

Planning for Eco-City in China: Policy Mobility in Path Creation of Eco-Zhuhai

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Abstract

Idea of eco-city booms in China's planning practices under central state's envisioned transition towards "ecological civilization" wherein Zhuhai stands out as an example well fitted the eco-livable paradigm. To disentangle how Zhuhai has achieved such fame, this article identifies two interlocked and nested forms of policy mobility: policy reformulation towards pro-environment and policy circulation of advanced eco-experiences, and reviews key process of eco-city planning in the city since 1980s. Rather than an explicit, long-term vision, the review suggests that Zhuhai's reputation as an eco-city model results from cumulative effects of early policy formulation towards environmental protection upon its geographical location, its natural assets, and essentially early hysteresis in the growth race. Though subsequent development has been path-dependently locked in, it is benefitted from the planning regime wherein knowledge and experiences related to eco-city are instantly shared.

Keywords: Urban planning, eco-city, sustainable, policy mobility, Zhuhai, China

1. Introduction

Zhuhai has kept topping in China for its environmental conditions according to the Report on the Development of China's Eco-Cities (2015) released in Beijing. It was crowned "the most liveable city" by Chinese Academy of Social Sciences and was praised for blazing a new trail for green, low-carbon development and a circular economy by deputy director-general of the Ministry of Environmental Protection (MEP). (He, 2015)

The preceding excerpt provides a glimpse of how Zhuhai has been acknowledged and promoted as a reputed eco-city in China. Zhuhai borders Jiangmen, Zhongshan and Macau and locates in competitive Pearl River Delta (PRD) region which has become one of the most populated and largest urban agglomeration in the world. The traditional PRD region include two Special Administrative Regions, Hong Kong and Macau, and nine mainland cities in Guangdong province, Guangzhou, Shenzhen, Dongguan, Huizhou, Foshan, Zhaoqing, Jiangmen, Zhongshan and Zhuhai. Under the strategic positioning of Chinese government, the PRD region is constructing the Greater Bay Area with Hong Kong and Macau to shoulder the world-class bay areas such as New York, San Francisco and Tokyo. A natural question is why, Zhuhai, a core city of the PRD and a former frontier of China's reform and opening, has embraced green environments in planning discourse and how it evolved into a model for a livable eco-city. To answer this question, the concept of eco-city and how pro-environment stance/policies are (re)molded and circulated by local government shall be understood, and a geographical/historical reading is in need because eco-city planning, like other planning practice, is a contested policy process embedded in specific local context.

The vertical policy mobility within China's bureaucratic system under the single-party rule also calls for attention as urban planning is sensitive to superior leadership, particularly central leadership.

Zhuhai's eco-urbanization against nationwide pro-growth policies/discourses is insightful and is of significance to fill the knowledge gap of how the idea of eco-city has been practiced and bolstered by policy and administrative system in China at urban level, as well as the wisdom and struggles in path creation of Chinese cities with less comparative advantage in the economic growth race. Case study approach is applied in this research, involving broad literature search and detailed review. First-hand empirical data were gathered from 2015 to 2019 during on-site research, mainly through semi-structured or unstructured interviews before the COVID-19 and supplemented telephone interviews thereafter. Six respondents accept the interview, two are from local government of Zhuhai in charge of urban development and master plan; three are researchers affiliated to universities in Guangzhou and Shenzhen, often travel or commute to Zhuhai and accumulate rich experiences studying Zhuhai; one is urban planner provided consultancy services to Zhuhai on urban planning and design. Some of the talks are formal, some are not, depend on the occasion and personality of the interviewees. Archives research is also conducted in Zhuhai library to trace local planning practice and policy implementation as much earlier practices were only documented in papers without electronic versions online. Desktop investigation on published articles, government working reports, local newspapers, planning documents and legislative books were widely conducted throughout this research in multiple databases.

2. Conceptual Framework: Policy Mobility and China's Eco-City in Action

Though eco-city is considered the key to sustainability according to UN environment programme report (UNEP, 2012), there has been no agreement on any specific definition of the concept (Bibri, 2020; Joss et al., 2013). It often assembles idea of "green", "smart" or "low carbon", or encompasses broad dimensions of economic, social or cultural sustainability, but to what extent these items should be incorporated remains inconclusive. Scholars even doubt the usefulness of a precise, narrowed definition (Joss, 2010) as prevalence of the concept actually relies on its malleability and variability in different context. One thing for sure is that eco-city is policy- and context-specific, depending on where it is embedded and what strategies it has practiced, and shall not depart from the tenet of an environment-friendly human settlement. As solutions for making cities livable and sustainable varied across the world, this research argues to treat eco-city as an objective or status that can be achieved through diverse ways but may evolve upon technological progress and innovation (Rapoport and Vernay, 2011). The eco-city title, viewed in this research, so derives from certain judgement or evaluation capable to distinguish cities by their superior livability, sceneries and ecological environment whatever how broad meaning it contains.

An eco-city must be supported by policy process (Joss, 2011), yet to understand a localized operation of an international concept is far from easy. Policy mobility, here conceptualized as policy (re)formulation and policy circulation, offers a viable lens to decode the mechanisms of eco-city path creation. Policy mobility as an analytical tool is explanatory about local politics and the worldwide green urbanism. Scholars agreed that city development tied to mayors' promotional tactics (McCann, 2013), either by vision or under pressure. Facing climate change and ecological degradation, municipal leaders around the world have been urged to balance the adversarial pressures on economic growth and environment protection, and so rightfully favor eco-city or related ideas. Supporters of eco-cities believe that cities do not always exploit the environment but are also sources of environmental remedies (Davis, 2017). This belief is well manifested in the World Bank's interpretation that eco-cities "strive to function harmoniously with natural systems and value their ecological assets, as well as the regional and global ecosystems on which we depend... (Eco-cities) drastically reduce the net damage to the local and global environment, while improving the overall well-being of their citizens and the local economy" (Suzuki et al., 2010, p. xvii). Yet, retrofitting a city as an eco-city in true sense is nearly impossible, even for the world's iconic self-boosted eco-cities, such as Curitiba in Brazil, Leeds in the UK, or Nantes in France (Beal, 2015; Miao and Lang, 2015; While et al., 2004). In most circumstances, it is the green/ecological rhetoric, discourse, and promotion of municipal elites, either political or economic, accomplishes an "eco-city" makeover and policy (re)formulation. Misuse, or the variegated nature, of eco-city has also been noted, e.g., to equate a small amount of manufactured greenness to eco-city or speculate on the term for real estate development (Chang and Sheppard, 2013; Chien, 2013; Chung et al., 2018; Jong et al., 2016). Thus, the techniques or means stated to constitute an eco-city may be less important than making clear what political or policy context, combined with appropriate governance and planning approaches, is beneficial for cities to evolve livable, ideal and harmless to nature. A contextualised examination would greatly help in this side.

Another reason for municipal leaders' favor on eco-city shall attribute to policy circulation, constituted by policy learning and policy diffusion (or boosterism), at multiple levels in contemporary policy operation system. Thus, fine-grained qualitative studies of how policy and governance are learned in particular settings, boosted/diffused

from place to place, and mutated as they travel help provide a nuanced understanding of the operation of urban policies and models and must be a focus in urban policy mobility research (McCann, 2011). Learning is about knowledge production and reinforcement through everyday life and participation in a broad sphere of political activities (McFarlane, 2011). It is “a political and practical domain through which the city is assembled, lived, and contested,” frequently marginalized as background noise to “real politics” (McFarlane, 2011: 360). Policy makers often seek to import ideas, best practices, and policy models that are off-the-rack, thereby allowing local governance coalitions to get on the “fast policy” track (Temenos and McCann, 2012). When policy makers mature, they go beyond simple imitation and start adaptive learning. Policy learning is introspective; it fixes policies, discourses, and narratives in a specific place via the politics of policy-making. By contrast, policy boosterism is extrospective; it promotes “best practices” and distinguishes cities through advertising, sloganeering, and marketing (McCann, 2013). As a subset of traditional branding activities, policy boosterism markets urban policies as commodities and promotes locally rooted policies across broader communities of interested peers. Among all policy boosters, city leaders (e.g., mayors) are vital and steer urban orientation. Given that municipal leaders are normally addicted to the race to the summit of “world-class” cities (Ong, 2011), rankings have become important reference that necessitate and benefit from policy boosterism. “Model cities” nominated by global ranking institutions in environmental policy-making, such as Curitiba, Portland, Copenhagen, Singapore and Osaka, have frequently been emulated by other cities that are keen on greenery (Denig, 2013; Pow and Neo, 2015). Policies are on the move; they not only transfer knowledge or technology between jurisdictions but also evolve through mobility, thereby establishing linkage between policy makers and policy-making sites (Peck and Theodore, 2010). In transferring “best practice” through back-and-forth learning and boosterism, policy circulation necessitates and benefits from the creation of model cities (e.g., eco-cities).

Idea of eco-city has also gained favour among city leaders in China, echoing central state’s envisioned transition towards “ecological civilization” (Chang et al., 2016). Apart from countless projects initiated in the name of eco-city within cities (Chien, 2013), various appraisals and ranks also rose, horizontally assessing the relative level of an individual city with all the other under a specific criteria of eco-city. As most Chinese cities are still in development and seek balance with environment protection, such criteria, in addition to focusing on evaluating the environment, normally include quantifiable indicators to measure other developments such as economy, society and urban health. The evaluation work is dominated by government and research institute, often at the national level (e.g. MEP or Chinese Academy of Social Science), and promoted by mass media (e.g. Xinhua News Agency), to pick model city and create competitive atmosphere for quickly putting eco-city into practice across the country. However, despite of numerous efforts being made to critically reflect on eco-city at project level, there is much less understanding about the mechanisms of how an individual eco-city, judged by concrete norms and indicator framework, comes into being and how its formation is combined with broader institutional, political economic and policy contexts at urban level. China’s planning system has played an important role in this formation process. In a narrow sense, planning system related to eco-city formation, especially construction, refers to urban and rural plans once solely administered by Ministry of Housing and Urban-Rural Development (MHURD). In this system, city development is primarily tied to a two-tier planning structure: the overall planning for urban vision and general spatial layout (often called master plan) and the detailed planning for development control, management (regulatory detailed plan) and construction (site detailed plan) (Note 1). MHURD launched two Sino-foreign cooperation programs of low carbon eco-city and kept importing latest techniques and ideas through this two-tier structure. Most work has been done by planning institutions subordinated to MHURD or local planning bureau, a small portion has left to private planning and design firms. Planners under this line carry out eco-city in plan making and urban construction. The latest sectoral reform in 2018 has integrated urban and rural plan with major functional zoning plan and land use plan etc. into spatial plan under Ministry of Natural Resources, the mainstay of “ecological civilization”. In a broad sense, socioeconomic plans from Development and Reform System and special plans from environmental sectors, particularly MEP, are also indispensable planning systems actualizing the idea of eco-city. Yet, whatever plans have been made, it is the plan implementation shapes urban development pathway, which greatly depends on local leadership and is often determined by local politics in Chinese context.

3. Policy Mobility in Zhuhai’s Eco-City Planning

Zhuhai locates at the rapidly growing PRD (Figure 1), covering an area of 1,732 km². Though its permanent population kept growing and reached 2.44 million in 2020, the quantity cannot count as outstanding, only ranking average among China’s 293 prefecture-level cities. But Zhuhai municipal government attaches great importance to the environment. Over 1/6 of the city’s land area, viz. 310 sq.km, were planned as ecological protection area. Local investment on environmental protection to GDP has been increasing year by year. City rank in national air

quality has been in the forefront and the excellent rate of atmospheric environment has maintained 100% for consecutive years. In 2020, Zhuhai's AQI compliance rate was 93.4%, improving 6.8% over last year and ranking high in both Guangdong and China. The city is also pioneered benchmarking with international first-class standards and cooperates with the Guangdong-Hong Kong-Macao Greater Bay Area in joint atmospheric governance, protection of transboundary water bodies, joint marine supervision and conservation of natural ecology. These efforts and achievement, plus pleasant environment of coastal ambience, mountain backdrop, and rich natural resources, Zhuhai has been vanguard of eco-city practices for the past few decades, outstood in various nationwide rankings and awards and praised as a model city for eco-livability (Table 1). The reputation, effectuated by interlocked and nested forms of policy mobility: from policy (re)formulation towards pro-environment to policy circulation of advanced eco-experiences, makes Zhuhai a viable case to disentangle how local politics and policy proceeded and operated at an individual eco-city level in China. Main policies related to environment throughout the process, though locally promulgated (Table 2), followed after the global waves of environmental governance since 1970s, which "ranged from the 'prevention and control', through to the emergence, consolidation of sustainable development, and latterly the market-leaning environmental management and low-carbon control" (While et al., 2010, pp. 80-81).

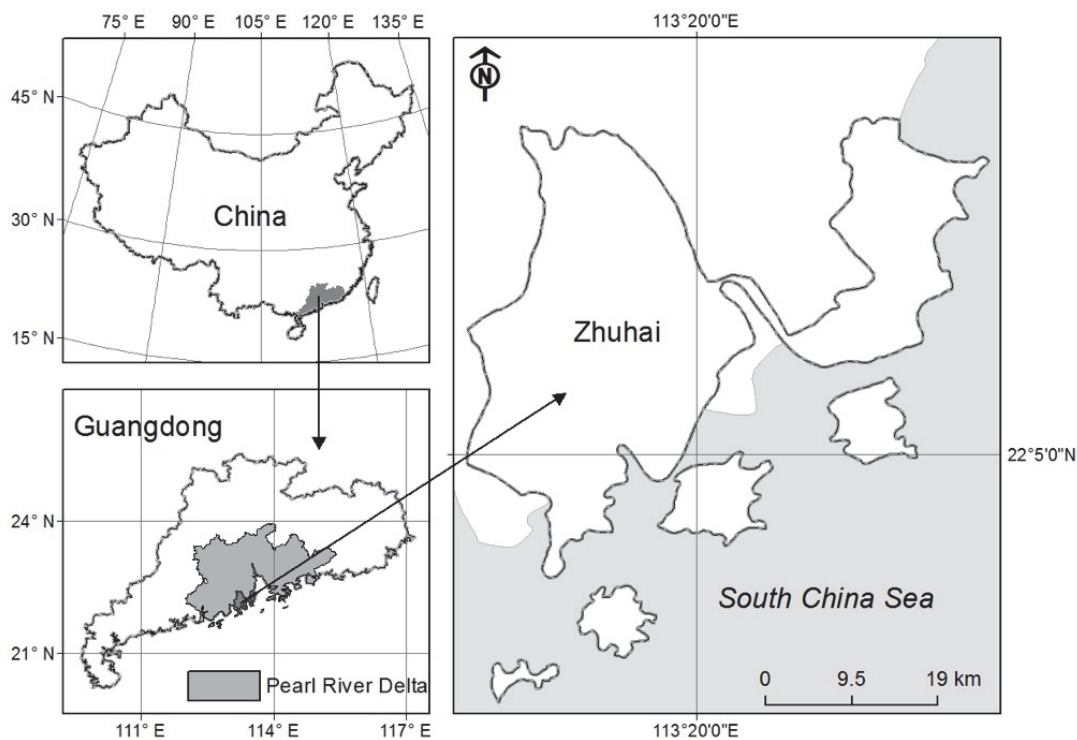


Figure 1. PRD and Zhuhai

Table 1. Honors & awards granted to Zhuhai for superior eco-livability

	National ministries	Research institutions	Mass media, NGO, international and local social organizations
Since 2020	National City [granted by NPHCC, NHC, 2022]	Hygienic City Second in terms of sustainable development [nominated in Blue Book released by CCIEE, Columbia University in New York City, AliResearch, Philips Investment, and SSAP, 2021]	Cities of the Year 2019-20 in the Healthy China Campaign [announced at the Healthy China Promotion Action & Annual index Release Conference, Xinhua News Agency, 2021]
	Demonstration City for Health Construction [granted as the top in Guangdong Province by NPHCC, NHC, 2020]	First in terms of sustainable development [nominated in Blue Book released by CCIEE, Columbia University in New York City, AliResearch and SSAP, 2020]	
2013-2019	National Hygienic City [granted by NPHCC, NHC, 2018]	First, Top 10 Chinese Cities in Sustainable Development [nominated in Blue Book released by the CCIEE and SSAP, 2019]	China Sea Bass Capital [awarded the title by China Aquatic Products Processing and Marketing Alliance, 2019]
	Demonstration City of China Ecological Civilization [designated by MEP, 2017]	Number 1 Competitive City in Urban Livability First, Top 10 Livable Cities in China [named in report released by CASS and the CSSP, 2015]	
	National Water-Saving City [designated by MHURD and NDRC, 2017]	First, Top 10 Livable Cities in China [evaluated by CASS, 2014]	Beautiful Landscape City [designated by the China Ecological Civilization Research & Promotion Association, 2017]
	National Forest City [National Greening Commission, NFA, 2016]	No.1, Top Ten Livable Cities in China [evaluated by CASS, 2013]	
	National Eco-City [designated by MEP, 2016]	China's Most Sustainable City [measured by Urban Sustainability Index (USI) published by McKinsey & Co, Columbia University, and Tsinghua University, 2013]	
	Pilot City of Europe-China Eco-Cities Link [designated by MHURD, 2016]		
	National Ecological Garden City [announced by MHURD, 2015]		
Before 2000	State-Level Exemplary Ecological Zone [designated by MEP, 2000]		Dubai International Award for Best Practice in Improving the Living Environment [granted by the UN Center for Human Settlements, 1998]
	National Environmental Protection Exemplary City [designated by MEP, 1997]		

Source: Collating from official website of Zhuhai municipal government, <http://www.cityofzhuhai.com/>, edited by authors;

Table 2. Waves of key environmental policies of Zhuhai since 1980s

Stage	1980s to early-1990s	Mid-1990s to late 2000s	Early 2010s onwards
Key/selected policies	“Provisional Regulations on Environmental Management” (1983); “Regulation of Eight Prohibitions for Environmental Protection (1992); Objectives and tasks of Environmental Protection 1994-1997 (1994)	Decision on enhancing environmental protection (1996); Regulations on environmental protection (1998; 2008); Economic plan on circular economy 2009-2020 (2008);	Implementation plan of low-carbon pilot city (2012); Construction Promotion Regulations on Eco-civilization of Zhuhai Special Economic Zone (2013); Environmental Protection Regulations (revised version, 2017); Management Approaches on Sponge City Construction (2018)
Policy discourse/key words	Pollution control/reduce;	Pollution control/reduce; Sustainable development/ecological civilization;	Pollution control/reduce; sustainable development/ecological civilization; low carbon/carbon control
Key actor	Government, firms	Government, firms, residents	Government, firms, residents, government alliance
Solution focus	Government regulation; firms get controlled	Government regulation; firms get controlled; public participation protected by laws and regulation	Government regulation; firms get controlled; public participation protected by laws and regulation; institutional mechanism
Approaches (proposed)	Laws and regulations	Laws and regulations; more market/market-oriented approaches (e.g. 1996 Resource compensation fees; principle of paid use of resources; gradually introduce the levy on ecological environmental compensation)	Laws and regulations; more market-oriented approaches (e.g. Resource compensation fees; principle of paid use of resources; levy on ecological environmental compensation; 2013 improve the sewage treatment price system; paid for industrial solid waste; gradually introduce the emission trading system; introduce and improve the levy on ecological environmental compensation)
Focus on production and consumption link	End of production	Whole process of production, consumption (public green consumption)	Whole process of production, consumption (public green consumption, changes in private consumption attitudes)
Environment-economy relations	viewed as two antithetical sets of pressures (economic growth in balance with environment protection)	unity of economic, social and environmental benefits (1996 developing environmental industries; 2008 eco-industrial parks)	unity of economic, social and environmental benefits; 2012 achieve win-win solutions; 2013 low-carbon economy, ecological civilization integrated into economic development

Source: compiled from various policy documents, authors.

3.1 (Re)Formulating Pro-Environment Policy and The Idea of Eco-City Planning

Idea of eco-city planning has deep roots in Zhuhai, attributed to its pleasant natural assets and early pro-environment policy selectivity. This is unusual because the city, like other special economic zones, was originally empowered to explore how to rapidly grow under the central government’s guideline of focusing on economic construction. Signs of the initial efforts on economic development include, for instance, the setup of the nation’s first modernized wool mill earning foreign currency, and the positioning of the city as an export commodity base in its Master Plan (1980-1988). However, export processing industrial development in Zhuhai is tepid, hardly comparable to the capital city Guangzhou and the vice provincial-level city Shenzhen and even inferior to

Dongguan and Foshan at the same administrative level. Distant from the powerhouse Hong Kong and weak transportation linkage were part of the reasons why Zhuhai did not stand out. The initial unsatisfactory growth opportunistically leaves room for reformulating policy towards eco-first, environment protection-stringent development when other counterparts embraced the short-sighted “treatment after pollution” during 1980s. Three principles, namely, “strictly control the land, strictly control the population, and strictly control the environment,” were proposed by Zhuhai municipal government to treat the potential growth-environment conflicts.

The municipal leaders’ early cognition on environmental protection (Note 2) is also nonnegligible. Before the idea of sustainability landed across China, economic growth was viewed incompatible with and antithetical to environment. As recalled by the second mayor and third Party Secretary Liang Guangda who had charged Zhuhai for 14 years and who is still recognized as the most important municipal leader initiating Zhuhai’s eco-city planning:

“I was deeply shocked by the pollution caused by the ‘No Industry No Wealth (wugong bufu)’ development mode in Nanhai county (where I was the party secretary) and determined to set strict standards to prevent pollution industrial programs from settling down in Zhuhai Special Economic Zone.”

The lesson of Nanhai County pollution to some extent precipitated Liang’s pro-environment policy selectivity for Zhuhai. The protection-stringent inclination was not exempted from stress at that time. Macro “economic imperatives” on efficiency and speed exerted considerable pressure on municipal leadership, who planned to take advantage of foreign capital and local firms, like other coastal reform vanguard cities, to invigorate Zhuhai’s industrialization. Economic development gained speed in 1984, with GDP growth rate reached the peak 68.7% and GDP value surpassing 678.3 million RMB. In 1989, the number of industrial firms reached 2141, with industrial output value increasing to 4.2 billion RMB. Over 3000 cooperative enterprises under the “three supplies and one compensation” trade mode were established in the early 1990s. Yet, these achievements can hardly be stated a success if looked at Shenzhen: with almost the same GDP in 1980 (Note 3), Shenzhen grew to 1.7 billion RMB in 1990, four times more than the 4,143 million RMB in Zhuhai. Hysteresis led to pessimistic emotion of entrepreneurs who had started to leave since 1994, as they judge Zhuhai might already be marginalized in that round of Hong Kong’s industrial transfer to PRD and can hardly breed manufacturing a pillar industry. This further molded local policy in favour of environment protection and locked Zhuhai in pro-environment pathway, which evolved different from other PRD rivalry cities.

The pro-environment mentality thus regained favor among the municipal leaders. Fundamental to environmental protection are environmental regulations and plan, which were reinforced (Note 4). Zhuhai pioneered issuing the “Regulation of Eight Prohibitions for Environmental Protection [1992, No.44]”, forbidding pollution industries such as electroplating, papermaking, bleaching, smelting, pulping, garbage disposal, petrochemicals, etc. Years later, the decision got reward: Zhuhai was conferred an Environment Protection Model City (*mofan chengshi*) in MEP’s first-round appraisal in 1997 (Note 5) and awarded International Best Practice for Human Settlement Improvement by UN habitat in 1998. Urban planning adhered to control functions, legislated [*chengxiang guihua tiaoli*, 1998] with explicit “8 unified principles”, prohibiting constructions along rivers (60m to the river bank), seas (80-100m to the coastal line), or in any place above 25m altitude, and reserving these areas for green and forest (Note 6). This legislation was amended in 2000, 2009 and 2013, supplemented with high-standard, non-relaxable regulation on per capita public green area and redline for building construction in places below 25m altitude. The legislation, in collaboration with regulatory plan, ensures stringent planning control and keeps the inherent, elegant scenic of island, mountains and sea, adding to Zhuhai’s eco-strength in a long run. The city then became perennial benchmark and is honored for eco-liveability and environment beauty, e.g. an exemplary city for environment protection [by MEP, 2012], a model city for ecological civilization construction [by Ministry of Ecology and Environment, 2017], and a graceful landscape city [by China Ecological Civilization Research and Promotion Association, 2017]. Even in socioeconomic development, Zhuhai stressed on sustainability and officially labelled itself as an eco-city in the 10th and 13th economic and social five-year plans, promoting green production and consumption to reduce environment burden.

Though the national-level power expansion of environmental sector, e.g. the elevation of the Environment Protection Bureau to a ministry-level institution in 2008 and the enlargement to Ministry of Ecology and Environment in 2018, has trickled down and empowered local environmental agency such as Zhuhai, eco-city planning is so complex, hardly confined to any sector (*tiao*) alone but a coordinated effort, whose success depends on the operational capability and integrity of local government system. Institutional support thus matters for the effectiveness of eco-city plan implementation whereby Zhuhai explored some innovative ways. For instance, it pioneered linking eco-civilization construction to government appraisal in 2016 and established lifelong responsibility on eco-environment damage, natural resources assets will be audited when cadres are reposted and

the result matters for cadre promotion. This prioritizes environment governance onto the growth-first agenda. The Gross Ecosystem Product (GEP) accounting standard, initially issued in Yantian, Shenzhen [No.: SZDB/Z342-2018], was in the first time imported to Zhuhai, and an emission trading system is established for pollution control (Note 7) enabling quantitative appraisal and management for eco-environment protection.

In short, Zhuhai has been able to better fit the eco-city criteria among functional departments and research institutions in China because of its geographical location, its natural assets, and essentially because it was lagging behind the growth race. This allowed the city to formulate and reform policies that in favour of environment conservation in a struggle with industrialization. Subsequent development has path-dependently locked-in to the pro-environment pathway and is consolidated through endogenous adherence to and exogenous shift towards green growth.

3.2 Circulating Reputed Eco-City Planning Experiences and Knowledge

To effectuate the idea of eco-city planning, Zhuhai joined the policy loop and circulated ecological development experiences and knowledge both domestic and abroad. As a newfound city, Zhuhai's political elites are, first, well learners trying the best to incorporate wisdom into eco-city planning. Figure 2 summarises environment-related policies made during 2007 and 2018. A majority of the policies are motivated by top-down guideline within the bureaucracy and adapted to local context in transmission. This can be viewed as "must learning" facilitated by the bureaucratic system wherein vertical delivery of command is efficient as political career is tied to evaluation from higher ups.

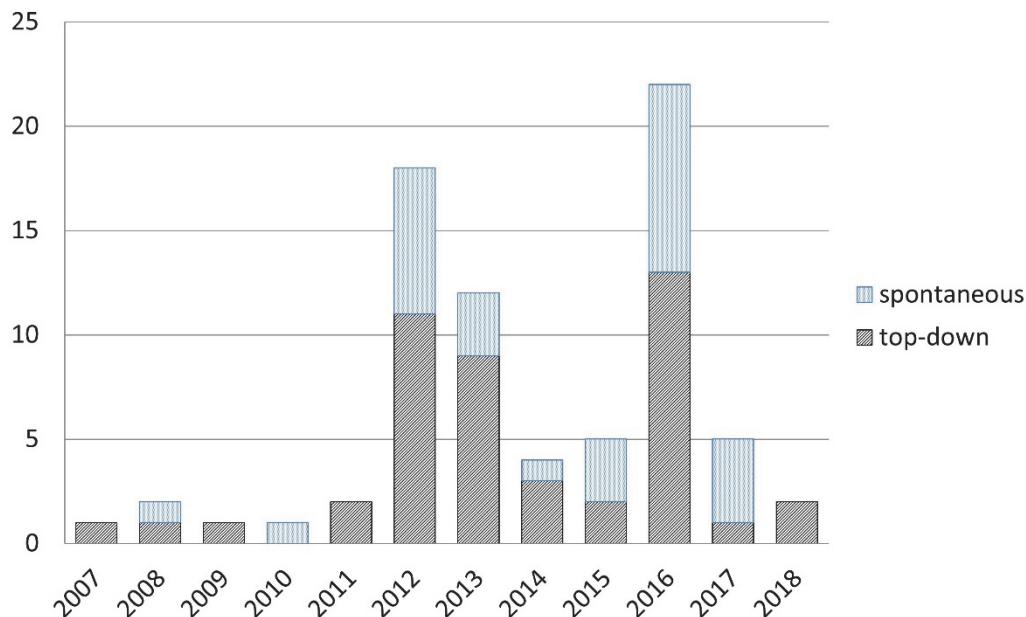


Figure 2. Environment-related policies driven by top-down or spontaneous forces in Zhuhai

Learning from advanced economy has been the main theme since reform and opening. In early times, Singapore is one of the best learnable models viewed by the paramount leader Deng Xiaoping, who was impressed by its well balance between fast development and centralized administration. Singapore's experiences in urban construction are also viewed more learnable than those low-density Euro-American cities as improvement and modernization of physical environment for populated Chinese cities are most urgent at that moment. Endorsement from the central made visits to Singapore possible for local officials such as those in Zhuhai. As recalled by a retired cadre, municipal delegations to Singapore led by the Party Secretary in 1980s were so impressed by its urban construction that the positioning of coastal garden city by south China sea was proposed in the master plan (1988-1995) and planning practices were transplanted to improve city appearance in Zhuhai. Though most of the experiential learnings were imitation of physical landscape, like building green belt and designing modern harbor bus stops along Lover's Road or planting flowers on the balconies of apartments and shrubs along hill slopes to increase urban green coverage, a greenery modern city look did take shape in just a few years. Similar dominance in land and economy over citizens by both Chinese and Singaporean governments was the premise for the fast

implementation of the greenery plan; in cities dominated by private ownership, similar actions may difficult to proceed or lead to social conflicts. In the 1992 “southern tour”, the paramount leader visited Zhuhai and affirmed that the landscape and built environment of the city resembled Singapore to a certain extent, greatly inspired local leadership.

With the completion of principal urban layout and emerging traffic, housing and employment problems after 2000, in-depth learning and communication were felt needed by municipal leaders who invited elite Singaporean planners to be consultants and run courses of eco-livable city to instruct local cadres. Knowledge inputs at this stage stressed on Asianization of eco-city planning ideas to deal with these urban problems. That is, residence, travel and public services shall balance dispersion and compactness, adapted to greater population size and family structure of Asian culture, so as to be compatible with the nature and open space. In particular, ideas of job-housing balance, social housing and circular economy in association with urban structure and operation beyond earlier reference of density control, landmark design and vertical greening became learning focus. To expertise from Singapore, addressing the aforementioned problems and achieving eco-city vision require a greater view to restructure Zhuhai for rebalancing unevenness between the developed, already centralized east, e.g., Xiangzhou, and the underdeveloped, distant west. The linchpin is to determine optimally balanced size for a city cluster, for which mass rail transit and high-density housing may greatly enlarge the volume. This is not a simple central city – new towns structure, but balanced city clusters each is compacted, penetrated with greenery in between.

Learning from Singapore has rapidly optimised the outlook and structure of Zhuhai. However, as sustained operation, not merely construction, of cities is increasingly in demand, learning has extended to Euro-America where green and low-carbon technology was much emphasized under global smart urbanism since the late 2000s. In Chinese bureaucratic system, Zhuhai pioneered in EC-Link programme, one of Sino-European low carbon eco-cities cooperative platforms initiated by MHURD in 2015. Officials in Zhuhai were sent to Europe for knowledge sharing of livable cities under this platform, e.g. the visit to Freiburg, Germany about energy saving and green architecture, and experts in Europe also returned visits to Zhuhai, enabling timely application of the technology they learnt.

Official media, businessmen, journalists, researchers, and developers have affirmed Zhuhai’s ecological livability, valued it as an eco-city model and attribute its success to (1) adherence to ecologically prioritized development ideas, (2) reliance on high-end industrial development, (3) high investment threshold to prevent polluting enterprises from entering, (4) controllable urban size and dispersed sub-urban clusters, and (5) an ecologically centered legislative system. The earned reputation enabled Zhuhai to capitalize on nature and ecology, promoting its pro-environment past (see 5.1) and policy experiences for other Chinese cities. China’s administrative operational system has bolstered the circulation of eco-Zhuhai’s experiences. One way is to press local leaders to be serious toward ecological governance by emphasizing green environment in cadre performance evaluation. Off-the-shelf experiences from Zhuhai help local cadres articulate the central state’s determination for ecological transition. In the multitude online news reports on official visits of delegations to Zhuhai, eco-civilization construction and environmental protection are highlighted and governance experiences were shared among local party–state cadres. Another way is to repost experiential cadres, often promotion, to other places so to precipitate the circulation of eco-governance knowledge. The city also got the chance to make it known to the world. As reported by China Daily, “elements of eco-Zhuhai” started to appear in Euro–American mass media, the British Daily Telegraph directly quoted viewpoints from Chinese mainstream media that the headway in ecological and scientific development was the primary reason for the popularity of Zhuhai. To what extent Zhuhai experiences can be incorporated into the global policy loop of ecological sustainability remain to be seen, it might be clear that the city and its nation would like to have a role and possibly to be influential on world stage.

4. Conclusion

This research engages policy mobility to explore path creation of eco-city in Zhuhai, China. It fills the knowledge gap of how an individual city has evolved and entitled eco-city in China at urban scale and supplements the understating towards the often neglected, slower growing west bank of the Pearl River estuary. The study also contributes to policy mobility literature by identifying two interlocked and nested forms: policy reformulation towards pro-environment and policy circulation of advanced eco-experiences in Zhuhai’s eco-city journey and contextualises the discussion in China’s peculiar political and power structure.

Story of eco-Zhuhai represents a microcosm of macro transition towards “ecological civilization” at urban scale in China. Although the macro transition, in many hyper-growth places, seems not enough to elicit establishment of a zero-waste, zero-carbon, self-sustained urban milieu in harmony with or harmless to nature, it explicitly conveys policy guideline from the central. To municipal elites, nature or green environment are what they can

capitalize on for local development. Learning experience from model cities, their sloganeering of eco-cities is for marketing purposes, that is, economic returns via ecology is often overemphasized but the costs, maintenance or reduction of depletion for cities to evolve sustainable may be greatly overlooked. But for those less developed or underdeveloped places, nature and ecology are invaluable assets and possible to anticipate a green ecological economy.

What distinguishes Zhuhai from other Chinese cities is the route of policy reformulation leadership's early cognition of the potential for environmentalism as an inherent heritage and advantage of the city. Zhuhai's geographical location and natural assets nurture a graceful environment, which is also a primary factor let Zhuhai be marginalized in the early round of Hong Kong's industrial transfer to PRD. The city can hardly breed manufacturing as a pillar industry without sustained investment and technological support from the powerhouse Hong Kong. A weak transportation linkage further impaired the early development opportunities in the competitive PRD. Lagging behind in early economic development overlapping the visible pollution in the PRD region have propelled municipal leaders choose a different path. Zhuhai's eco-city journey is a technical sustainability fix, a political framing, and an ideological discourse of the municipality's past, present, and future.

Mayor and Party Secretary Liang, who was in charge of Zhuhai for 14 years, believed that the environment is an honorable asset. Liang appeared as a "master" of the art of establishing good relationship (*guan xi*) with central leaders. Given that the "Interim Provision on the Tenure of Cadres of the Party and Government (2006) (Note 8)" was not an issue at that moment, the leadership in Zhuhai's early period was stable, which enabled a coherent environment-friendly policy ambience. However, this condition does not mean that Zhuhai is an exception that is immune to the growth-first ideology. Indeed, due to growing competition pressures from peer cities – Zhuhai once compromised to develop petrochemicals industries in its periphery areas to chase for growth. Its unsatisfactory economic performance has made policy makers determined in environmental protection.

The study also reals how China's administrative system effectuates policy circulation in Zhuhai's path towards eco-city: environmental policy trickles down from central to local under the vertical command system and advanced eco-practices are inter-referred among institutions at similar levels horizontally. The (re)production of policy knowledge is also realized through cadre transfer, delegation (re)visits, and media/academic publications. Nevertheless, it should be noted that vertical relation among different levels of government has dominated China's administrative system wherein horizontal relation has been relatively weak (Qian and Xu, 1993), this consolidated the trickling down of policy knowledge from upper-level to lower-level governments as indicated in Zhuhai. Such vertical-dominated reality is reasonable because appointment, promotion, and dismissal of Chinese officials are controlled by superior cadres (Lu and de Jong, 2019), and so municipal policy learning has the motive to cater guideline from upper-level government. This exemplifies, for instance, in the selection of Singapore for initial learning. Singaporean model is reputed for guaranteeing state control and perpetuation of single-party regime over its economic miracles, which satisfied the political ends of CCP leaders. As a city-state, its various practices, whatever political or nonpolitical, are acceptable for both central and local. For the leadership of Zhuhai, learning from Singapore to build a sustainable eco-city is not only technically feasible but also politically safe, especially in early period of reform. Similarly, municipal policy diffusion adapts to and benefits from the cadre appointment system. For instance, reposting of mayor in Zhuhai to be Party Secretary in Zhanjiang in 2017 has directly facilitated policy interreference and benefitted Zhanjiang in eco-city development. As superior leadership, particularly the national leadership, is extremely influential, municipal policy boosterism also satisfies the discourse paradigm of its superior, and seeks appraisal from higher ups to enhance promotion effects. This was illustrated by Deng and Xi's appraisal, which greatly improved exposure of Zhuhai in official mainstream media and elevated its reputation among prefecture-level cities. Nevertheless, given the multi-level nature of the bureaucratic system and the unleashed power of local government since decentralisation, flexibility and opportunities for horizontal linkage between governments have emerged and is likely to facilitate the formation of inter-referencing network of policy knowledge. This can be indicated by recent discernible bottom-up, self-reflective stance of local government and the inter-city policy references in PRD. Searching development path under accurate positioning that conforms to self-distinguishing features may matter more in the future.

Abbreviation

Chinese Academy of Social Sciences (CASS)

China Social Science Press (CSSP)

Social Sciences Academic Press (SSAP)

China Center for International Exchanges (CCIEE)

Office of the National Patriotic Health Campaign Committee (NPHCC)
National Health Commission (NHC)
Ministry of Housing and Urban-Rural Development (MHURD)
Ministry of Environmental Protection (MEP)
National Development and Reform Commission (NDRC)
National Forestry Administration (NFA)

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Notes

1. Detailed planning includes regulatory detailed planning and site detailed planning [Urban and Rural Planning Law of the People's Republic of China, Order of the President of the People's Republic of China (No.74)].
2. An interview with a Zhuhai local official from Zhuhai Bureau of Natural Resources, 2018
3. Shenzhen's GDP was 270 million RMB while Zhuhai's was 261 million RMB in 1980.
4. Telephone interview with Zhuhai local official from Zhuhai Bureau of Natural Resources, 2019
5. Only six cities were conferred in the first-round in 1997, based on evaluation of air and water quality, rate of green coverage, industrial solid waste treatment and sewage treatment etc. According to the report
6. Data accessed from Zhuhai Municipal Archives Bureau in January, 2019.
7. Interview with local officials, supplemented with Nanfang Daily report: How can Zhuhai's eco-civilization sustain?
8. The tenure of leading members in the local party and government is 5 years, and the same cadre can hold the same position for less than two sessions.

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