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A Green Leap Forward? Eco-State Restructuring and the Tianjin–Binhai Eco-City Model

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CHANG I-C. C., LEITNER H. and SHEPPARD E. A green leap forward? Eco-state restructuring and the Tianjin–Binhai eco-city model. *Regional Studies*. China has experienced a remarkable explosion of designated eco-cities since the year 2000, with Tianjin–Binhai becoming the best-practice model. Embedded in broader political economic changes, shifting multi-scalar regimes of environmental governance have shaped this efflorescence. Applying eco-state restructuring, this paper argues that eco-city construction became a new strategic project after the 2000s, driven by central state-driven model cities and assessment initiatives. This also led to a very different kind of ‘best practice’ eco-city model: Tianjin–Binhai, a China–Singapore collaboration in which greenness is manufactured rather than adapted. Notwithstanding significant implementation problems, Tianjin–Binhai’s status as best practice persists, raising questions about what it means to claim eco-city status.

Eco-state restructuring Urban environmental governance Eco-cities China Tianjin–Binhai

CHANG I-C. C., LEITNER H. and SHEPPARD E. 绿色大跃进? 生态国家重构与天津滨海生态城模型, *区域研究*. 自 2000 年以来, 中国生态城市的数量迅速增长。其中, 位于滨海新区、由中国与新加坡政府共同建设的天津生态城, 成为“最佳实践”的模范城市。然而, 中国生态城市数量上的增长与最佳实践模范的型塑, 其实是政治经济转型与环境治理模式改变在不同空间尺度中运作的结果。藉由“生态国家重构”理论作为分析取径, 我们认为生态城市建设是中国在 2000 年后政治经济政权转型下的新策略计画, 并由中央政府的模范城市政策与相关的评鉴标准来引导其发展。在此脉络下, 天津生态城演变成一个倚赖人造环境、而非试图融入自然生态系统的生态城模型。儘管至今天津生态城仍旧面临不少建设上的困境, 它作为最佳实践模范的地位却未曾动摇, 这也意味着我们需要重新检视生态城市的实质意涵。

生态国家重构 城市环境治理 生态城市 中国 天津—滨海

CHANG I-C. C., LEITNER H. et SHEPPARD E. Un bond en avant écolo? La restructuration de l'éco-état et le modèle éco-ville de Tianjin–Binhai, *Regional Studies*. La Chine a fait témoin d'une explosion remarquable d'éco-villes désignées depuis l'an 2000, dont Tianjin–Binhai est devenue un modèle de bonnes pratiques. Ancrées dans des changements politiques et économiques de plus grande envergure, des régimes multi-scalaires de gouvernance environnementale ont influé sur cette situation florissante. Appliquant une restructuration de l'éco-état, cet article affirme que la construction d'éco-villes est devenue un nouveau projet stratégique depuis les années 2000, conduit par des villes-type et des évaluations centrales pilotées par l'État. Cela a amené aussi à un modèle éco-ville ‘de bonnes pratiques’ tout à fait différent: Tianjin–Binhai, une collaboration sino-singapourienne où tout ce qui est écolo s'avère fabriqué plutôt qu'adapté. Malgré d'importants problèmes de mise en oeuvre, le statut de Tianjin–Binhai comme exemple de bonnes pratiques persiste, ce qui remet en cause ce que signifie prétendre le statut d'éco-ville.

Restructuration de l'éco-état Gouvernance environnementale urbaine Éco-villes Chine Tianjin–Binhai

CHANG I-C. C., LEITNER H. und SHEPPARD E. Ein grüner Sprung nach vorne? Ökostaat-Restrukturierung und das Ökostadt-Modell Tianjin–Binhai, *Regional Studies*. Seit 2000 hat China eine bemerkenswerte Explosion von designierten Ökostädten erlebt, mit Tianjin–Binhai als das ‘Best-Practice’-Ökostadtmodell. Diese Entwicklung ist Ausdruck von globalen und national politischen und wirtschaftlichen Veränderungen und einem assoziierten multiskalaren Wechsel in der Umweltpolitik. Unter Zuhilfenahme des Konzeptes der Ökostaat-Restrukturierung (ESR) zeigen wir auf, dass das Ökostadtmodell seit 2000 eine zunehmend zentrale Position in Chinas nationaler Umweltpolitik eingenommen hat. Veränderungen in der Umweltpolitik haben auch zu einem alternativen ‘Best-Practice’-Ökostadtmodell geführt: Tianjin–Binhai, eine Kooperation zwischen China und Singapur, hat als Leitbild eine technologisch gesteuerte Produktion einer grünen Ökostadt, welche universell anwend- und transferierbar ist. Trotz

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erheblicher Umsetzungsprobleme hat Tianjin-Binhai seine Position als 'Best-Practice'-Ökostadtmodell beibehalten, eine Entwicklung, die die Bedeutung der Bezeichnung Ökostadt und deren Realisierung in Frage stellt.

Ökostaat-Restrukturierung Urbane Umwelt-Governance Ökostädte China Tianjin-Binhai

CHANG I-C. C., LEITNER H. y SHEPPARD E. ¿Un paso ecológico hacia delante? Reestructuración del ecoestado y el modelo de la ciudad ecológica Tianjin-Binhai, *Regional Studies*. Desde 2000 China ha experimentado una impresionante explosión de ecociudades diseñadas, siendo Tianjin-Binhai el modelo de mejores prácticas. Este desarrollo se debe a amplios cambios políticos y económicos y al cambio de los regímenes multiescalares de la gobernanza medioambiental. Aplicando una reestructuración ecoestatal, en este artículo argumentamos que la construcción de ecociudades desde 2010 se ha convertido en un nuevo proyecto estratégico, fomentado por las ciudades modelo dirigidas por el Estado central y las iniciativas de evaluación. Estos cambios también conducen a un tipo muy diferente de modelo de ecociudad de mejores prácticas: Tianjin-Binhai, una colaboración entre China y Singapur, donde en vez de adaptar lo ecológico más bien lo fabrican. Pese a los importantes problemas de aplicación, Tianjin-Binhai sigue teniendo el estado de un ejemplo de mejores prácticas, haciéndonos plantear qué significa tener el estado de ecociudad.

Reestructuración del Estado ecológico Gobernanza medioambiental urbana Ecociudades China Tianjin-Binhai

JEL classifications: H77, P25, Q56, R11

INTRODUCTION

With 230 ecological and 133 low-carbon cities, China presents itself as the global leader in ecological urbanization. By March 2011, almost 90% of local prefectures had undertaken at least one green urban development project (CHINESE SOCIETY FOR URBAN STUDIES (CSUS), 2011a), initiatives that Thomas Friedman dubs China's 'Green Leap Forward' (FRIEDMAN, 2010). This paper interrogates the role of eco-cities in this process. Research examining China's eco-cities (e.g., CHANG and SHEPPARD, 2013; DE JONG *et al.*, 2013; HULT, 2013; JOSS and MOLELLA, 2013) largely examines individual case studies. This paper seeks to place Chinese eco-cities within the broader context of China's shifting political economy and environmental governance. This 'green leap forward' has been associated with a rescaling of eco-city governance from a local responsibility and initiative, to prioritization within China's Five-Year national plans. This compels scholarly attention, particularly given China's continuing role as the 'workshop of the world' (WU, 2010a).

The paper begins by exploring the utility of eco-state restructuring (ESR) (WHILE *et al.*, 2010) for analyzing China's changing regulatory and governance regime. It then provides a brief overview of the political economic context within which China's turn to environmental governance has occurred, focusing on the period since market reform. Third, it operationalizes ESR to discuss the reorganization of state powers, regulations and governance underlying the emergent prioritization of environmental goals at different scales, and of eco-cities as a strategic project within these goals. Fourth, it discusses the very different fates of the two exemplars presented as eco-city models by the Chinese state: Dongtan eco-city in Shanghai and Sino-Singaporean Tianjin eco-city in Binhai New Area (hereafter, Tianjin-Binhai eco-city), examining the processes and discourses underlying Dongtan's

suspension and replacement by Tianjin-Binhai as the current 'best practice' model.¹ It is discussed how this context shaped the Tianjin-Binhai master plan, and the persistent support for the Tianjin-Binhai model notwithstanding implementation challenges, concluding by reflecting on implications for what counts as an eco-city.

This research draws on field research conducted in 2011, semi-structured and in-depth interviews undertaken in 2012 and 2013 with 21 planners, policy-makers, developers and scholars involved in Tianjin-Binhai, and analysis of written materials, including policy documents, technical and planning reports, master plans, academic publications, information brochures, news coverage and online resources. Interviews were conducted in Mandarin or English. To ensure anonymity, interviewees are not listed by name.

ECO-STATE RESTRUCTURING (ESR)

Since the 1980s, three influential normative conceptualizations have emerged to describe modes of environmental governance: sustainable development, ecological modernization and sustainability. Sustainable development is criticized for its presumption that economic growth can be ecologically sustainable (SAT-TERTHWAITE, 1997), and ecological modernization for its optimism about finding technological and institutional solutions to the economy-environment tension (MOL and SPAARGAREN, 2000). Sustainability and sustainable livelihood approaches, far less sanguine about overcoming such tensions, receive less attention in debates about environmental governance because they tend to prioritize local-scale activities (e.g., SNEDDON, 2000).

ESR, critiquing such conceptualizations for underestimating the role of the state (WHILE *et al.*, 2004; KRUEGER and GIBBS, 2007), seeks to theorize how such modes of environmental governance emerge in

certain places and times, as state–economy–environment relations shift in ways that reflect political struggles surrounding competing ecological agendas (BUTTEL, 2000). Building on strategic relational conceptualizations of the capitalist state (JESSOP, 2007), WHILE *et al.* (2010, p. 81) describe ESR as

the reorganisation of state powers, capacities, regulations and territorial structures around institutional pathways and strategic projects [...] viewed as less environmentally damaging than previous trajectories. In this process, the state takes a more active and directed role in regulating the environmental inputs and outputs of mainstream economic and social activities. [...] This includes organising and mobilising strategic interests and actors to undertake specific projects and activities that the state (or certain actors operating in and around the state apparatus) understands to be consistent with strategic environmental goals and outcomes set at international and national levels.

ESR thus conceptualizes environmental governance as an ongoing process infused with power struggles, often riven with conflicts, and occurring across distinct spatiotemporal registers. The emergence of particular modes of environmental governance is placed within the larger context of how the state seeks to manage the relationship between the economy, the natural environment and competing social goals.

ESR's applicability in China is subject to question: WHILE *et al.* (2010) restrict themselves to 'First World political ecology' (p. 78). JESSOP and SUM (2006) extend strategic relational state theory to 'exportist' regulatory regimes in Asian newly industrializing countries – capitalist societies marked by the visible hand of the state – but do not discuss China or environmental governance.² Yet studies of China's environmental governance since the late 1990s link environmental legislation and management innovations closely with the adoption of market incentives in environmental management, urgent demands for improved quality of life from rapidly expanding middle classes and economic restructuring promoting a consumer society (ECONOMY, 2007; MOL and CARTER, 2007; MOL, 2009; HE *et al.*, 2012). Such studies do not explicitly explore the connections between political economic changes and environmental initiatives, particularly at the local scale. This paper seeks to stress test ESR, teasing out how shifting state–economy–society relations selectively shape, but also are reshaped by, China's environmental governance.

CHINA'S EVOLVING POLITICAL ECONOMY: FROM MARKET REFORM TO POST-ECONOMIC CRISIS

Fulong Wu provides a regulation–theoretic account of China's changing territorial political economy, the context within which the ESR perspective is operationalized.³ He identifies three broad regulatory phases

(WU, 2010a, 2010b): state socialism, market reform and export-oriented industrialization, and the unsettled direction since the 2008 global financial crisis. Market reform, accelerating after 1992, represented a clear strategic shift in focus by the Chinese state, responding to dissatisfactions with previous reform initiatives by Deng Xiaoping that culminated in the 1989 Tiananmen Square protests. The 1992 shift emphasized low-wage labour-intensive export-oriented industrialization, rooted in low wages, the suppression of workers organizing, and massive labour supplies, attracting foreign investors to special economic zones (SEZ) located along China's southern and eastern coastal areas. Three regions were targeted: the Pearl River Delta, the Yangzi River Delta, and the Bohai Bay Economic Rim (around Tianjin's Economic–Technological Development Area (TEDA) and the Free Trade Zone). Extensive rural–urban and west–east migration underwrote very rapid urbanization in the Pearl and Yangzi River Deltas (FAN, 2005), but the Bohai Bay Economic Rim stagnated (cf. ZHOU and PING, 2009).

This strategic shift also ushered in novel central–local state relations, requiring and empowering city administrations to engage in local entrepreneurialism to compete for investment. New tensions emerged between the public and emergent quasi-private sectors, and between different tiers of the state. Local officials' national recognition and career promotion depended on their performance in achieving urban economic growth, creating great pressure to succeed locally. Yet the central state continued to appropriate the bulk of local revenues (TSUI and WANG, 2004). After the 1994 national fiscal reform introducing 'tax sharing' (*fēn shuì zhì*) and mandating central state appropriation of local taxes, central government's share of China's total revenues increased from 22% to 56% (LIN, 2012). Yet, there was one exception to this centralization: income from land development was declared not a budgetary item, thus belonging to local governments (WU, 2010a). This exception triggered a massive boom in local government appropriation of rural land on the urban fringe for conversion and sale for urban development, also creating a powerful potential source of personal wealth for local officials (HSING, 2006, 2010): the 'tripolar relation between state power reshuffling, urban land commodification, and municipal finance' (LIN *et al.*, 2015, p. 1975).

WU (2010a) argues that the 2008 financial crisis catalyzed a further strategic shift in China's political economy. Under market reform, the potential contradictions of low-wage industrialization could be exported to Western consumers, eager to purchase the cheap products unaffordable to poorly paid Chinese workers. These contradictions came home to roost as foreign demand collapsed with the crisis, dramatizing emergent difficulties with low-wage export-oriented manufacturing. The supply of migrant workers was already drying up due to expanded social security, labour unrest and the

slowing of China's 'demographic dividend' (WU, 2010a), and production was relocating to even lower wage locations in South and Southeast Asia. With export-based manufacturing now perceived as less desirable than promoting domestic demand, the central state's development discourse shifted to emphasize 'human-oriented' (*yǐ rén wéi běn*) development and 'development with a scientific outlook' (*kē xué fā zhǎn guān*), with a significant focus on promoting a consumer society and environmental governance. Major new state-led initiatives included: capital- and technology-intensive investments (particularly green and information technologies); large-scale neo-Keynesian infrastructure investments (including environmental initiatives); enhancing the social safety net; reasserting the role of state-owned enterprises (SOEs) in profitable and monopolistic economic sectors; and allowing domestic incomes to increase, further stimulating urbanization. At the same time, Wu argues, the central state is reasserting its power and influence, also over environmental governance.

CHINA'S ECO-STATE RESTRUCTURING AND URBAN ENVIRONMENTAL EXPERIMENTS

This section applies ESR to the emergence of eco-cities in China, examining how the increasing salience of state environmental goals at the national and urban scales, and the increasing power of environmental agencies, triggered eco-cities as an important urban-scale strategic project. With respect to cities, the shift from state-directed command and control to engagement with actors in lower tiers of the state and non-state actors, together with a complex process of national supervision of local initiatives (including multiple regulatory and model city initiatives with an increasingly 'eco' focus and a plethora of assessment programmes) has resulted in an environmental urban governance system of questionable coherence. The emergence of the Tianjin-Binhai eco-city as the new 'best practice' model can best be understood in this context.

China's environmental governance and the emergence of eco-cities

The Chinese state has pursued environmental goals since 1972 (HE *et al.*, 2012), but the focus here begins in 1992. Immediately after the 1992 Rio Summit, China announced Ten Strategic Policies for Environment and Development, framing its first national sustainable development agenda. The 9th Five-Year Plan (1996–2000) set 'sustainable society' as the national environmental goal, explicitly restated in each subsequent Five-Year Plan, seeking to restructure China into a sustainable, mature consumer society, with a resource efficient industrial economy and eco-friendly urbanization (Fig. 1). The 11th (2006–10) Five-Year Plan introduced the goal of a 'circular economy' – an

industrial ecology paradigm involving the closed-loop circulation of energy, materials and waste and the 'three Rs' (reduction, reuse, recycling) – as central to China's envisioned transition. The circular economy was linked to eco-cities, both being associated with sustainable development 'with a scientific outlook'. This reframed national goal focused on scientifically innovative and ecologically sustainable development, underwriting 'a harmonious socialist society with democracy, law, equity, justice, honesty, vitality, social stability, and harmony between man and nature' (Hu Jintao at the 17th National Congress, 25 October 2007) – combining social justice with ecological sustainability. The 12th Five-Year Plan introduced 'ecological civilization', articulating the Party's vision of an era during which China should 'leapfrog' Western post-industrial capitalist states, providing an ecological lifestyle with cutting-edge green technologies for all.

Entering the 2000s, environmental goals increasingly focused on the urban scale. Rapid post-1992 coastal urbanization catalyzed two major problems: fast and highly concentrated coastal urbanization, and severe urban environmental pollution. The latter triggered highly visible domestic and international criticism of the state. The 1996 annual State of the Environment in China noted that environmental pollution and ecological destruction were rapidly intensifying inside cities and at the urban fringe (MINISTRY OF ENVIRONMENTAL PROTECTION, 1997). The 9th Five-Year Plan, and associated long-range planning document, Social Development and Long-Range Objectives to 2010, integrated concerns for urban environmental protection and ecological systems deeply into China's national planning.

The 2006 reframing around circular economy envisioned cities as playing a key role. The circular economy was seen as simultaneously resolving the challenges of clean production and clean consumption (YUAN *et al.*, 2006; GENG and DOBERSTEIN, 2008). On the production side, ecological industrial parks were a key strategy for implementing the three Rs by updating existing industrial standard operating procedures and equipment (improving pollution control built-ins), while seeking technological solutions that reduce resource utilization – analogous to ecological modernization. On the consumption side, eco-cities were proposed as a policy tool to address both existing urban environmental issues and demands for further urban growth (XIE *et al.*, 2010). Increasing numbers of cities enrolled in eco-garden city, eco-city, low-carbon city and low-carbon eco-city initiatives, transforming eco-cities (in various designations) into a key strategic project for implementing China's emergent state environmental goals.

Empowering state environmental agencies and shifting local–state relations

There has been a continuous ascendance and expansion of environment governance authority. The National

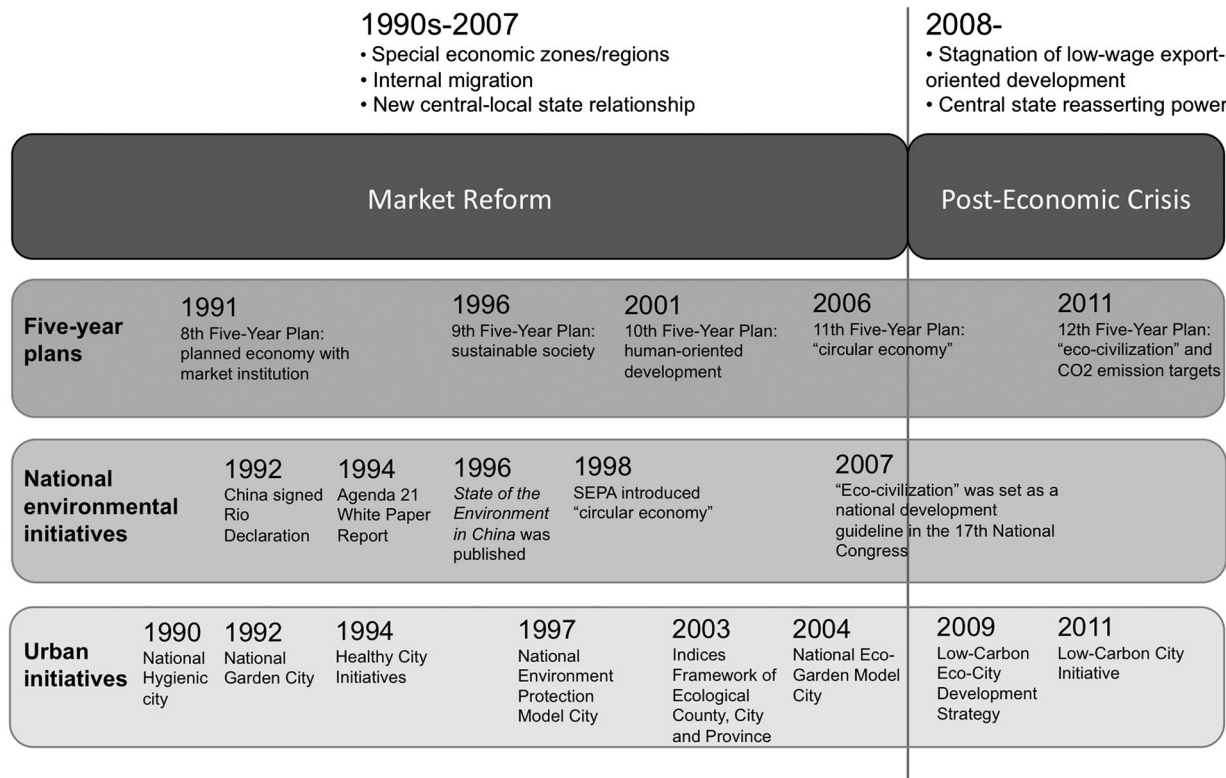


Fig. 1. Chinese eco-state restructuring since the 1990s

Environment Protection Bureau, the highest environment protection authority in the 1980s, was elevated in 1998 to a ministry-level apparatus, becoming the State Environmental Protection Agency. In 2004, the promotion and implementation of a circular economy was taken over by the National Development and Reform Commission, the State Council committee in charge of national economic and social development plans. In 2008, the State Environmental Protection Agency was further elevated, becoming the Ministry of Environmental Protection with the same administrative power as the ministries of Housing and Urban–Rural Development and of Commerce (the principal state agencies controlling economic development).

The central state fostered parallel changes at the urban scale. Local environmental protection departments were promoted to become first-tier independent bureaus, empowering them to initiate new, environmentally oriented, local development projects with other first-tier bureaus – particularly local construction bureaus (JAHIEL, 1998; MOL and CARTER, 2007; LO and TANG, 2007). Local environmental protection bureaus also received independent funding for environmental projects from local and central governments, and were allowed to generate their own revenues by providing environmentally related consulting services.

The increasing influence of the eco-city strategic project can also be seen in the jostling of state agencies seeking to enhance their influence. As the Ministry of

Environmental Protection developed criteria for designating cities, counties and provinces as ‘eco-’, the Ministry of Housing and Urban–Rural Development mimicked this for ‘eco-garden cities’, as did the National Development and Reform Commission for ‘low carbon cities’. Cities sought to demonstrate leadership in national environmental governance by collecting these various designations.

Implementing this national-scale project involved both up- and downscaling of environmental governance. As environmental governance has become increasingly central to China’s five-year planning process, responsibility for eco-oriented development has been devolved to cities, counties and provinces. When local actions are seen as insufficiently coordinated, the central state reasserts control over the parameters that lower tiers of the government should comply with (ZHOU *et al.*, 2012), as in the development of eco-city-related indicator systems and model cities to align local initiatives with central-state environmental governance priorities.

Regulatory tools and incentives

Environmental regulation originally was entirely command and control, like all state regulation, but post-1992 processes of market reform and devolution of responsibility to local governments created space for a variety of local state and non-state actors to influence

development trajectories. A complex landscape of regulations, incentives and model city initiatives thus emerged as the tools for realizing emergent state environmental and urban economic development goals. This proliferation of environmental regulations from different departments and bureaus, operating at local, provincial and national scales, has fragmented environmental governance (ZHANG and WEN, 2008; LIU *et al.*, 2012). More than 450 new national and local environmental laws and regulations have been issued since the 1990s, shifting the focus from end-of-pipe pollution control to pollution prevention and environmental conservation (SHI and ZHANG, 2007; ZHANG and WEN, 2008; MOL, 2009; HE *et al.*, 2012). A variety of new policy instruments include market-based economic incentives, measures for restructuring production, voluntary campaigns and public participation. Together, these have diversified the institutional pathways of China's environmental governance, incorporating new actors: industries, non-governmental organizations (NGOs) and citizens.

Model city initiatives long have been a key national tool for aligning urban development with national-level goals (HOFFMAN, 2011; ZHANG, 2012). Paralleling the increased power and authority of environment protection agencies, central state-led model city initiatives were (re)invented or supplemented to address environmental concerns and negative publicity about pollution. National Garden City (*guó jiā yuán lín chéng shì*) and Healthy City (*jiàn kāng chéng shì*) initiatives were proposed in 1992 and 1994, respectively, to tackle polluted, overcrowded urban environments and the 'social disorder' associated with rapid urban industrialization. The National Civilized City (*quán guó wén míng chéng shì*) and National Hygienic City (*quán guó wèi shēng chéng shì*) initiatives, developed as model-socialist cities in the 1980s and early 1990s, underwent revisions in the late 1990s to incorporate new requirements regarding the urban environmental quality of life.⁴ Yet this increased emphasis on environmental quality needed to be squared with the Chinese state's desire for continued rapid economic growth: the sustainable development paradigm. Thus, 1997 saw the first explicit environmental protection model city initiative, the National Environment Protection Model City.⁵

Endorsed by the State Council, the National Environment Protection Model City and National Garden City initiatives were further revised in the early 2000s to guide China's current eco-city strategic projects. In 2003, the National Environment Protection Model city initiative generated the Indices Framework of Ecological County, City and Province (*shēng tài xiàn shēng tài shì shēng tài shēng jiàn shè zhǐ biāo*), administered by the Ministry of Environmental Protection. In 2004, the National Garden City became the National Eco-Garden Model City (*guó jiā shēng tài yuán lín chéng shì*) initiative, administered by the Ministry of Housing and Urban-Rural Development. Cities seeking such

designations submitted themselves to an annual assessment process, undertaken by ministry officials examining long lists of criteria (ZHOU *et al.*, 2012). Notwithstanding their differences, these programmes seek to reframe an earlier focus on urban economic development, quality of life and green space, to prioritize public infrastructure that reduces pollution and enhances environmental health, to reduce resource consumption, and to conserve and restore natural landscapes. The central government encourages cities to align themselves with these initiatives by developing eco-city projects.

National implementation challenges

While the Chinese state certainly is taking environmental goals very seriously, the plethora of agencies, laws, directives and policies, as well as resources invested, do not guarantee the achievement of such goals. Any assessment should consider two questions: whether the stated goals are reached, and whether these are the right goals. With respect to overall environmental governance goals, HE *et al.* (2012, pp. 34–35) identify four challenges: The rapid rate of economic growth, the ongoing greater influence that economic policy institutions assert over environmental policy institutions, the downscaling of political autonomy and the political weakness of civil society (undermining social sustainability). They anticipate further difficulties in extending environmental governance to the private sector and in increasing domestic consumption. Such challenges are also geographically uneven, with environmental experiments more prevalent in eastern, richer provinces (MOL, 2009, p. 98).

The multiplicity of assessment standards and state agencies seeking to advance eco-city development compounds attempts to measure goal achievement. Poor coordination between different agencies has resulted in competing definitions, indicators and performance measures. When local officials focus on rankings, or on designation as eco-, eco-garden or eco-low-carbon cities, gaming the system directs energy away from identifying and reducing actual urban environmental risks (cf. ROCK, 2002). In 2011, the Chinese Society for Urban Studies set about developing a unified scheme to 'redress lack of coordination and agreed standards' (JOSS and MOLELLA, 2013, p. 119), only to result in another list of 45 indicators. ZHOU *et al.* (2012) identify six national indicator systems developed by state agencies and academic institutions, with over 160 indicators, and inspectors travelling annually to cities to measure these for each system – a veritable eco-city assessment industry.

SHIFTING ECO-CITY MODELS

With eco-cities trumping other urban environmental governance approaches, becoming the next construction

fever after the SEZs and global cities of the 1990s, the Chinese central government set out in search for a model eco-city to ground this strategic governance project. From the beginning, it has been recognized that any eco-city model would require working with non-state actors through public–private partnerships, developing Chinese expertise but also working with international partners. Seeking to implement eco-cities, local governments in entrepreneurial competition with one another have been eager to sign agreements with foreign partners, both to utilize their green urbanism expertise and to raise external capital (WU, 2012). The majority are prestigious architecture and construction companies or governments from North America, Western Europe and now Singapore. Partnerships presumably must be endorsed by Beijing, but the level of central state involvement varies: Dongtan, China's first eco-city, experienced much less central state involvement than Tianjin–Binhai.

The first experiment

Dongtan eco-city, on Chongming Island on Shanghai's urban fringe, was the first national experiment. Planning the implementation of this Sino–British collaboration began in 2005, primarily by Arup (a London-based transnational engineering and design firm) with support from the UK government, the Chinese central state and Shanghai's municipal government through its Shanghai Industrial Investment Company. Its design closely resembled the conception of eco-cities developed by founding father Richard Register (REGISTER, 1987, 2002). Register conceived eco-cities as making good on the principle that human settlements can be ecologically sustainable and liveable. They should be compact, supportive of urban life, fitting the bioregion and healing the biosphere: reducing energy consumption, promoting community, health and social equity, prioritizing non-motorized transport, and contributing to the economy (REGISTER, 2002, pp. 174–176). Dongtan represented this integrated sustainable urbanism approach, incorporating human life and the natural environment into a self-sustaining system (SHANGHAI INDUSTRIAL INVESTMENT COMPANY (SIIC), 2006). Dongtan's master plan was closely connected to its wetland ecosystem, with low-rise and low-density residential development to accommodate the wetland's specific geological conditions and carrying capacity, and innovative environmental technologies to realize a carbon-neutral city.

Dongtan eco-city exemplified the initial conception of Chinese eco-cities as greenfield projects (CHANG and SHEPPARD, 2013), functionally incorporating exurban fringes and isolated rural economies into existing urban systems (see also XIE *et al.*, 2010; MAY, 2011). Local government officials saw this as ideal for accommodating (and promoting) urbanization at the urban fringe, while sustaining local (and national) economic

growth. Such greenfield eco-city projects could also contribute to the 'land economy': commodifying land at the urban fringe to raise municipal finance for construction projects – the major revenue-generating path for Chinese local states after market reform.

Dongtan was officially suspended in 2008, prior to implementation. A variety of factors led to this suspension: the waning political influence of Shanghai's former mayor and major supporter of Dongtan, significant criticism of Dongtan's location on urban conservation wetland, its marketing strategy that aimed at wealthy elites, and the absence at that time of a land transportation link with Shanghai. Dongtan's master plan was characterized as a 'brainstorming exercise' that failed to consider financial feasibility (WU, 2012). Ex-post, its location on an environmentally sensitive wetland was seen as a fatal flaw (QIU, 2011).

Changing conceptions and discourses

Dongtan's suspension, together with the failure of Hungbaiyu, another US and United Nations' sponsored small-scale eco-village experiment, coincided with shifts in the late 2000s in central state conceptions of what constitutes an appropriate eco-city model for China. Emergent thinking envisioned an eco-city development paradigm that is less dependent on localities with productive ecosystems, and thus potentially replicable across China's less fertile northern and western provinces – reflecting concerns about excessive concentration of urbanization in coastal regions. With this, eco-city projects gradually have shifted from greenfield toward greyfield and brownfield sites. This also would reduce the compulsory acquisition of arable land, a major cause of both environmental deterioration and social unrest challenging the Chinese state's legitimacy after the late 1990s (MOL and CARTER, 2007; CHEN, 2009).

After the 17th National Congress in 2007, eco-city development was reframed as development with a 'scientific outlook'. Eco-city initiatives increasingly were defined as cities using green technologies and circular economy principles to upgrade outdated physical infrastructure in already urbanized regions, scientifically restoring greyfield and brownfield sites, and guiding urban consumption patterns along a more environmentally friendly path (QIU, 2009). Current thinking also emphasizes social sustainability – social welfare provision, including housing, education, and healthcare – to realize 'Eco-Civilization'. Tianjin–Binhai, the current flagship project, exemplifies this very different conception (Table 1).

Discourses of carbon footprints and reduction also have become hegemonic. Carbon emissions were absent from the Chinese state's initial National Eco-Garden Model City and Indices Framework of Ecological County, City and Province initiatives. Only in 2008, when the World Wildlife Fund (WWF) promoted the Low Carbon Cities Initiative in China, did eco-city

Table 1. Differences between Dongtan and Tianjin–Binhai eco-cities

	Dongtan	Tianjin–Binhai
Collaboration type	Private–public	Public–public
Main foreign partner	Arup, UK	National government, Singapore
Regional focus	South–eastern	Northern and Western
Development type	Greenfield	Greyfield and brownfield
Planning paradigm	Symbiotic with local ecosystem	Engineering artificial ecosystem
Planning vision	Innovative and visionary	Practical and replicable
Economic feasible plan	Attracting foreign investment	Aiming at economic self-sufficiency
Targeted population	National and international elites; featuring high-tech luxury condos	Residents at all income levels; featuring public housing

developments turn to incorporate widely low-carbon emission goals (SCHREURS, 2010; ZHOU *et al.*, 2012). Following mandatory greenhouse gas (GHG) emission targets issued by State Council in 2009 (in preparation for the 2011 12th Five Year Plan), the Ministry of Housing and Rural–Urban Development launched the China Low-Carbon Eco-City Strategy through the Chinese Society for Urban Studies (CSUS), synergizing pre-existing eco-city frameworks with various CO₂ emission targets (BAEUMLER *et al.*, 2012). In 2011, the National Development and Reform Commission proposed a national pilot programme for Low-Carbon Cities, triggering a surge of ‘low-carbon eco-city’ projects, augmented by international collaborations with the United Nations Development Program (UNDP), US–China Collaboration on Clean Energy, the Sustainable Development Technology Foundation, the China–Switzerland low carbon city project, and the World Alliance for Low Carbon Cities (ZHOU *et al.*, 2012). The 12th Five-Year Plan included CO₂ emission targets, further establishing low-carbon eco-city development as a central means for reaching national emissions goals (BAEUMLER *et al.*, 2012).

Intra-Asian collaboration and site selection for a new eco-city model

The selection of Tianjin–Binhai for an alternative model eco-city emerged from the national-scale decision to explore inter-Asian collaboration. In 2007, Premier Wen Jiabao signed an agreement with Singapore’s Prime Minister Lee Hsien Loong to develop jointly a flagship eco-city.⁶ Four industrial cities in northern and western China with insufficient water resources were proposed as potential sites: Tianjin–Binhai, Tongshan–Caofeidian, Baotou and Urumqi. These locations feature two major Chinese urban governance challenges that eco-cities were supposed to redress: upgrading low-tech, heavily polluted and labour-intensive manufacturing-based urban economies, and improving the water supply (LI, 2011).

With respect to upgrading, after decades of striving to become manufacturing powerhouses during the socialist era, with market reform many Chinese cities faced great pressure to expand their service sector. This intensified once the 1994 fiscal reform forced local governments

to shoulder funding for their development projects (WU, 2010b; LIN, 2012, 2015). Affluent southern coastal cities with successful SEZs achieved relative financial independence, but northern and western cities continued to struggle, often heavily dependent on less profitable and outdated mining and heavy industries (LIU, 2009). Inefficient water management systems also have become a pressing constraint on Chinese urban development. In *China’s Water Crisis*, Ma Jun argued that 400 of China’s 600 cities face varying degrees of water shortage, including 30 of the 32 largest (MA and LI, 2006; see also LIU and DIAMOND, 2008). Even in southern cities with better water supply, urban and industrial pollution generated severe clean water shortages.

The new eco-city collaboration offered the promise of upgrading to a more efficient and greener economy (introducing new industrial standard operating procedures and equipment) and developing less polluting industries with greater value added (e.g., information, communications and environmental technologies), while expanding the service sector. Adopting localized circular systems, especially in water supply, was envisioned as more energy self-sufficient and less resource-consuming than conventional cities. The model eco-city would be equipped with a new water management system, focusing on potable water, and water recycling, treatment and reclamation facilities. The Chinese state and Singapore governments set three broad criteria for the best practice eco-city model: practicability, adopting commercially viable technologies; replicability, across China and in other countries; and scalability, to eco-city projects of varying sizes (SINO-SINGAPORE TIANJIN ECO-CITY ADMINISTRATIVE COMMITTEE (SSTECAC), 2009).

The Sino-Singaporean collaboration also signalled a shift in China’s international partnerships in urban development projects. Post-1992, Western capitalist cities became popular imaginaries and models for various urban development projects (HUANG, 2006; WU, 2015). Thus, Shanghai’s Pudong district imitates Manhattan in New York City and its satellite towns strive to replicate European cities. In the past decade, however, Chinese cities increasingly seek to emulate Asian cities, including Singapore, Hong Kong, Taipei,

Seoul and Tokyo. The changing eco-city foreign partnership arrangement reflects this transition, supplementing the European partnerships of the early 2000s with intra-Asian partnerships, adopting urban planning codes and designs originating in Singapore and Japan.⁷

Interviews with Chinese planners identified several factors influencing the initial decision to collaborate with Singapore: a previous, well-received collaboration with Singapore, political and cultural affinities, and high-level political and financial endorsement. In 1994, China and Singapore began collaboration on the China–Singapore Suzhou Industrial Park (CSSIP). In the 2000s, this was presented as an internationally competitive high-tech eco-industrial park with an ecologically friendly township in Singapore’s image (WEI *et al.*, 2009). This model circulated widely among Chinese cities.⁸

The affinities between and familiarity with one another’s governance systems were identified as particularly important. From the perspective of China’s national government, Singapore represents a ‘capitalist version of the communist dream’ (CARTIER, 1995, cited in WEI *et al.*, 2009, p. 416). Singapore and China’s cultural and political affinities underlie Singapore’s extensive foreign direct investments in China’s industries and urban land markets since the 1990s (HSING 2006). One Chinese urban planner, collaborating at the time with a European partner on a small-scale eco-city master plan, spoke of ‘profound differences’ between European and Singaporean partners based on his work experience. In his view, Singaporeans are much more adept at securing support for their master plan from local leaders by ‘being flexible in green designs to cater to the preference of each *Yibashou*’.⁹ The national government has warned local officials against copying foreign models (HUGHES, 2006), but Tianjin–Binhai eco-city planners argue they are ‘not just copying a foreign model this time’, but ‘an advanced eco-city model from an advanced Chinese society’.¹⁰

Beyond the belief that a government partner is more reliable than foreign private companies, collaboration with Singapore was appealing to Chinese politicians and planners because of the Singaporean government’s promised financial investment and institutional support. The capital-intensive nature of eco-cities requires initial investments that exceed the financial capacity of most Chinese cities (WU, 2012). North American and European partners offered limited financial investment, but the Singaporean government would shoulder half the construction costs, also offering substantial support from its Ministry of National Development and other state agencies (cf. DE JONG *et al.*, 2013, p. 108). A leading Singaporean planner and early participant in planning Tianjin–Binhai stated: ‘at a time when many private [investment] projects have failed across Chinese cities, work[ing] with Singapore can make sure [that] the eco-city is a risk-free investment and will certainly be built on time’.¹¹ Public–

public collaboration is also believed to be less prone to property (real estate) speculation, and more attentive to social sustainability goals.¹²

Site selection took place in October 2007, involving China and Singapore; Tianjin–Binhai was announced the winner in November. Two principal reasons were given in the media and interviews. First, the project site was located inside Tianjin Binhai New Area, which had been designated as Northern China’s flagship SEZ. Location inside the SEZ entailed better basic infrastructure and also resembled the setting for the previously successful CSSIP, perceived as conducive to the eco-city’s success.¹³ Second, its proximity to Beijing offered a more accessible site than the other three candidate cities, with greater prospects for commercial viability and long-term economic sustainability. Singapore preferred this location for its residential housing market potential.¹⁴ Wu Tsai Wen, the first chief executive officer (CEO) of the Sino–Singapore Tianjin Eco-City Investment and Development Co., Ltd,¹⁵ publicly presents the aim of Tianjin–Binhai eco-city as creating a residential city with affordable housing prices (WANG, 2009):

We are realistic. We are not going to demonstrate an eco-city with the most state-of-the-art environmental technologies, zero carbon emission and zero waste, where people need to spend a lot of money and wait twenty years for completion to move in. [...] We are going to make cities that normal Chinese people with average income can buy and move into within three to five years.¹⁶

PLANNING TIANJIN–BINHAI ECO-CITY

After three bilateral meetings, in 2008 China and Singapore planners finalized the master plan and began to build Tianjin–Binhai eco-city. The master plan was jointly designed by the China Academy of Urban Planning and Design, the Tianjin Urban Planning and Design Institute, and the Singapore planning team (led by its Urban Redevelopment Authority). The project site was largely non-arable wasteland, requiring no complicated legal manoeuvres to develop. According to Tianjin–Binhai’s 2009 relocation plan only 2157 people in three villages were relocated (WORLD BANK, 2009, p. 14), a microscopic number by Chinese standards.¹⁷

Tianjin–Binhai is envisaged to house 350 000 permanent and 60 000 temporary residents on 34.2 km², a medium-sized Chinese city. The master plan prioritizes ‘a thriving city which is socially harmonious, environmentally-friendly and resource-efficient – a model for sustainable development’.¹⁸ It envisions infrastructure powering the city mostly on clean and renewable energy, lowering carbon emissions. Wind turbines and solar panels should supply renewable energy for up to 20% of total consumption, with the remainder from two combined heating and power plants outside the

eco-city using clean coal and waste heat. The plan features green transportation, including rail transit, slow mobility systems and electric cars.

Dry and alkaline land would be converted into a green oasis through a water recycling and reclamation system, geological engineering and ecological restoration. By 2020, half of Tianjin– Binhai eco-city’s water consumption should come from rainwater collection, distilled seawater and reclaimed wastewater. Imported fertile soil would replace alkaline and polluted soil, and polluted ponds cleaned up and vegetation planted, creating a wetland and river ecosystem expected to become a bird habitat. The Tianjin– Binhai master plan proclaims ‘an integrated ecosystem comprising “reservoir–river–wetland–greenery”’ (SSTECAC, 2009, p. 10).

Tianjin– Binhai also emphasizes economic development, specializing in service industries, with an educational and research and development (R&D) centre for environment-related technologies. Software, animation and pharmaceutical industries are investing here, and there are plans to expand tourism- and education-related services. In terms of housing, the plan replicates Singaporean housing development practices, including mixed-income high-rise public housing blocks. Called ‘eco-cells’, these are 1600 m² footprint high-rise residential towers. Four to five eco-cells, sharing basic infrastructure, schools and businesses, constitute an

‘eco-community’. These are combined into four ‘eco-districts’, each with a business centre (Fig. 2), surrounding an eco-island for recreation, and linked through transportation corridors (SSTECAC, 2009). All construction is to be certified by state-of-the-art green building codes. A total of 20% of the housing units are planned to be affordable housing, and all residents will receive free 12-year education, free local transportation and discounted rates for medical care. Providing these benefits would make Tianjin– Binhai a pioneer.

The plan has three phases. Phase one, for implementation between 2008 to 2010, would entail a 4 km² start-up area, housing 85 000. Phase two (2011–15) would complete the basic physical layout, including a transport network linking it with Tianjin– Binhai New Area and surrounding regions. Phase three (2016–20) will focus on developing the north and north-east districts for mixed use of residential housing, businesses and industries (SSTECAC, 2009; WORLD BANK, 2009). By the end of 2011, phase one was complete, including a Chinese animation and filming company from Shenzhen.

IMPLEMENTATION CHALLENGES IN TIANJIN– BINHAI

*A ‘ghost town’ as exemplar*¹⁹

Tianjin– Binhai has failed to meet projected population goals; no residents had moved in as of October 2011. The Sino-Singapore Tianjin Eco-City Administrative Committee (SSTECAC), the eco-city’s governing body, promoted its residential projects widely in the Chinese media throughout 2012. Chinese households have purchased some units as investment property since, but most still remain unoccupied. Nevertheless, Tianjin– Binhai eco-city retains a very high level of support from the national government, as China’s flagship eco-city. Tianjin– Binhai ambitiously attempts to synthesize different eco-city standards by tightening construction requirements and creating a new kind of eco-city (cf. DE JONG *et al.*, 2013), and also to form the basis for a guide to eco-city construction models and indices for other Chinese eco-cities to emulate (SSTECAC and BLUEPATH CITY CONSULTING, 2010). Indeed, SSTECAC is working with the Ministry of Housing and Urban– Rural Development to develop indices and measures for evaluating other Chinese eco-city projects (CSUS, 2011b).²⁰

Secondary sources and expert interviews suggest that the central government’s ongoing promotion of Tianjin– Binhai reflects its potential to redress major problems facing Chinese urbanization. Tianjin– Binhai is seen as exemplary of how to productively and sustainably use environmentally disadvantaged and degraded land. One-third of Tianjin– Binhai is on alkaline non-arable land, one-third on a deserted saltpan and the final third on polluted water bodies (SSTECAC,

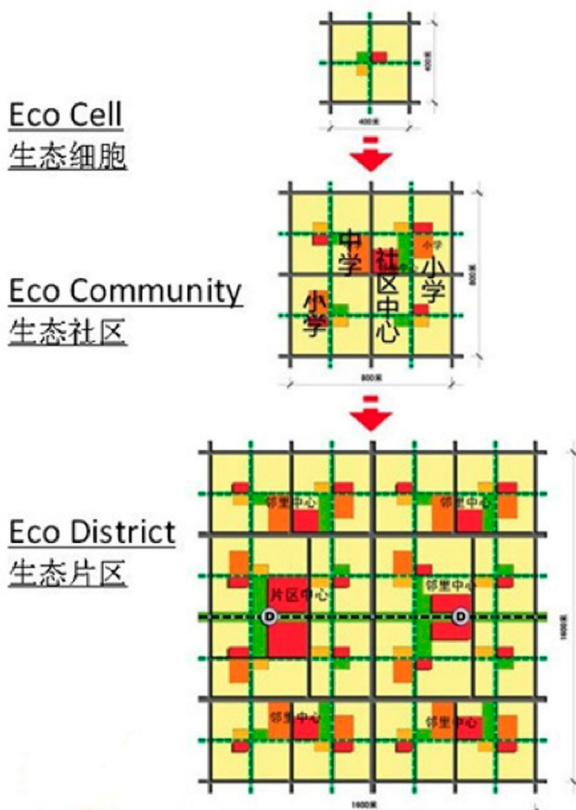


Fig. 2. Eco-cell, eco-community and eco-district
Source: See http://www.tianjinecocity.gov.sg/bg_masterplan.htm

2009). According to SSTEACAC's deputy director, this makes it a perfect site for experimentation: 'if we are able to make Tianjin eco-city work, it means we can create valuable urban space from nothing'.²¹

In the phase one start-up area, 'naturalness' is manufactured using green technologies: ecological engineering, man-made material flows and circulation systems, and landscaping with non-native plant species. Everything 'natural' is artificial or imported, erasing from the landscape the indigenous coastal arid ecosystem and replacing it with green urban space around an artificial river and lake – a desirable environment for human settlement. In this vision, by freeing ecological urbanization from place-specific ecosystems, eco-cities can be standardized and replicated anywhere. One eco-city planner commented:

upon completion of this eco-city, we can use the experience to build cities in places like some abandoned towns in central and western China in the future. [...] People will no longer have to move to the big cities for better quality of life, [because] they can have their own eco-city at home.²²

Refashioning the model

Tianjin–Binhai aims to be economically sustainable, expecting all construction expenses eventually to be covered by real estate revenues, but this seems unrealistic. Local political leaders acknowledged that Tianjin–Binhai is unlikely to reach projected population goals in the absence of sufficient employment opportunities at the project site and in the nearby TEDA.²³ The cost of adopting green technologies remains comparatively high, potentially lowering profit margins below developers' expectations.²⁴ This has compelled SSTEACAC to change its social planning goals, decreasing the proportion of affordable housing, even though this is an important feature where Singapore has considerable expertise. The original goal of 50% affordable housing units has been reduced to 20%.²⁵ While similar to other major Chinese cities, this is lower than in Tianjin City (about 30%), and significantly lower than in cities where the traditional socialist *Danwei* structure still provides affordable housing.²⁶ In terms of housing affordability, then, Tianjin–Binhai eco-city is less socially sustainable than the traditional Chinese socialist city.

Rather than underwriting the costs of development, after 2010 SSTEACAC sold small parcels of land in the eco-city's residential area to real estate companies at below-market prices.²⁷ These companies are encouraged to maximize profits, as long as construction follows green building codes. As a result, the majority of the housing is targeted at households with above-average incomes, and the original open-space Singaporean housing planning was altered. Some properties use fences or elevated driveways to create gated

communities, advertised using images of luxury urban living, high-quality hospitals and schools where eco-city residents receive priority for treatment and enrolment, and community-owned lakes, forests and parks for everyday recreation. These changes signal a tendency towards a property-based eco-city of gated eco-communities, compromising social for economic sustainability.

Interviews reveal other implementation difficulties. Chinese eco-city planners stressed the challenges of being a pioneer in national ecological urbanization experiments. They felt that Singaporean urban planners and governmental officials privileged housing construction over introducing new green technologies. Lacking established guidelines for eco-city planning and construction (as opposed to targets and assessment indicators), SSTEACAC sought alternative consulting expertise by hiring a newly established Chinese consultancy, Bluepath City Consulting, to develop a new implementation plan stressing green construction and carbon reduction.²⁸ This new plan shifts the focus from the eco-city scale towards that of individual buildings. Emphasizing carbon reduction also enabled Tianjin–Binhai to join the Ministry of Housing and Urban–Rural Development's Low-Carbon Eco-City Strategy programme.

With the help of Bluepath, green building standards are being developed that exceed those proposed by Singapore. Tianjin–Binhai eco-city planners also have been revising US-based Leadership in Energy and Environmental Design (LEED) certification standards to fit Chinese cities. Their ambition is to create a new set of standards for China and compete with LEED across Asia.²⁹ Green building standards are also the focus of the indices evaluating Chinese eco-city projects being developed in collaboration between SSTEACAC and the National Ministry of Housing and Urban–Rural Development (CSUS, 2011b). Local and national planners offered different opinions regarding a focus on green buildings as the mainstay for eco-cities. Some were wholeheartedly in favour, believing that an eco-city composed of green buildings is the only way to make eco-city practical and replicable. Others, however, expressed concern about reducing the eco-city concept to an agglomeration of green buildings.³⁰

The implementation challenges faced by Tianjin–Binhai pose serious questions about what constitutes an eco-city. As for ESR at the national scale, there are two kinds of questions: are the intended goals being achieved, and are they appropriate? The intended goal of creating a desirable natural environment where none existed radically departs from Register's original vision; also from the notion of a circular urban economy. Yet the outcome would feel green to its inhabitants, and has been endorsed by Register himself (REGISTER, 2012). Modifications necessitated by implementation challenges have compromised other intended goals, undermining social sustainability. In

terms of downscaling ecological sustainability to green buildings, it is questionable that an agglomeration of low-carbon green buildings constitutes an eco-city, and there is disagreement even about whether green buildings are themselves environmentally sustainable (e.g., NEWSHAM *et al.*, 2009; SCOFIELD, 2009). Lack of social sustainability undermines the integrated sustainable development vision, propagated globally, as simultaneously economic, social and ecological. According to imported criteria, then, Tianjin–Binhai can be criticized for not being a proper eco-city. But should these criteria be open to revision?

CONCLUSIONS

Since 1992, ESR in China can be characterized by: (1) environmental issues and institutions playing an increasingly central role in national and local planning (including rescaled responsibilities for environmental governance); (2) enhanced involvement by non-state actors; (3) the proliferation of environmental regulations and initiatives at all levels of the state; and (4) the diversification of regulatory tools. Within this context, cities have been presented as a key scale for achieving environmental goals, including the strategic project to promote eco-cities. These cities have provided experimental sites for planners and policy-makers to explore and test new ideas of eco-city-ness, as exemplified in Tianjin–Binhai eco-city model.

The shift from export-oriented industrialization and coastal urbanization toward promoting the domestic market coincided with a state-led redefinition of the eco-city. Seeking a model that could respond to China's urbanization challenges, the notion of an eco-city as in harmony with its natural environment was replaced by an ubiquitously replicable, technology-driven model: an eco-city that converts degraded into green environments while underwriting residents' social welfare. Tianjin–Binhai, also enacting a new geography of collaboration – partnering with an Asian state rather than European or North American firms – became the new best practice eco-city. The deep involvement of the Chinese central government in framing and selecting Tianjin–Binhai, the inclusion of social welfare provision into its master plan, the ambition of developing new technologies and standards for eco-city construction, and the inclusion of low-carbon goals, reflect both China's recent environmental governance transition and the post-Kyoto global focus on reducing territorial carbon emissions (WHILE *et al.*, 2010).

Tianjin–Binhai's status as the national eco-city model remains seemingly unaffected by multiple implementation problems to date, and by serious questions about whether it qualifies as an eco-city. The model's departure from Register's original eco-city principles of sustainability nevertheless has gained international

acceptance, including by Register, illustrating China's capacity to shape eco-city discourses and models. Future research should examine the malleability and mobility of competing eco-city conceptions, how some become hegemonic, whether there can be definitive standards for eco-cities, and, if so, what these should be.

The Chinese case inevitably also raises questions about ESR: about its applicability beyond the capitalist North Atlantic realm, and its national territorial imaginary. Some features of ESR in China will feel familiar to Anglophone scholars, such as the rescaling of environmental governance, but China's one-party state limits the scope of the political negotiations between stakeholders that is at the centre of strategic relational state theory. Inter-state cooperation with Singapore, and the international circulation of both the Dongtan and Tianjin–Binhai models, illustrate the importance of horizontal connectivities extending beyond the nation-state, challenging the scalar and territorial imaginaries prioritized in ESR. In sum, these observations pose important conceptual as well as empirical challenges for further research on eco-cities and ESR.

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NOTES

1. Officially known in English as Sino-Singaporean Tianjin Eco-City, shifting names have been used locally. Since 2011, Zhōng Xīn ('Sino-Singaporean' in Mandarin) eco-city has become more prevalent, enhancing the semiotic significance of its collaborative nature. Dongtan, a China–UK collaboration, never was named 'Sino-British'.
2. For the purposes of this paper, the authors do not think it necessary to take a position on whether post-market reform China is, in fact, capitalist (cf. ONG, 2006; PECK and ZHANG, 2013), or its implication for cities (cf. WALKER and BUCK, 2007).
3. Regulation theoretic approaches to state–economy relations can be criticized, for example, for

- methodological territorialism, but they seek to account for spatiotemporal variegation and need not be limited to capitalist economies.
4. For further information, see CHINESE ACADEMY OF SCIENCES (2010).
 5. The National Environment Protection Model City was initially part of a China–Japan collaboration. Selection criteria included environmental, economic and social indices. Only cities accredited as a National Hygienic City could become a National Environment Protection City – a common inter-referencing practice in Chinese city initiatives.
 6. *Framework Agreement on the Development of an Eco-City in the PRC* (2007).
 7. For example, in March 2013, invited by Singapore, China sent top cadres at the provincial level to visit Singapore in order to learn eco-city and sustainable urban planning (interview with SGLC02, March 2013). China also hosts an annual International Eco-City Forum in Tianjin–Binhai Eco-City, publicizing and legitimizing its collaboration with Singapore. Other eco-cities still collaborate with European and North American partners, however.
 8. Interviews with TJEC01, September 2011; BJPR10, October 2011; and TJNU11, October 2011.
 9. Interview with SHUP05, October 2011. *Yibashou* are de facto senior leaders with absolute power in Chinese public or private organizations, mostly party members with good political connections.
 10. Interview with TJEC03, September 2011.
 11. Interview with SGSB01, March 2013.
 12. Interviews with TJEC02, September 2011; and SGSB01, March 2013.
 13. Interviews with TJEC03 and TJEC06, September 2011; see also http://www.tianjinecocity.gov.sg/bg_intro.htm.
 14. Interviews with TJEC03, TJEC05 and TJEC06, September 2011.
 15. The joint investment company of China and Singapore specifically created for Tianjin eco-city development.
 16. Original text in Mandarin, translated by Chang.
 17. Interview with TJEC05, September 2011. Greenfield eco-cities face two challenges: loss of valuable farmland and relocation of large numbers of pre-existing residents, each with considerable potential political obstacles. With preserving farmland for food production a national priority, converting farmland on the urban fringe involves complex legal procedures with the Ministry of Land and Resources, an obstacle faced by Dongtan (Wu, 2012).
 18. See the Tianjin–Binhai Eco-City official website: http://www.tianjinecocity.gov.sg/bg_intro.htm.
 19. In the Western context, a ghost town refers to a city abandoned after economic decline or human/natural disasters. In China, ghost towns are newly built, unoccupied urban areas that have become common with China's recent local construction fever; see <http://www.time.com/time/magazine/article/0,9171,1975336,00.html>.
 20. Interview with TJEC01, September 2011 and November 2012.
 21. Interview September 2011.
 22. Interview with TJEC02, September 2011.
 23. Unofficial conversation with two local government officials, October 2011.
 24. Interview with TJEC03, September 2011.
 25. Interview with TJEC03, September 2011.
 26. The current housing units allocation is 60% for the high-income population, 20% for the medium-income population and 20% for the low-income population (which will be designated as affordable housing units).
 27. Interview with TJEC06, September 2011; and TJEC07, September and October 2011.
 28. Bluepath was founded by a Chinese planner who had worked for Arup on Dongtan.
 29. The most recent green building construction guideline for Tianjin eco-city can be found in SSTEACAC and BLUEPATH CITY CONSULTING (2010, p. 429).
 30. Interviews with TJEC01 and TJEC03, September 2011.

REFERENCES

- BAEUMLER A., IJASZ-VASQUES E. and MEHNDIRATTA S. (Eds) (2012) *Sustainable Low-Carbon City Development in China*. World Bank, Washington, DC.
- BUTTEL F. H. (2000) Ecological modernization as social theory, *Geoforum* **31**, 57–65. doi:10.1016/S0016-7185(99)00044-5
- CARTIER C. (1995) Singaporean investment in China: installing the Singapore model in Su'nan, *Chinese Environment and Development* **6**, 117–144.
- CHANG I. C. and SHEPPARD E. (2013) China's eco-cities as variegated urban sustainability: Dongtan eco-city and Chongming eco-island, *Journal of Urban Technology* **20**, 57–75. doi:10.1080/10630732.2012.735104
- CHEN C. J. (2009) Growing social unrest and emergent protest groups in China, in XIAO X. and LIN Z. (Eds) *Rise of China: Beijing's Strategies and Implications for the Asia-Pacific*, pp. 87–106. Taylor & Francis, New York, NY.
- CHINESE ACADEMY OF SCIENCES (2010) *2010 zhōng guó kě chí xù chéng shì fā zhǎn bào gào (2010 Report on the Development of Chinese Sustainable Cities)*. Science Press, Beijing.
- CHINESE SOCIETY FOR URBAN STUDIES (CSUS) (2011a) The cases of Chinese eco-city. Paper presented at the Press Conference on Annual Achievements of Eco-City Assessment and Best Practices (2010–2011). Beijing, 29 March 2011.
- CHINESE SOCIETY FOR URBAN STUDIES (CSUS) (2011b) *zhōng guó dī tàn chéng shì fā zhǎn bào gào (China's Low Carbon Eco-City Development Report)*. China Architecture and Building Press, Beijing.
- DE JONG M., WANG D. and YU C. (2013) Exploring the relevance of the eco-city concept in China: the case of Shenzhen Sino-Dutch low carbon city, *Journal of Urban Technology* **20**, 95–113. doi:10.1080/10630732.2012.756202
- ECONOMY E. (2007) Environmental governance: the emerging economic dimension, in CARTER N. and MOL A. (Eds) *Environmental Governance in China*, pp. 23–41. Routledge, New York, NY.
- FAN C. (2005) Interprovincial migration, population redistribution and regional development in China: 1990 and 2000 census comparisons, *Professional Geographer* **57**, 295–311. doi:10.1111/j.0033-0124.2005.00479.x

- FRIEDMAN T. (2010) Who's sleeping now?, *New York Times*, **9 January** (available at: http://www.nytimes.com/2010/01/10/opinion/10friedman.html?_r=0).
- GENG Y. and DOBERSTEIN B. (2008) Developing the circular economy in China: challenges and opportunities for achieving 'leap-frog development', *International Journal of Sustainable Development and World Ecology* **15**, 231–239. doi:10.3843/SusDev.15.3:6
- HE G., LU Y., MOL A. and BECKERS T. (2012) Changes and challenges: China's environmental management in transition, *Environmental Development* **3**, 25–38. doi:10.1016/j.envdev.2012.05.005
- HOFFMAN L. (2011) Urban modeling and contemporary technologies of city-building in China: the production of regimes of green urbanism, in ROY A. and ONG A. (Eds) *Worlding Cities: Asian Experiments and the Art of Being Global*, pp. 55–76. Wiley-Blackwell, Chichester.
- HSING Y. (2006) Land and territorial politics in urban China, *China Quarterly* **187**, 575–591. doi:10.1017/S0305741006000385
- HSING Y. (2010) *The Great Urban Transformation: Politics of Land and Property in China*. Oxford University Press, Oxford.
- HUANG Y. (2006) Urban development in contemporary china, in VEECK G., PANNEL C., SMITH C. and HUANG Y. (Eds) *Globalization and the Dynamics of Political, Economic and Social Change*, pp. 233–26. Rowman & Littlefield, Baltimore, MD.
- HUGHES C. (2006) *Chinese Nationalism in the Global Era*. Routledge, London.
- HULT A. (2013) Swedish production of sustainable urban imaginaries in China, *Journal of Urban Technology* **20**, 77–94. doi:10.1080/10630732.2012.735405
- JAHIEL A. R. (1998) The organization of environmental protection in China, *China Quarterly* **156**, 757–787. doi:10.1017/S030574100005133X
- JESSOP R. (2007) *State Power: A Strategic-Relational Approach*. Polity, Cambridge.
- JESSOP R. and SUM N.-L. (2006) *Beyond the Regulation Approach: Putting Capitalist Economies in their Place*. Edward Elgar, Cheltenham.
- JOSS S. and MOLELLA A. (2013) The eco-city as urban technology: perspectives on Caofeidian international eco-city (China), *Journal of Urban Technology* **20**, 115–137. doi:10.1080/10630732.2012.735411
- KRUEGER R. and GIBBS D. (Eds) (2007) *The Sustainable Development Paradox: Urban Political Economy in the United States and Europe*. Guilford, New York, NY.
- LI P. (2011) *zhōng xīn shēng tài chéng : tàn suǒ lǜ sè dī tàn xīn jǎ zhǎn zhī lù* [Sino-Singaporean Tianjin eco-city: exploring green low carbon new town development], *dī tàn shì jiè* [Low Carbon World] **9**, 60–63.
- LIN G., LI X., YANG F. and HU F. (2015) Strategizing urbanism in the era of neoliberalization: state power reshuffling, land development and municipal finance in urbanizing China, *Urban Studies* **52**, 1962–1982. doi:10.1177/0042098013513644
- LIN G. C. S. (2012) Strategizing urbanism in the era of neoliberalization: power reshuffling, land development, and municipal finance in urbanizing China. Paper presented at the conference on Urban Revolutions in the Age of Global Urbanism, Jakarta, Indonesia, 17–21 March 2012.
- LIU F. (2009) New trends in China's regional economic development, in SAW S. and WONG J. (Eds) *Regional Economic Development in China*, pp. 9–27. Institute of Southeast Asian Studies, Singapore.
- LIU J. and DIAMOND J. (2008) Revolutionizing China's environmental protection, *Science* **319**, 37–38. doi:10.1126/science.1150416
- LIU L., ZHANG B. and BI J. (2012) Reforming China's multi-level environmental governance: lessons from the 11th Five Year Plan, *Environmental Science and Policy* **21**, 106–111. doi:10.1016/j.envsci.2012.05.001
- LO C. W.-H. and TANG S.-Y. (2007) Institutional reform, economic changes and local environment management in China: the case of Guangdong province, in CARTER N. and MOL A. (Eds) *Environmental Governance in China*, pp. 42–62. Routledge, New York, NY.
- MA J. and LI N. (2006) Tackling China's water crisis, *China Dialogue* **21 September** (available at: <http://www.chinadialogue.net/article/show/single/en/392>).
- MAY S. (2011) Ecological urbanization: calculating values in an age of global climate change, in ROY A. and ONG A. (Eds) *Worlding Cities: Asian Experiments and the Art of Being Global*, pp. 98–126. Wiley-Blackwell, London.
- MINISTRY OF ENVIRONMENTAL PROTECTION (1997) *The State of Environment in China 1996* (available at: <http://english.mep.gov.cn/SOE/soechina1996/index.htm>).
- MOL A. P. (2009) Urban environmental governance innovations in China, *Current Opinion in Environmental Sustainability* **1**, 96–100. doi:10.1016/j.cosust.2009.07.002
- MOL A. and CARTER N. (2007) China's environmental governance in transition, in CARTER N. and MOL A. (Eds) *Environmental Governance in China*, pp. 1–22. Routledge, New York, NY.
- MOL A. and SPAARGAREN G. (2000) Ecological modernisation theory in debate: a review, *Environmental Politics* **9**, 17–49.
- NEWSHAM G., MANCINI S. and BIRT B. (2009) Do LEED-certified buildings save energy? Yes, but ... , *Energy and Buildings* **41**, 897–905. doi:10.1016/j.enbuild.2009.03.014
- ONG A. (2006) *Neoliberalism as Exception: Mutations in Citizenship and Sovereignty*. Duke University Press, Durham, NC.
- PECK J. and ZHANG J. (2013) A variety of capitalism ... with Chinese characteristics?, *Journal of Economic Geography* **13**, 357–396. doi:10.1093/jeg/lbs058
- QIU B. (2009) From green building to low carbon eco-city, *Urban Studies* **16**, 1–11. [in Mandarin]
- QIU B. (2011) Low-carbon development and eco-city. Public speech delivered at the 2nd China (Binhai Tianjin) International Eco-City Forum, 24 September 2011.
- REGISTER R. (1987) *Ecocity Berkeley: Building Cities for a Healthy Future*. North Atlantic, Berkeley, CA.
- REGISTER R. (2002) *EcoCities: Building Cities in Balance with Nature*. Berkeley Hills, Berkeley, CA.

- REGISTER R. (2012) Report from China – progress at Tianjin eco-city and promise at Nanjing, *Ecocity Builders* **24** **October** (available at: <http://www.ecocitybuilders.org/2012/10/24/report-from-china-progress-at-tianjin-eco-city-and-promise-at-nanjing/>).
- ROCK M. (2002) Integrating environmental and economic policy making in China and Taiwan, *American Behavioral Scientist* **45**, 1435–1455. doi:10.1177/0002764202045009008
- SATTERTHWAITE D. (1997) Sustainable cities or cities that contribute to sustainable development?, *Urban Studies* **34**, 1667–1691. doi:10.1080/0042098975394
- SCHREURS M. (2010) Multi-level governance and global climate change in East Asia, *Asian Economic Policy Review* **5**, 88–105. doi:10.1111/j.1748-3131.2010.01150.x
- SCOFIELD J. (2009) Do LEED-certified buildings save energy? Not really ... , *Energy and Buildings* **41**, 1386–1390. doi:10.1016/j.enbuild.2009.08.006
- SHANGHAI INDUSTRIAL INVESTMENT COMPANY (SIIC) (2006) *Shanghai Dongtan: An Eco-City*. Shanghai Sanlian, Shanghai.
- SHI H. and ZHANG L. (2007) China's environmental governance of rapid industrialization, in CARTER N. and MOL A. (Eds) *Environmental Governance in China*, pp. 123–144. Routledge, New York, NY.
- SINO-SINGAPORE TIANJIN ECO-CITY ADMINISTRATIVE COMMITTEE (SSTECAC) (2009) *Master Plan of Sino-Singapore Tianjin Eco-City 2008–2020*. SSTECAC, Tianjin.
- SINO-SINGAPORE TIANJIN ECO-CITY ADMINISTRATIVE COMMITTEE (SSTECAC) and BLUEPATH CITY CONSULTING (2010) *dǎo háng shēng tài chéng shì* [Navigating the Eco-City]. China Architecture and Building Press, Beijing.
- SNEDDON C. (2000) 'Sustainability' in ecological economics, ecology and livelihoods: a review, *Progress in Human Geography* **24**, 521–549. doi:10.1191/030913200100189076
- TSUI K. and WANG Y. (2004) Between separate stoves and a single menu: fiscal decentralization in China, *China Quarterly* **177**, 71–90. doi:10.1017/S0305741004000050
- WALKER R. and BUCK D. (2007) The Chinese road: cities in the transition to capitalism, *New Left Review*, n.s. **46**, 39–68.
- WANG S. (2009) *zhōng guó qiǎng jiàn lǜ sè chéng shì* [China rushes to build green cities], *Common Wealth Magazine* no. **436**, 2 December (available at <http://www.cw.com.tw/article/article.action?id=39624>).
- WEI D., LU Y. and CHEN W. (2009) Globalizing regional development in Sunan, China: does Suzhou industrial park fit a neo-Marshallian district model?, *Regional Studies* **43**, 409–427. doi:10.1080/00343400802662617
- WHILE A., JONAS A. and GIBBS D. (2004) The environment and the entrepreneurial city: searching for the urban 'sustainability fix' in Manchester and Leeds, *International Journal of Urban and Regional Research* **28**, 549–569. doi:10.1111/j.0309-1317.2004.00535.x
- WHILE A., JONAS A. and GIBBS D. (2010) From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development, *Transactions of the Institute of British Geographers*, n.s. **35**, 76–93. doi:10.1111/j.1475-5661.2009.00362.x
- WORLD BANK (2009) *Sino-Singapore Tianjin Eco-City: A Case Study of an Emerging Eco-City in China*. World Bank Technical Assistance Report. World Bank, Washington, DC.
- WU F. (2010a) Pathways and challenges to 'the workshop of the world': China's economic growth and urbanization in political economic perspectives. Paper presented at the conference on Making Global Cities and the World Economic Crisis, Shenzhen, China, 1–8 January 2010.
- WU F. (2010b) How neoliberal is China's reform? The origins of change during transition, *Eurasian Geography and Economics* **51**, 619–631. doi:10.2747/1539-7216.51.5.619
- WU F. (2012) China's eco-cities, *Geoforum* **43**, 169–171. doi:10.1016/j.geoforum.2011.08.001
- WU F. (2015) *Planning for Growth: Urban and Regional Planning in China*. Routledge, New York, NY.
- XIE P., ZHOU L., LIU Y., ZHANG A., PANG T. and SONG F. (2010) Research on eco-city index and best practices, *Urban Studies* **17**, 12–18. [in Mandarin]
- YUAN Z., BI J. and MORIGUCHI Y. (2006) The circular economy: a new development strategy in China, *Journal of Industrial Ecology* **10**, 4–8. doi:10.1162/108819806775545321
- ZHANG J. (2012) From Hong Kong's capitalist fundamentals to Singapore's authoritarian governance: the policy mobility of neo-liberalising Shenzhen, China, *Urban Studies* **49**, 2853–2871. doi:10.1177/0042098012452455
- ZHANG K. and WEN Z. (2008) Review and challenges of policies of environmental protection and sustainable development in China, *Journal of Environment Management* **88**, 1249–1261. doi:10.1016/j.jenvman.2007.06.019
- ZHOU L. and PING S. (2009) Bohai Rim's regional development: problems and policy options, in SAW S. and WONG J. (Eds) *Regional Economic Development in China*, pp. 179–210. Institute of Southeast Asian Studies, Singapore.
- ZHOU N., HE G. and WILLIAMS C. (2012) *China's Development of Low-Carbon Eco-Cities and Associated Indicator Systems*. China Energy Group, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA.