Chapter 5
"Ecocity China": An Ethos Under Development

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Abstract In China, the ecocity has become the model for sustainable urban development. When considering that upward of 45% of the population of China may still urbanize within the next 50 years, the issue of developing China's cities in a sustainable way concerns not only China, it also concerns the world. This chapter first looks at the concept of the ecocity and how it has taken on its own brand identity within China, labeled here as "Ecocity China." Drawing from various examples, an analysis of "Ecocity China" follows as to how differences in constructing ecocity indicators and urban master plans reflect distinctly different ontological and epistemological approaches to sustainable development. Different than most top-down approaches to ecocity design in China, this chapter looks at a promising example of an incremental ongoing "policy by design" approach to ecocity planning and development. Also emerging from this analysis is the realization that to fully embrace ecocity development requires the adoption of eco-cosmopolitanism ethics by governing institutions. Conclusions from this analysis suggest that moving to a robust ecocity approach will be challenging for status quo Chinese politics and that such planning will necessitate a more experimental approach to urban development and establishment of an information infrastructure and a culture of collaborative communication.

Keywords Ecocity • Sustainable city • Urbanization • Development • Sustainability ethics • China • Eco-cosmopolitan

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Introduction

In the year 2000, 50% of the global population lived in cities. By 2025, city dwellers are projected to reach five billion in number across the world, representing over 60% of the world's population. In countries such as China, India, and Brazil, rural to urban migration is happening at an unprecedented rate in human history. This urbanization is presenting rapidly developing societies with technological, material, logistical/planning, health care, infrastructural, and organizational challenges never before encountered on this geopolitical scale. Globally, urbanization is one of the most pressing issues facing both developed and developing societies. To address these challenges at a local level, urbanization requires that the planning, design, and production of cities be brought into a certain coherent organization that is both livable and sustainable. "Ecocity"—short for ecological city—has become the model term for developing just such a livable and sustainable city. However, no successful urban-sized example of an ecocity yet exists in either a developed or developing economic context.

The concept of the ecocity emerged from various urban social movements concerned with improving living conditions for all residents while decreasing the overall ecological footprint of the city toward a zero-sum outcome, that is, from low to no impact.[1] The basis for the ecological city finds its formalization in the works of Paulo Soleri (1973), Richard Register (1987, 2006), Wang Rusong (Wang 2001; Wang and Ye 2004), and Timothy Beatley (2000). While Register does not explicitly provide a steadfast definition for ecocities, he defines *ecocitiology* as "the science and art of investigating, describing, designing, and building healthy cities" (Register 2006, p. 23). In other words, the ecocity is an ongoing process of design and redesign, including municipal policy.

The explicit definitions of what constitute an ecocity are based on qualitative terms and quantitative indicators that have, as of yet, no explicit preexisting examples of systemic success in contemporary urban development. Nevertheless, explicit ecological indicators are being developed based on directives and development imperatives mainly defined by states. (See following section on description of indicators.) These imperatives are articulated in ways that capture public imagination as well as providing the rhetorical framework for setting developmental goals. For example, President Hu Jintao describes the overall goals of China's development as being that of achieving a *harmonious society*—an encompassing metaphor toward which the development of objective standards and indicators needs to be aimed.[2]

[1] Ecological footprints are a way to try to measure the impact of humans on ecosystems, as a means to understand whether an ecosystem can sustain the output needed by a local or global population.

[2] "A harmonious society advocates an overall, coordinated, and sustainable development concept, making the interests of different sectors balanced. So long as we follow this scientific development concept, we can get rid of social unrest and the destruction of natural resources that generally occurs in developing nations. During this period, we should pay attention to the relationship between humanity and nature, properly protect natural resources, reduce pollution, and make efforts to raise the quality of the environment in order to realize sustainable development (China Daily 2005)."

As a means for articulating the goals of the Chinese state, metaphorical phrases such as *harmonious society* and *sustainable development* indicate a set of state values that are to be interpreted as the ends of a development project, such *as the Beijing Green Olympics*, the theme of the 2010 Shanghai World's Fair "Better City, Better Life," or the planned *Dongtan Ecocity* sector of Shanghai. The construction of ecological indicators as objective benchmarks toward these goals is situated in the state's ethos of what happiness and stability mean for the Chinese people. If we consider this ethos within the Confucian philosophical traditions of state, one may even trace to *the Analects of Confucius* and *the Mencius*, theories in support of state performance of the terms of social happiness. That is, the ongoing interpretation of the ethos (*harmonious society* or *ecocity*) is how the state works toward achieving (operationalizing) the virtue of happiness (or "well-offness") for its society. Developing and redesigning China's urban centers need to be conducted in a manner that provides a sustainable economic foundation, enhances surrounding ecosystems, and supports healthy communities. Using example cases, this chapter looks at how interpretations of Chinese ecocities embody an ethos for China's overall sustainable development[3]—even if there is much to be critical of and there has yet to be a definitive and/or sustainable example of success.

Ecocity China

Chinese cities, by many accounts,[4] have some of the world's most polluted conditions—conditions that make readily apparent the need for clean urban development and the implementation of efficient and coherent planning. The degradation problem is compounded when taking into account the fact that much of China's urbanization (rural to urban migration) is yet to come.[5] Because building better cities holds the key to China's urbanized future and economy, the ecocity needs to become a steadfast reality and not just an attempt by regional and local officials to appease the mandates of the central government.

[3] The major challenges to sustainable development in China include the country's rapid economic growth, primarily fueled by the massive consumption of natural resources; China's population and internal growth of consumption; interregional differences between economic and infrastructural development (such as between poorer western provinces and wealthier coastal provinces); and a coherent legal system which can quickly process and uphold necessary laws (State Environmental Protection Administration 2004).

[4] There are multiple ways to describe pollution, but in terms of air pollution and overall water quality, Chinese cities rank among the world's worst. For example, according to a World Bank report, China has 20 cities ranked in the top 30 in terms of air pollution, due mainly to the burning of coal and rapid growth in personal automobile use (World Bank 2011).

[5] In 2009, the percentage of the population urbanized was 46.1% in China, while it was 82% in the United States, 29.7% in India, and 86.1% in Brazil (United Nations Department of Economic and Population Division Social Affairs 2009). As much as another 40% of the population in China and India will urbanize by the end of the twenty-first century, so the already large cities will continue to grow.

The structure of urbanization in China is undergoing rapid transformations. Large-scale land-use changes, increases in material consumption of energy and goods, emissions and climatic effects, and profound shifts in culture are all emerging from the pressure to develop and urbanize the population. Questions concerning ecological sustainability revolve around the success of China's urban centers to control and manage these transformations. The size of China's population means that any significant increase in consumer (consumption) habits is going to impact profoundly on the stock of natural resources, such as forestry products and ecosystem services, and it is urbanization which is the major driver of this increase in consumption.[6]

Urbanization is the primary engine for economic change within China. Migrant workers travel from their home regions in search of construction labor among the thousands of ongoing building projects. Urban centers, particularly since China's economic reforms of the late 1970s, are the primary sectors of industrial, economic, and capital production for both regions and the nation as a whole (Schienke 2006).

Comprehensive approaches to ecocity development in China require thinking beyond the city limits by taking broader regional efforts into the planning process. The relatively recent emergence of the circular economy (CE) approach to urban-ecosystem-economy integration is an attempt to address such questions of material and energy flows across industrial sectors within a specific urban region. These demands have brought about the need for new analytical forms which can encompass multiple types of complexities and transform information about processes from one system (e.g., industrial performance) to another (e.g., watershed management).

> Circular economy is a kind of networking and adaptive ecological economy operated according to the principles of ecological economics of "totality, co-evolution, recycling, and self-reliance," having high efficiency of resource use, and harmonious with surrounding life-support ecosystem. Recycling here means not only material recycling, but, and maybe most importantly, renewable energy use; information feedback; regional symbiosis; efficient monetary circulation; and intelligent evolution of the economic systems itself, towards sustainable models.
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> (Wang and Liu 2005)

Based on Wang's description of what is required to support a circular economy, it is readily apparent that to actually implement such an approach requires significant coordination of logistics, information, expertise, and material flows across an urban area. Further, circular economy requires coordination across various urban centers within a given region.

Projects bearing the "ecocity" moniker in China range from the planning of multiple cities within a region, an entirely new city, a well-defined sector of a city,

[6] "The number of China's households grew almost three times as fast as its population during 1985–2000, because average household size decreased from 4.5 to 3.5 people. This alone gave China an extra 80 million households in 2000, more than the total number of households in Russia and Canada combined.... China is also becoming more urban. From 1952 to 2003, while its total population "merely" doubled, its proportionate urban population tripled from 13 to 39%. Hence, the urban population increased sevenfold to more than half a billion. The number of cities increased fourfold to more than 660 (including more than 170 with at least one million residents), and the areas of existing cities grew significantly" (Liu and Diamond 2005).

a newly expanding sector of a city yet to be built, the redevelopment of a currently industrial city, an aspect of urban master planning of current cities, or as a dimension of urban infrastructure such as transportation and energy. In addition to a general overall focus on net impacts, ecocity projects further vary in how the designs take into account impacts on and use of local ecosystems and biodiversity. As much as it is a definitive approach to development, the concept of "Ecocity China" has also become a brand and, as such, is often subject to interpretation by marketing interests. While initially promising, entire unfulfilled ecocity projects such as Dongtan (at the mouth of the Yangtze River on the outskirts of Shanghai) have received harsh critiques from, among others, the Ethical Corporation, which referred to Dongtan Ecocity (Castle 2008) as a "masterpiece of greenwashing on several accounts" (French 2007). The main problem with the Dongtan Ecocity project appears to arise from the fact that local (Shanghai) interests were represented by land developers (probably hoping to turn estuary into highly valuable land) working in conjunction with foreign design experts. The result was a heavily designed project without any governmental or public support worthy of note.

The concepts underlying ecocity planning, however, are too fundamental to overall sustainability to be ignored. Moving forward, urban and regional planning, and questions concerning overall development, will necessarily require following an ecocity plan in one form or another. Further, if China is to move past its dominant "factory to the world" model for ensuring sustained economic growth, policy makers will need to more seriously consider how to best leverage ecocity principles such as regional circular economics, zero-emissions transportation, renewable energy, and biodiversity. It is crucial, however, that further false starts such as Dongtan do not tarnish the "Ecocity China" brand. Rather, "Ecocity China" needs to become an ethos for the overall development of China. Cities are key to the economies that drive contemporary civilizations. Ecocities, then, are key to China's future ecological-economic conditions that will drive future *ecological civilizations*, a concept that is only beginning to be used. If indigenous terms of success are realized, "Ecocity China" will become a very viable and attractive brand of ethos for most of the developing/redeveloping world.

Ecocity Indicators: The Epistemology and Ontology of Ecocities

Before analyzing examples of ecocities projects, it is useful to understand how ecocity projects are typically measured. Ecological indicators—usually included in broader formal urban master plans—are used to measure how well an ecocity is performing (achieving its "ecocity-ness"). Ecocity projects also require attention to the design of indicators themselves. There are common indicators that are found in a variety of projects, and there are green building standards such as the US LEED building standards,[7] but there exists no set standard for indicators or measures for

[7] Leadership in Energy and Environmental Design (LEED) is a green building certification system developed by the US Green Building Council in 2000 (U.S. Green Building Council 2011).

an entire city. Zero-net greenhouse gas emissions are a likely standard most ecocities would consider as a major benchmark, but this alone does not take into account the other dimensions under consideration, such as biodiversity, commuting distances, richness of social interactions, and other factors that make a city livable. Nevertheless, ecocity projects require indicators by which their successes can be measured. Overall, the argument here is that ecocities are (ontologically) determined by indicators more than by a prescribed set of sociotechnical arrangements.

To understand how indicators differ across projects, consider the key performance indicators (KPIs) for the Sino-Singapore Tianjin Eco-City project (launched in 2009) and compare these with indicators developed for the Caofeidian "Genetic City" project as proposed by the Dynamic City Foundation (DCF). The purpose is to demonstrate that different approaches to indicators are possible (and useful) mainly because they attempt to measure ecocity as a constructive "ethos" as opposed to ecocity as a definitive benchmark. Some of the indicators are significantly qualitative in character and represent more a sense for how people ought to behave and act within an ecocity and the *ends* toward which ecocities ought to be striving.

Both Tables 5.1 and 5.2 represent "ontological sets" of an ecocity. That is, the indicators within these tables delineate the categories and imperatives that signify and comprise "ecocity-ness" in the minds of planners, architects, policy makers, etc. Referring to Table 5.1, the Sino-Singapore Tianjin Eco-city (SSTE) project, the categories (left column) represent the *ends* toward which the indicators are targeted. For example, good lifestyle habits, developing a dynamic and efficient economy, and balance in the man-made environment more resemble categories of happiness and could be easily found alongside indicators of gross national happiness (GNH) rather than alongside indicators of economic development, such as gross domestic product (GDP). The key indicators (right column) were developed "to guide [Tianjin Eco-city's] planning and development into a model city for sustainable development" (Singapore Ministry of National Development 2008). The key indicators, thus, are intended to represent model ecocity goals and are the highest standards of either country. "In formulating these KPIs, reference is made to national standards in China and Singapore, and the higher of the two standards is adopted wherever feasible" (Singapore Ministry of National Development 2008).

In comparison, Table 5.2, representing the Caofeidian (CFD) "Genetic City" project, prescribes a more functional or physiological approach to analyzing the ecocity. First, the CFD approach breaks down the analysis according to functional systems within the city (which is more similar to the Richard Register approach) and then sorts the indicators into functional categories within the system. It should be noted that the CFD approach is not comprehensive of the overall proposal or project and that there are other significant aspects to the proposal that take into account social dynamics. Further, there are many subcategories of architectural specifications. The CFD approach to ecocity indicators keeps focus on functional systems that can be engineered, while the SSTE approach includes social ends and human "talent" ratios that can be planned for, but not guaranteed through engineering alone. (The CFD approach locates these considerations elsewhere in its design plans.) For example, in calling for "at least 50 R&D scientists and engineers per

Table 5.1 Key performance indicators (KPIs) for the Sino-Singapore Tainjin Eco-City Project (SSTE)

Category	Indicator
Good natural environment	Ambient air quality: The air quality in the ecocity should meet at least China's National Ambient Air Quality Grade II Standard for at least 310 days. The SO_2 and NOX content in the ambient air should not exceed the limits stipulated for China's National Ambient Air Quality Grade 1 Standard for at least 155 days
	Quality of water bodies within the ecocity: Water bodies in the ecocity should meet grade IV of China's latest national standards by 2020
	Quality of water from taps: Water from all taps should be potable
	Noise pollution levels: Noise levels must fully comply with China's standards for environmental noise in urban areas
	Carbon emission per unit GDP: The carbon emission per unit GDP in the ecocity should not exceed 150 tonne-C per US$1 million
	Net loss of natural wetlands: There should be no net loss of natural wetlands in the ecocity
Healthy balance in the man-made environment	Proportion of green buildings: All buildings in the ecocity should meet green building standards
	Native vegetation index: At least 70% of the plant varieties in the ecocity should be native plants/vegetation
	Per capita public green space: The public green space should be at least 12 m^2 per person by 2013
Good lifestyle habits	Per capita daily water consumption: The daily water consumption per day each person should not exceed 120 l by 2013
	Per capita daily domestic waste generation: The amount of domestic waste generated by each person should not exceed 0.8 kg by 2013
	Proportion of green trips: At least 90% of trips within the ecocity should be in the form of green trips by 2020. Green trips refer to nonmotorized transport, i.e., cycling and walking, as well as trips on public transport
	Overall recycling rate: At least 60% of total waste should be recycled by 2013
	Access to free recreational and sports amenities: All residential areas in the ecocity should have access to free recreational and sports amenities within a walking distance of 500 m by 2013
	Waste treatment: All hazardous and domestic waste in the ecocity should be rendered nontoxic through treatment
	Barrier-free accessibility: The ecocity should have 100% barrier-free access
	Service network coverage: The entire ecocity will have access to key infrastructure services, such as recycled water, gas, broadband, electricity, and heating by 2013
	Proportion of affordable public housing: At least 20% of housing in the ecocity will be in the form of subsidized public housing by 2013
Developing a dynamic and efficient economy	Usage of renewable energy: The proportion of energy utilized in the ecocity which will be in the form of renewable energy, such as solar and geothermal energy, should be at least 20% by 2020

(continued)

Table 5.1 (contiuned)

Category	Indicator
	Usage of water from nontraditional sources: At least 50% of the ecocity's water supply will be from nontraditional sources such as desalination and recycled water by 2020
	Proportion of R&D scientists and engineers in the ecocity workforce: There should be at least 50 R&D scientists and engineers per 10,000 workforce in the ecocity by 2020
	Employment-housing equilibrium index: At least 50% of the employable residents in the ecocity should be employed in the ecocity by 2013
Qualitative KPIs	Maintain a safe and healthy ecology through green consumption and low-carbon operations
	Adopt innovative policies that will promote regional collaboration and improve the environment of the surrounding regions
	Give prominence to the river estuarine culture to preserve history and cultural heritage and manifest its uniqueness
	Complement the development of recycling industries and promote the orderly development of the surrounding regions

Source: (Singapore Ministry of National Development 2008)

10,000 workforce in the ecocity by 2020," the SSTE approach heavily emphasizes the need to enhance local innovation capacity in science and technology, an issue tied directly into China's overall medium-term indigenous innovation goals. (See China's 15-year Medium-to-Long Term Plan for Science and Technology (2006–2020) (Cao et al. 2006)).

There are significant similarities between the two approaches, but there are some critical differences as well. Both sets of indicators from the SSTE and CFD projects seem viable approaches to setting the design goals and constraints toward ecocity ends. Both approaches propose quantitative benchmarks for ecocity development.

The SSTE approach uses current and projected government standards whenever possible, which is not surprising considering the project is primarily collaboration between governmental organizations and actors. What we can understand from this is that the ecocity itself is a venue for political collaboration and interchange of discourse and goals about development between East-Asian regional partners. The discussion is as much about shared development values as it is about what an ecocity ought to be. The deep involvement of local and national officials in the SSTE project appears to result in the overt attention given to discussing the social and environmental ends of the ecocity project, to the point that the somewhat vaguely worded ends provide for the overall categorization of indicators. This approach, however, makes it difficult to arrive at a sense for whether the 26 key indicators are enough to satisfy or justify the ends they are categorized under. Difficulty also occurs in parsing differences between the categories and their underlying indicators. For example, when evaluating "good natural environment" versus "healthy balance in the man-made environment," many of the indicators are able to

Table 5.2 Ecocity system analysis for Caofeidian "Genetic City" proposal

System	Classification	Identifier
Compact city system	Housing	Percentage of total housing that is economically affordable and low rent
		Housing mixture of different rent forms and property right based on different price levels and areas
		Per capita land for construction projects
		Per capita residential area
		Housing footprint ratio to number of inhabitants
		Per capita housing footprint
	Public service facilities' accessibility	Green spaces and public parks ratio to public buildings
		Investment ratio of per capita public construction funding
Green architecture system	Construction environment	Set database of every single building eco-technology, building construction, and other contents for monitoring and management
		Eliminate harmful materials: Follow a list of harmful and toxic materials
		Indoor air quality: radon density
		Indoor air quality: good ventilation
		Indoor air quality: The nitrides content of interior space meets with the national standard
		Indoor noise environment quality fit national standards
		Indoor daylighting physical environment quality: fit national standards, using ecological technology to achieve a comfortable temperature, humidity, and good physical environment
	Green construction	Use a set of inspection standards and environmental management system (ISO 14000, LEED, etc.)
		according to the national standard or make appropriate method to of environmental report and grading
Green Transportation system	Transportation efficiency	Time difference between taking public transportation and cars from major residences to main workspace journey with less than 1.5 times difference between taking bicycle vs. cars from major residences to main workspace journey
	Transportation mode	Walk and nonmotorized traffic-sharing rate
		Bus-sharing rate
		The ratio of green commuting

(continued)

Table 5.2 (contiuned)

System	Classification	Identifier
	Transport energy efficiency	CO_2 emissions caused by traffic
		The percentage of renewable energy sources in traffic energy consumption accounts for total energy demand
		The percentage of traffic energy consumption accounts for whole city energy consumption
		The rate of gas-based of public transportation and taxi
Solid waste recycling system	Solid waste collection	Frequency and rate of waste recycling
	sanitation infrastructure	"Coverage scale of waste transport vehicles of transportation closed"
Water recycling system	Supply and demand	The pass rates of drinking water
	Recapture for reuse	Permeable surfaces
	Enhancing groundwater	Ecological treatments and processes
Ecological environment and public space system	Coastal defense	Erosion protection
		Tsunami protection
	Forestation rates	Afforestation coverage in the city
		Urban buildup green land rate
		Per capita public green land area
		Per capita park green land area
	Atmosphere and air quality	Days which better or equal to "level two" air quality standards and
		days which better or equal to "level one" air quality standards of:
		NOX emissions
		SOX emissions
		CO emissions
		Noise emissions
	Water quality	The reclaimed water quality reaches the urban wastewater standard
	Ecosystem quality	Biodiversity rates
		Biocomplexity rates

Source: Preliminary materials from the "Genetic City" Caofeidian project (Dynamic City Foundation 2010) fit under either category. Overall, the SSTE approach seems to consider the ecocity itself as a means to the categorical ends of state development.

In comparison, the CFD design proposed by an architectural group working under the direction of the Dynamic City Foundation exemplifies an architectural design approach to ecocity planning and benchmarking. The engineered design and management of urban systems, then, become the way to achieve the functional ecocity itself, which is an ongoing (genetic/genealogical) process of adaptations. If an ecocity is the *ends* of the CFD project, then designing management indicators for these urban systems is necessarily the primary *means* toward those *ends*.

The categorical choice of indicators, in both examples, is representative of the overall ontology of the ecocity plan in question. The indicators represent the (epistemic) knowledge that is to be collected to determine whether the plans for implementation are on the expected course. The primary differences between these two examples appear to be at the ontological level, where governmental actors produce and perform an ecocity ontology that conforms with overall state development goals, whereas the design actors produce an ecocity ontology that conforms to the broader design community's approaches to ecocity planning.

Ecocity Urban Master Planning

Urban master planning is a common and essential tool for the midterm (5–15 years) and long-term (20–50 years) development planning of an urban region. Ecological and engineering performance indicators, described above, are a significant component of overall urban master plans. Urban master planning, as verb, refers to development and planning for various dimensions of an entire urban region, ranging from block-by-block neighborhood planning to regional resource management. As opposed to other development plans for a city, urban master planning refers to the overall land-use and infrastructural plans. Urban master plans, as objects of decision making, are the diagrams, models, and policies that result in a 5- to 50-year plan for how land-use and transportation networks, for example, will be allowed to change. Urban master planning is not specific to any political system, though it is seen applied much more in planned geographic-economic situations, such as in China, the former Soviet Union, or in Germany under the National Socialists. Urban master planning is more prevalent in political systems where there is a planned economy and the government exercises strong powers of eminent domain.

Within compatible political systems, some form of urban master planning is an essential tool for enabling the comprehensive oversight necessary to the short- and long-term implementation of ecocities. Issues such as reduction of urban sprawl, efficient transportation, energy infrastructure, building efficiency, urban heat island effects (Xiao et al. 2008), and ecosystem services cannot be addressed without a properly complex and coherent master plan. Developing ecocities based only on existing regulations is currently not sufficient to ensure green development, let alone ecocity development. This is particularly the case in China, since upward of 30% of new residential construction around urban areas such as Beijing are unapproved by the state and municipal governments but are typically "approved" by well-connected local officials (Schienke 2006). Comprehensive master planning coupled with proper and sufficient implementation of local regulations appears to be *the* necessary political baseline for implementation of a functional ecocity in China. Anything less would likely result in an ineffective outcome, contributing further to social, economic, and ecological problems extending from rapid urbanization.

Based on ongoing ethnographic investigations (since 2004) into Chinese ecological development (Schienke 2006, pp. 146–231), the biggest challenges ecocity architects and planners face is not at the level of technology or engineering capacity, but at the level of local political capacity to implement proper rule-of-law within the existing base of inflexible building codes and regulations. While architects and planners can produce what appear (in models, at least) to be viable ecocities, they often encounter significant hurdles with local regulations that are not compatible with eco-efficient designs. For example, a common regulation is that buildings are required to have a specific offset distance from roads and from other buildings, with sufficient pedestrian space and some viable green space. This essentially results in a medium- or high-rise building that gets located squarely in the center of the lot. Considering impacts only at the scale of the building, this regulation does not seem unreasonable. However, at the scale of the city block and of city sectors, this regulation prevents the efficient use and connection of pedestrian and transport space, green space, and mixed-use space—all of which are essential to the well-functioning ecocity. Even if one sector of the city is planning to be ecocity-scaped, such as in Tianjin or Shanghai, the rigid building regulations typically apply citywide. Thus the ecocity encounters debilitating regulatory hurdles before it even gets started. The reasonable response, then, seems to be to allow for the flexible design of the policies and regulations that are needed to achieve the necessary ecocity designs, which is the procedural inverse of the typical master planning processes. This "policy by design" was precisely the approach proposed by the Dynamic City Foundation (DCF) in their "Genetic City" CFD exhibit at the World Expo 2010 Shanghai (Dynamic City Foundation 2010). This is explored in the next section.

Ecocity Policy by Design: "Genetic City" Caofeidian

> The second hurdle for sustainability involves regulations. Urban planning codes have not yet been updated to deal with the broad implications of contemporary forms of urban sustainability. In previous research it became clear that in China, working within the official planning regulations effectively makes it impossible to design a sustainable city. Apart from inadvertently promoting sprawl, the regulations actually prevent innovation. The building off-set rules produce cities that are hostile to pedestrians. As a result, although green buildings and technologies are welcomed and often good planning is attempted, the city is unable to break away from inefficiency, congestion and pollution.
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> (Mars 2011)

Over the long term, an in-depth comparative analysis of different approaches to ecocity plans in China will help render a detailed picture of the range of policy recommendations that are necessary to produce regulations compatible to ecocity development. For now, the example of DCF's "Genetic City" provides useful examples and lessons learned when considering underlying policies and regulations as part of the design process.

The case discussed here focuses on the outcomes, first displayed at the World Expo 2010 Shanghai, of a collaboration between ten Dutch and Chinese architectural/urban design teams working collaboratively on sequentially evolving an ecocity design for Caofeidian—currently an industrial-converted economic development zone in Bohai Bay under the jurisdiction of Tangshan City, Hebei Province—which is projected to grow from 100,000 inhabitants in 2010 to 1,000,000 inhabitants in 2040. Results from this collaboration indicated that following an "ecocity ethos" could result in vibrant designs but that these designs cannot be implemented without similar and necessary reforms in building codes and development policies for these particular regions.

The experimental development of a longer-term approach to comprehensive green master planning for Caofeidian Eco-city puts its designers at the center of many diverse and interconnected challenges of development in China. The Caofeidian Genetic City project collected ten different design teams, Chinese and Dutch, to contribute to an evolving 30-year master plan for CFD from 2010 to 2040. In an iterative relay format for the design process, each team began with the conditions set by the previous team and a set of projected technological, social, political, ecological, and economic constraints. Each team expanded upon previous teams' designs to create a quickly "evolving" (genetic) set of plans and possible trajectories, all toward the ends of a livable and realizable ecocity. The result and output is an imbricated set of 3-year plans, one by each different team, each posing a relatively new image of a rapidly developing Chinese city, similar to numerous other locations throughout China.

Findings that emerged from this collaborative design process can be categorized in three significant ways. First, urban policy and planning processes should be flexible in the near term and stable in the long term to be able to adapt to unforeseen conditions and take advantage of new technologies. Second, major policy incentives, such as "special ecological zones," should be developed to strongly encourage developers/builders to take advantage of ecologically focused strategies. Third, sociocultural, economic, political, technological, and ecological contingencies should be considered in relation to each other, that is, one contingency cannot be deterministically anticipated to result in benefits to other sectors. For example, technological adoptions, while perhaps efficient, do not determine cultural continuity/harmony as a result.

Findings[8] from the "Genetic City" experimental design suggest that (1) China's urban planning processes need to be much more flexible in contexts where change is occurring rapidly and the goal is *ecological civilization*; (2) any contingency can

[8] These findings are drawn from personal field notes and direct participation with the Dynamic City Foundation leading up to the launch of "Genetic City."

be a driver of most any other and, from both the design and planning perspective, need to be anticipated to the best capacity possible; (3) without significant (and already existing) benchmarks on the road to a successful ecocity strategy, attention will need to be given to forms of valuation (signifiers) other than market performance, that is, ecosystem services, measurements of happiness, etc.; and (4) the properly developed ecocity can mediate between major interests and become an incubator for the rest of China's ecological aspirations. Overall, China needs to experiment further with the design of urban policy itself.

Toward Eco-Cosmopolitanism as Ecocity Ethics

We live in an increasingly crowded world where cultures are in close and continuous contact and where individual actions can have consequences at a distance. As Anthony Appiah points out, these days, mostly anyone exiting an international airport or walking through a city will encounter more people in one day than our ancestors encountered in their entire lifetime and that these conditions require us to be increasingly *cosmopolitan* (Appiah 2006) in how we approach our ethical obligations to others. Cosmopolitanism, referring to *citizen(ship) of the world/cosmos,* is a branch of ethical theory addressing questions concerning responsibilities, obligations, affinities, and loyalties to all humans, regardless of national, regional, or local affiliations. Approaches to cosmopolitan ethics can vary widely depending on the degree to which duties to local individuals are considered more obligatory over duties to a global population and the moral, political, cultural, and economic context of the duty or obligation under consideration. Recently, scholars such as Ulrich Beck, Patrick Hayden, and Ursula Heise have presented environmental approaches to cosmopolitanism that discuss individual duties and obligations which are demanded in response to global environmental and ecological risks. Cosmopolitanism in climate change obligations has been evaluated in depth by Paul Harris (2011) and in Schienke's analysis of China's ethical obligations to address climate change across scales of governance (Schienke 2011). Articulations of *cosmopolitics* and narratives of risk and science are also developed by Isabelle Stengers (2010) and Bruno Latour (2004). Further, Jacques Derrida (2001) analyzes cosmopolitanism with respect to "cities of refuge," which provides an interesting analog if one considers that which is seeking refuge to be the ecosystem itself. All of these considerations, from environmental risk to duties and obligations, play out to some level in concepts underpinning the Chinese ecocity. President Hu Jintao's notion of a *harmonious society* can even be considered a call for a kind of Chinese cosmopolitanism.

The Chinese *ecocity*, if properly implemented, would take the need to remain vigilant about protecting ecosystems and environment out of the overt responsibility of each and every resident and make living an ecologically sustainable lifestyle a product of the structural constraints and opportunities of the urban design. The structural principles underlying ecocity design link local considerations of urban development to regional, provincial, national, and global interests. Incorporating the ecosystem as a fundamental aspect of the urban system requires the consideration of impacts not only at the scale of governmental institutions but to the scales of ecosystems as well, that is, linked to habitats of particular species, but also linked to larger systems such as the regional ocean ecosystem and the global climate system. In other words, linking urban development to ecological protection and enhancement innately requires the consideration of impacts in nonlocal cosmopolitan terms or what Heise (2008) refers to as an "eco-cosmopolitanism." Further, eco-cosmopolitanism seems to be an ethical system intrinsic to the very concept of ecocity. For example, *circular economy* could be considered a form of economic and material cosmopolitanism, where local considerations and obligations are linked into a broader regional and even global industrial production cycle.

The implementation of proposed special ecological zones in China to support robust ecocity and circular economy implementations would necessarily link local policy and planning considerations to regional, provincial, and national decision-making processes. Ecocities, then, will further necessitate a form of political eco-cosmopolitanism among collaborating political actors and organizations, which may encounter certain significant barriers in a top-down bureaucratic China (Schienke 2006). However, ecocity development may also provide an opportunity for further collaboration between civic and regional authorities. In addition to comprehensive communication across organizations, another significant dimension to a well-functioning ecocity appears to be the processes and infrastructure for robust sharing of information and federation of data about all dimensions of the urban system. As well, a moral eco-cosmopolitanism will require the protection of the ecosystems within which the city is woven. Further, a shift toward a more eco-cosmopolitan culture within ecocities will necessitate an increasingly open position on information sharing not just about ecosystems but also about other eco-cosmopolitan cultures throughout the developing and redeveloping world.

For China to embrace the ecocity as something more than a traditionally planned city with a few green-washed enhancements, the status quo will also need to reflect eco-cosmopolitan ethics. Current trends in the politics of information sharing and attitudes toward critical reflection needed for a successful ecocity implementation indicate that a transition to an eco-cosmopolitan society would not come easily for China.

Conclusions

The "Ecocity China" brand is continuing to find purchase in China's rapidly urbanizing society, a brand that will continue to grow in relevance and import, as 40–45% of the nation's population still needs to urbanize if it is on course to reach the level of most OECD countries. Considering any dimension of socioeconomic analysis, questions concerning China's urbanization are key to achieving sustainable development, both for the nation and globally. The ecological planning of cities, in addition to the explicit design of ecocities, will influence China's future significantly. The ontological approaches to categorizing ecocity indicators and the epistemological approaches to measuring ecocity effectiveness have both practical and ethical implications. As demonstrated here, one approach to ecocity planning can reflect the need to maintain political ethos of the state while another approach reflects the functional needs of the ecosystem in which the city is embedded. Paying close attention to how elements such as indicators are chosen or constructed is important, as differing ecocity-planning approaches can have significantly different epistemological and ethical outcomes.

As an overall ethos for China's development, "Ecocity China" seems worthy of close attention in how it continues to be constructed. Such an ethos will face push-back in significant arenas that China may find contentious to its *status quo*, in that a successful ecocity will necessarily need to embrace some form of eco-cosmopolitanism. Further enhancements in collaboration between local, regional, provincial, and national authorities will also prove a logistical and political necessity, such as in the implementation of a regional circular economy that supports the material flows in and out of centers of industrial production. Improved federation of ecological and economic data will also prove necessary, as will improving capacity for unfettered communications between individuals, institutions, industry, and planners. Finally, China will need to embrace more of an experimental approach to planning and development, much in the way it did when Deng Xiaoping opened up the special economic zones following the social and economic reforms of 1978–1979. Opening up areas as special ecological zones that allow for necessary and incremental changes to construction policies will also become a necessity. In sum, "Ecocity China" is an ethos that requires continual interpretation, reflection, and experimentation, as it could be the key to China's common and sustainable future.

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