwa Ong, "Graduated sovereignty in South-East Asia," *Theory, culture & society* 17(4) (2000): 55–75.

26. Kris Olds & Henry Yeung, "Pathways to global city formation: a view from the developmental city-state of Singapore," *Review of International Political Economy* 11(3) (2004): 489–521.

27. Barbara W. Andaya, *A History of Malaysia* (Honolulu: University of Hawai'i Press, 2001).

28. Martin Perry, Lily Kong and Brenda S.A. Yeoh, *Singapore: A Developmental City State* (New York: Wiley, 1997), 6.

29. C.J.W.-L. Wee, *The Asian Modern: Culture, Capitalist Development, Singapore* (Hong Kong: Hong Kong University Press, 2007), 33.

30. Singapore official, interview with author, June 2012.

31. Belinda Yuen, "Creating the Garden City: The Singapore Experience," *Urban Studies* 33(6) (1996): 955–970.

32. Cherian George, *Singapore: The Air-Conditioned Nation: Essays on the Politics of Comfort and Control, 1990-2000* (Singapore: Landmark Books, 2000).

33. Singapore official, interview with author, June 2012.

34. See Manuel De Landa, *A Thousand Years of Nonlinear History* (New York: Zone Books, 1997), and Jared Diamond, *Guns, Germs, and Steel: the Fates of Human Societies* (New York: Norton, 1997).

35. Timothy W. Luke, "Global Cities vs. "global cities:" Rethinking Contemporary Urbanism as Public Ecology," *Studies in Political Economy* 70 (2003): 14.

36. Permanent Court of Arbitration [PCA], Case concerning Land Reclamation by Singapore in and around the Straits of Johor (Malaysia v. Singapore), decision of 1 September 2005 (No. Volume XXVII) (2005), 133–145.

37. The Economist, "The hourglass effect: Seven maids with seven mops might fail, but Singapore gets close," October 8, 2009.

38. Denis D. Gray, "Cambodia sells sand; environment ravaged," *Asian Reporter,* 21(17) (2011): 4.

39. Carl Grundy-Warr, Karen Peachey and Martin Perry, "Fragmented Integration in the Singapore-Indonesian Border Zone: Southeast Asia's "Growth Triangle" Against the Global Economy," *International Journal of Urban and Regional Research* 23(2) (1999): 304–328.

40. Tim Bunnell, Hamzah Muzaini and James D. Sidaway, "Global City Frontiers: Singapore's Hinterland and the Contested Socio-political Geographies of Bintan, Indonesia," *International Journal of Urban and Regional Research* 30(1) (2006): 10.

41. Singapore planner, interview with author, June 2012

42. Carl Grundy-Warr, Karen Peachey and Martin Perry, "Fragmented Integration in the Singapore-Indonesian Border Zone: Southeast Asia's "Growth Triangle" Against the Global Economy," *International Journal of Urban and Regional Research* 23(2) (1999): 304–328.

43. Ministry of National Development, Singapore [MND], "Tianjin Eco-city: Introduction," accessed May 29, 2012, http://www.tianjinecocity.gov.sg/bg_intro. htm.

44. Ibid.

45. Singapore planner, interview with author, June 2012.

46. Urban Redevelopment Authority, Singapore (URA), Press Release, Speech by Michael R. Bloomberg, Mayor, City of New York, Lee Kuan Yew World City Prize 2012 Laureate Lecture, 21 March 2012, accessed August 22, 2012, http://www. leekuanyewworldcityprize.com.sg/press6.htm Singapore Model: State Capitalism and Urban Planning," manuscript submitted for publication, 2011, 4.