ISLAND DYNAMICS

Island Smart Eco-Cities: Innovation, Secessionary Enclaves, and the Selling of Sustainability

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Abstract: Governments and developers around the globe are exploiting the benefits of island spatiality to sell urban sustainability. Many new-build smart cities, eco-cities, and sustainable cities ('smart eco-cities') are constructed on small islands or otherwise bounded from surrounding urban space. Island spatiality presents benefits for selling smart eco-cities as role models of sustainable innovation: ease of creating value, ease of measuring sustainability, and ease of communicating success. These benefits, however, are all largely illusory, contributing primarily to the appearance of sustainability for the sake of economic profit. The great innovation of island smart-cities is frequently an innovation in the selling of sustainability. By monetising the environment through ecosystem services, incentivising largely symbolic 'green' projects and architecture, drawing attention away from unsustainable practices elsewhere, and exacerbating social inequality, island smart eco-cities may be making the world *less* sustainable. They may also be unreproducible by design and lead to a global devaluing of genuinely sustainable but non-iconic urban development. Island smart eco-cities increasingly serve as secessionary enclaves for a global elite, privileging corporate over public interests and spearheading an invidious argument of sustainable development by deregulation.

Keywords: Eco-cities, innovation, island cities, smart cities, smart eco-cities, secessionary enclaves, sustainable cities

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1. Introduction

Islands have long been produced as scenes for mainland dreams and nightmares (Gillis, 2007), used to set continental problems, tensions, and paradisiacal visions in relief. Even notwithstanding the fact that some islands contain endemic species, unique ecosystems, and distinctive cultures, the tendency to regard islands as (potentially vulnerable) paradises and utopias makes them particularly well-suited for ecotourism initiatives and 'green' branding (see for instance Grydehøj & Kelman, 2016; d'Hauteserre & Funck, 2016; Bragagnolo *et al.*, 2016; Baldacchino & Kelman, 2014; Moyle & Evans, 2008).

This paper explores another aspect of the green branding of islands: the development of new or pre-existing islands into 'smart eco-cities' with an eco-ethos and eco-branding. In this paper, we consciously use 'smart eco-city' – a deliberate concatenation of buzz-terms used equally in academic and journalistic writing – as an umbrella term. This term has been used, for example, in the title of a major UK Economic & Social Research Council project (Smart Eco Cities, 2016); by property developers (Leptos, n.d.; Forest City, n.d.); by planners and designers, both large and small (McClean, 2014; We Thinq, 2014); and by industry bodies (SmartEcocity, 2016; US-China Green Energy Council, 2012).

Although important differentiations can be made between categories such as 'smart cities', 'eco-cities', 'sustainable cities', and 'resilient cities', there are also significant conceptual overlaps (de Jong *et al.*, 2015). Places that we label 'smart eco-cities' in this paper are not necessarily called 'smart eco-cities' by their designers or promoters, and we do not pass judgment on their actual sustainability. By labelling a place as a 'smart eco-city', we are simply designating that its designers or promoters have applied to the place one of the numerous partial analogues to the 'smart eco-city' label.

Most smart eco-cities – like most cities in general – are located on what are often termed or assumed to be mainland locations. As Joss *et al.* (2013) note, many 'eco-city' initiatives are retrofits or renovations of existing urban areas or of entire cities. The present paper, however, focuses its attention on smart eco-city new-build or retrofit initiatives located in small island or presqu'île (almost-island; see Hayward, 2016) spaces.

We take this island focus because many of the places that are most visibly and heavily marketed as smart eco-cities are based in island spaces, with examples including the new-build smart eco-cities of Dongtan/Chongming and Caofeidian Eco-City (China), Forest City (Malaysia), Västra Hamnen (Sweden), Saadiyat Island (Abu Dhabi), Songdo International Business District (South Korea), Eko Atlantic (Nigeria), and Ørestad (Denmark). That is, just as cities seem to be at their most city-like when based on small islands (Grydehøj, 2015a), smart-eco cities seem to be at their most visibly sustainable when based on small islands. Due to their spatial benefits, small islands are becoming the focus of powerful efforts to envision new forms of urban sustainability. Our arguments regarding islanded smart eco-cities cannot necessarily be directly extended to initiatives pursuing smart eco-cities in non-island spaces. Instead, we focus directly on initiatives that are physically or

conceptually bounded or islanded, leaving open the question of the transferability or non-transferability of our conclusions to mainland spaces.

In the face of mounting concerns regarding climate change and other environmental challenges as well as growing social inequality in many regions of the world, national governments such as China (Sze, 2015: 38) and India (Ministry of Urban Development, 2015), not to mention organisations such as the World Bank (Moffatt et al., 2012), are supporting smart eco-cities as a matter of policy. Yet there are reasons to doubt whether smart eco-cities on islands genuinely contribute to global sustainability – or whether they instead further feed unsustainable processes.

This paper proposes that by monetising the environment, incentivising largely symbolic 'green' projects and architecture, drawing attention away from unsustainable practices elsewhere, and exacerbating social inequality, islanded smart eco-cities may in fact be making the world *less* sustainable. These issues have been explored for many other large-scale environmental policy and practice initiatives showing how, for instance, payment for ecosystem services (Reid, 2013), carbon offsetting (Richards & Andersson, 2001), and the Clean Development Mechanism (Lokey, 2009) might have done more harm than good for sustainability. No work has yet explored 'smart eco-' or 'sustainable' cities on small islands.

This paper proceeds by introducing the concept of the smart eco-city, then discusses the appeal of island spatiality. The next section explores how island spatiality allows smart eco-cities to assume ambiguous relationships with their hinterlands, facilitating the creation and localisation of environmental goods as well as the externalisation of negative environmental conditions. This is followed by discussions of smart eco-cities as icons of (largely symbolic) sustainability and as secessionary enclaves. Finally, conclusions provide recommendations for rescaling smart eco-city ambitions.

2. Utopian urbanism: Eco-cities, smart cities, and smart eco-cities

Utopian visions of self-sufficient and philosophically balanced cities have a long history, from the planned cities of ancient times to the idealised island cities of Medieval and Renaissance Europe to Howard's Garden City to 20th Century techno-cities (Pigou-Dennis & Grydehøj, 2014; Kargon & Molella, 2008).

According to the definition arrived at by *Ecocity Builders* (2014), the brainchild of influential utopian urbanist Richard Register: "An ecocity is a human settlement modeled on the self sustaining resilient structure and function of natural ecosystems. […] Its inhabitants' ecological impact reflect [*sic*] planetary supportive lifestyles; its social order reflects fundamental principles of fairness, justice and reasonable equity." This is an idealistic striving toward future cities that are not only dense (thereby claiming to avoid environmentally damaging sprawl) but that also intermesh with a particular collectivist political philosophy (Register, 2006). Although present-day city-builders do not always adopt the politics of Register's imagined future, eco-city initiatives have become mainstream and fashionable at various levels of government in many regions of the world (Joss *et al.*, 2013: 54).

The smart city concept has followed a similar trajectory to that of the eco-city. Machine Age technological utopianism has been replaced by the dream of the networked, digital city, dovetailing with the futuristic bent of the eco-city concept. Indeed, Rapoport (2014: 140) stresses that "ecological modernization promises that technological and procedural innovation can solve urban environmental problems," with the result that "many contemporary eco-cities rely heavily on technology as a means for achieving their sustainability objectives." Similarly, the comparative analysis of eco-city initiatives by Joss *et al.* (2013: 67) reveals the envisioning "of the eco-city as advanced socio-technical system, consisting of an array of renewable energy and other 'green' technologies and supported by digital information technologies." Of the 178 eco-city initiatives they studied, 111 focused primarily on technological innovation, to such an extent that "the modern eco-city is designed not just to function as efficient high-tech system, but also as incubator and hub for the next generation of research and high-tech industries." Such discourse fits perfectly into the view of islands, in fiction and in science, as bounded laboratories or 'novelty sites' in which innovation occurs (Baldacchino, 2007b).

For all of the emphasis placed on technology in the eco-city, Yigitcanlar and Lee (2014) note a certain nomenclatural fluidity: Distinctions between the designations "carbon-neutral, low-carbon, smart-eco, sustainable, ubiquitous-eco, zero-carbon and so on" can be difficult to determine, with individual cities changing or appending new qualities to their labels as branding strategies shift and international tastes develop. Some actors, seeking to avoid placing themselves at the mercy of nomenclatural fortune, hedge their bets by positioning themselves as both 'smart cities' and 'eco cities' simultaneously. For example, Grid Solutions (2015), a partnership between GE and Alstom, seeks clients with the tech-heavy declaration that:

> A Smart City or Eco City is a new concept of transversal optimisation to deliver energy, water, transportation, public health and safety, and other key services to empower cities to better run and control critical infrastructure operations while providing a clean, economic and safe environment to the people.

Behind the plethora of precise designations for the smart eco-city lies a shared understanding of an "ecologically healthy city using advanced technologies and having economically productive and ecologically efficient industries, a systematically responsible and socially harmonious culture, and a physically aesthetic and functionally vivid landscape" (Yigitcanlar & Lee, 2014: 100). For the sake of convenience, we shall hereafter refer to planned or existing cities as 'smart eco-cities'. As Alusi *et al.* (2011) point out, the concept of the eco-city remains in any case "loosely defined."

From Register's (2006) imagined cities to those of today's design studios, involving models of energy and material inputs and outputs that can be toggled – and observed – in real-time (Shahrokni *et al.*, 2015), visions of social and ecological urban utopia have tended to privilege architecturally spectacular solutions in verticality, resulting in a particular aesthetics of green urban living. There is a reciprocal relationship between the cities of science fiction and the cities that people build (Hewitt & Graham, 2015). This is perhaps especially the case for smart eco-cities, which often mark their self-conscious futurism by indulging in a recognisable SciFi aesthetic. For example, Joss and Molella (2013:129-130) remark of the designs and marketing for Caofeidian Eco-City in Hebei Province, China:

> Its general architectural impression is unmistakably European modern, with a hint of the post-modern, such as one would see in many contemporary western metropolises.

> In some ways, with its forward thrust, the overall picture is reminiscent of the sort of futuristic, science-fiction-inspired cityscapes that have been imagined in Western Europe and the United States since as far back as the 1930s. In a sense, it is a case of going "back to the future."

For Caofeidian Eco-City, however, the future never arrived: The site is today a monumental "ghost town" (Sabrie, 2014).

The eco-city aesthetics of decades past have proved influential in mainstream architecture – specifically in megaproject architecture, for utopian dream buildings do not come cheap. As we shall see, smart eco-cities' reliance on spectacular – and spectacularly expensive – architecture is not merely incidental but is invidiously intertwined with these cities' roles as exclusive, technology-based enclaves for a global elite (Easterling, 2014). It is telling that such smart eco-city spectacular verticality extends in one direction, upwards, without considering the advantages and disadvantages of extending downwards as well. This is in contrast to the rather more pragmatic, non-utopian, and less visually spectacular subterranean solutions for extreme urban density being pioneered in island cities such as Hong Kong and Singapore (e.g. Zhou & Zhao, 2016).

Before moving on to a consideration of smart eco-cities on small islands, we briefly introduce why small island spatiality is particularly amenable to experimental projects such as smart eco-cities.

3. The attraction of bounded island space

Borders and defined spaces stereotypically characterise islands. The land-sea interface is frequently assumed or expected to be delineated and immutable. Crossing the sea can be adventurous and a transition, especially when coming to or from a highly limited land space – namely an island. Islands evince an illusory knowability (Royle, 2014: 155), their boundedness and clear borders fostering easy conceptualisation.

No matter how small the island or the archipelago, we are driven to regard it as a distinct entity, separated from other distinct entities by the water discouraging passage. The perception of island boundedness is crucial to our comprehension of other aspects of island spatiality (*cf.* Fernandes & Pinho, 2016): The alleged smallness and isolation of an island are envisioned with reference to the island's internal coherence, its ostensibly clear beginning(s) and end(s). All else being equal, Greenland – a massive island – is 'imageable' (Lynch, 1960) in a way that similarly sized mainland territories such as Saudi Arabia and Algeria are not. By the same token, the Holy Island of Lindisfarne off the coast of Northeast England can absorb immeasurably more symbolic and emotional meaning than could a similarly sized mainland heritage site. Lindisfarne's island status infuses it with meaning, allows it to comprehensively occupy its own space, however artificially that space has been created by the imagination: We presume to know not only where the island ends but also where the mainland fails to extend.

Boundedness is a characteristic of both densely and lightly populated islands, of island centres and island peripheries. Bridges, tunnels, causeways, cheap flights, ferries, and catamarans may decrease an island's isolation in terms of transport, but they do not necessarily decrease its islandness, its conceptual boundedness and difference (Baldacchino, 2007a; Grydehøj *et al.*, 2015). Venice's spatial comprehensibility is not lessened by its causeway to mainland

Italy or the trains that pass over it. Urban centres of island cities as diverse as Hong Kong, Manhattan, and Mombasa are thus often represented and mapped as spatially distinct from their adjacent mainlands. Even central Copenhagen – which has long since been physically de-islanded as its walls have been breached, its moats bridged, and its shorelines expanded – continues to be cartographically represented as an island or almost-island space.

"Like the past," Lowenthal says (2007: 210), "the island seems laid out for our inspection; we are encouraged to feel we can know all about it." Yet our knowledge of the island is not the same as the island itself. The restrictions of island spatiality are alluring (Baldacchino, 2012), but they may seduce us into symbolism and essentialism rather than into deeper knowledge of the island. What begins in the imagination can extend to the material world: Island spatiality – bounded, conceivable, knowable – both appeals to the fantasies of on- and off-island power holders and makes islands especially susceptible to political, economic, and social manipulation (Baldacchino, 2010). This is not, however, to idealise the notion of 'island': While accepting that humans seek out definition, deliberating in and about spatial circumscription and enclosure, both 'island' and 'islandness' have been deconstructed, critiqued, and expanded upon within the literature (e.g. Carroll, 1989; Hayward, 2012; Grydehøj et al., 2015; Pugh, 2016).

Boundedness and illusory comprehensibility makes islands useful spaces for cultural, political, and economic engineering as well as environmental manipulation. Islands have long been regarded as ideal sites for experimentation, in fiction and in reality, with their straightforward boundedness presumed to provide unambiguous limits to scope, ambition, and (if all goes wrong) contagion. It is thus that Iran maintains Kish Island as an experimental zone for economic and social liberalism, that China has favoured island locations for its special economic zones (not just the former colonies of Hong Kong and Macau but also Xiamen, Hainan, and Zhuhai), and that Denmark has accommodated the countercultural enclave of Freetown Christiania as a presqu'île on a small island in Copenhagen. Meanwhile, we enjoy the island icons of experimentation and exclusion in *The Island of Doctor Moreau*, *Brave New World*, and *Lord of the Flies* among many others, appealing to our innate sense of what islands should be used for. Limited spatial extent and population numbers are idealised to make results more easily implementable, achievable, and testable in fiction and in fact. These observations from island studies complement those of innovation and transition studies, which often emphasise the importance of the 'niche', providing a protective function "because path-breaking innovations fail to successfully compete within selection environments embedded in incumbent socio-technical regimes" (Smith & Raven, 2012: 1025).

There has been a lack of recognition, however, of how islandness also renders the results of policy experiments more communicable. In fact, some of what we may regard as results of exceptional island manageability may in part be results of exceptional island imageability. For example, a mainland community of 1000 people may be just as easy to transition to full renewable energy use as would be an island community of 1000 people, but it is much easier to *envision* 100% renewable status in a small island community simply because we know – or we construct – where this community begins and ends. It is physically bounded and thus quantifiable.

Consequently, there has been a proliferation of more-or-less remote and peripheral small island communities engaging in 'eco-island' branding, seeking competitive advantage (positive

place brand, advantages in attracting tourists, enhanced diplomatic power) by casting themselves as 'green' islands (Grydehøj & Kelman, 2016). The tendency for cities to be regarded as inimical to islands (Grydehøj, 2014a) means that the islandness of many high-profile urban sustainability initiatives has been overlooked. As we argue here, the location of many smart eco-cities on small islands is not merely incidental but is key to the effectiveness of these initiatives.

4. Islands within, outside of, and without the city

Utopia requires borders (Royle, 2014: 92). It is thus interesting that Caprotti (2014: 1286) identifies a self-reflexive aspect of smart eco-city boundedness:

> The focus on cities as experimental locations in which to trial new technologies, architectures, and environmental-economic reforms is in large part linked to a quasi-utopian approach to the city as laboratory, as an empty and bounded container. This approach renders the physical environment of the city as a single site of intervention, and conceptualises the urban as a vessel of constrained socio-economic, environmental, and technological relations. When viewed as an experiment, the city can thus be reduced to a tabula rasa on which new technologies, transitional strategies, and other approaches can be tried and tested, and subsequently rolled out across wider scales.

Sustainability experiments may be easier to carry out in bounded cities, but the challenges of environmental sustainability – such as ecosystem destruction and human-induced environmental changes, including river engineering, climate change, and pollution – require multi-scalar, integrated solutions rather than isolated, piecemeal approaches. Our analysis of islanded smart eco-cities casts doubt upon the extent to which they can successfully serve as niches for fostering and ultimately disseminating innovation.

The smart eco-city trend has been facilitated by an increasing monetisation and capitalisation of the environment, by a push to create exchange value from objects that had previously not even been assigned use value. This is the case with the emergence of 'ecosystem services', tradable environmental processes, goods, and spaces ranging from a clean atmosphere to habitat protection to sustainable family sizes. Partitioning is prevalent, such as Colorado law separating the right to purchase a piece of land from the right to use surface water flowing through that piece of land. Ecosystem services can be conceived of in a positive light, and indeed in remote island communities with no adjacent hinterlands, the downsides to an internal ecosystems services approach may be minimal (e.g. Polman *et al.*, 2016). This approach may be more problematic for islands seeking to exchange ecosystems services with the mainland.

According to Robertson (2012: 396), "Ecosystem services, like all resources, can be defined as fungible commodities only through a process of assessment, measurement and negotiation between capitalists, scientists and regulators concerning value." Yet a locally oriented ecosystem services approach does not always complement a global sustainability perspective. Researchers concerned with global sustainability have increasingly argued that density – a characteristic of more traditional kinds of island cities (Grydehøj, 2015a) – is itself environmentally valuable: Assuming that a given number of people must live somewhere, it is better in terms of minimising greenhouse gas emissions, preserving habitats, and limiting *per capita* material consumption that people live in densely populated cities (Tonkiss, 2013: 37-39). A similar environment-oriented thinking underlies Register's (2006) eco-city dreams. This environmental calculus does not always consider the social consequences (good and bad) or the fact that, at

present, even hyper-dense cities produce oversized ecological footprints, but it does challenge the at-times superficial conflation of rural idylls with sites of exceptional sustainability.

This valourisation of density is not, however, particularly helpful for those seeking to capitalise ecosystem services in a particular place or seeking to use smart eco-city projects as tools for municipal, regional, or national boosterism. The environmental credits and debits produced through urban density or sprawl are added and subtracted elsewhere: A dense city may preserve forested land outside the city while a sprawling city may increase levels of pollutants far outside its own borders, on the other side of the world (e.g. Downie & Fenge, 2003). If the 'natural environment' is valued, a dense city is not merely sacrificing potential competitive advantage but is actively donating it to other locations, a strategy that will always be a hard sell to local policymakers. It is thus necessary for smart eco-city developers to find means of creating measurable value out of environmental goods that can be added to the city's own account.

Clear island borders can artificially encapsulate green space within the conceptualisation of the city: For instance, the much-promoted but little-achieved Dongtan Eco-City on Chongming Island sought to enhance nearby Shanghai's sustainable credentials by integrating into the city's scope that which had previously been regarded as wild nature. As Sze (2015: 65) notes, "The features that made Chongming Island historically 'backward' – its natural and rural character, open space, underdevelopment, and lack of industry – are now [...] the source of its natural capital." As we shall see with the case of Saadiyat Island below, ecological goods are perversely created through the construction of city-nature juxtapositions. Although the natural environment would possibly best thrive by remaining (relatively) unurbanised, the environment can only be capitalised if it is drawn into urban processes. It is easiest to make the environment a distinct – and distinctly visible – part of the city when it is located on an island. The island status of urban nature preserves and parklands such as Chongming, New York City's Randalls and Wards Islands, and Singapore's Pulau Ubin grant them an outsized role in the vision of the city (Grydehøj, 2014b).

Chang and Shepphard (2013: 67-68) recognise the role that islandness *per se* plays in constructing smart eco-cities, noting that "as a development on a relatively isolated island, Dongtan/Chongming would seem to fit with western thinking about eco-cities as self-sufficient and sustainable" and indeed that local stakeholders and policymakers recognise the symbolic importance of "Chongming's island geography." The project's success rested on reinforcing the mental borders around the island. Sze (2015: 17) argues that "taken collectively, these projects are literally attempts to build an 'anti-Shanghai,' a space that will somehow be both rural and urban, Chinese and cosmopolitan, natural and artificial." Dongtan could only be a smart eco-city relative to Shanghai; otherwise, it would be either an unvalued, provincial backwater or a speck of green space in a polluted, all-consuming megacity.

This tendency for islanded smart eco-cities to encapsulate nature areas as a means of downscaling environmental value has an insidious side effect: It devalues the apparent environmentally protective function of traditional dense urbanism. Held to the stated standards of Dongtan (a city of 500,000 people located in a pristine wetland environment), even the densest of cities with the smallest of ecological footprints that does not encapsulate a natural area could not help but fail the sustainable urbanism test.

The designers, planners, and engineers of smart eco-cities sometimes harness island spatiality as a means of enhancing the measurability of environmental goods. Measures of energy consumption, greenhouse gas emissions, and water usage as well as of clean energy production, carbon capture, and ecosystem preservation are easier to both delineate and manipulate within bounded island spaces. Even though Dongtan – like so many promoted smart eco-cities – was never actually built, Dongtan's "planning principles are circulated as eco-city 'best practices'" (Chang & Shepphard, 2013: 59), continuing to contaminate sustainable urbanism expectations from beyond the policy grave. Furthermore, the tendency for developers of smart eco-cities to apply an "elaborate eco-city indicator [...] can be understood as an attempt to define 'scientifically' what makes an eco-city, to specify quantifiable benchmarks to support rapid development and, in turn, to compete" internationally with the raft of emerging smart eco-cities (Joss & Mollela, 2013: 126). Sustainability benchmarks are established to fit specific smart eco-city island spatialities and are then marketed as (potentially unrealisable) global ideals.

Islands provide clear boundaries and thus limits to an initiative's scope. Whereas it is difficult to know where to draw the lines around a mainland smart eco-city initiative, the physical limits to island cities allow them to be unambiguously and comprehensively 'greened'. Clear boundaries likewise make it more defensible to ignore potentially complicating, polluting, or otherwise mitigating activities taking place outside of the smart eco-city.

In a mainland city, the exclusion of suburbs, industrial areas, airports, ports, and other green-confounding features might be regarded as a deceptive attempt to limit the sustainability accounting to a particularly manageable area. Thus, for example, although Toronto's main international airport sits outside the city boundaries, it is inevitably included in analyses of the city's urban green tourism (Gibson et al., 2003). In contrast, the straightforwardness of water borders makes it superficially defensible to measure sustainability within a limited land area. The Maldives' marketing of itself as an eco-tourism destination notably neglects to consider air and shipping emissions in its carbon calculations (Baldacchino & Kelman, 2014). These analyses are artificial constructs that deliberately create boundaries. For instance, Toronto's cargo port (a presqu'île) is rarely considered in calculations of the city's greenness. Islandness is used to artificially construct boundaries for determining eco-credentials and is rarely called out for doing so.

Abu Dhabi's Saadiyat Island project seeks to create "an environmentally sensitive tourist destination that includes, as its centrepiece, an international cultural district":

> A major aim of the Saadiyat Island plan is to protect ecological niches for endangered species of the Arabian Gulf, while at the same time the ideal location shall be exploited for maritime research. Therefore, strict guidelines have been developed to keep hotels and public beaches in considerable distance from nesting grounds, natural dunes and mangroves which flank the shoreline. Raised walkways will allow visitors to enjoy the ecological protected areas (Abu Dhabi Government, 2016).

The plan for Saadiyat Island emphasises the importance of urbanisation for attributing value to surrounding wetlands (*cf*. Royle, 2014: 154), a plan that is complicated by the fact that the entire island – its nesting grounds, lagoons, resort areas, museum districts – are constructed on reclaimed (i.e. artificial and manufactured) land built from dredged sand.

Abu Dhabi uses Saadiyat's separation from the archipelago's main island to set it up as a closed system: The dense development and industrial functions across the water do not infect the small island's own sustainable credentials, despite the flows of goods and people. The designation of specific sustainable island zones does more than just keep uncontrolled development from invading nature areas; it also keeps demands for nature areas from invading the city proper. Even the design of Masdar City (Figure 1), a smart eco-city free trade zone planned on the Abu Dhabi mainland, involves the territory being virtually islanded by means of a perimeter wall, the primary purpose of which seems to be to support claims of carbon neutrality and other measures of sustainability within Masdar City by cutting it off from the adjacent Abu Dhabi International Airport and other non-'green' urban areas.

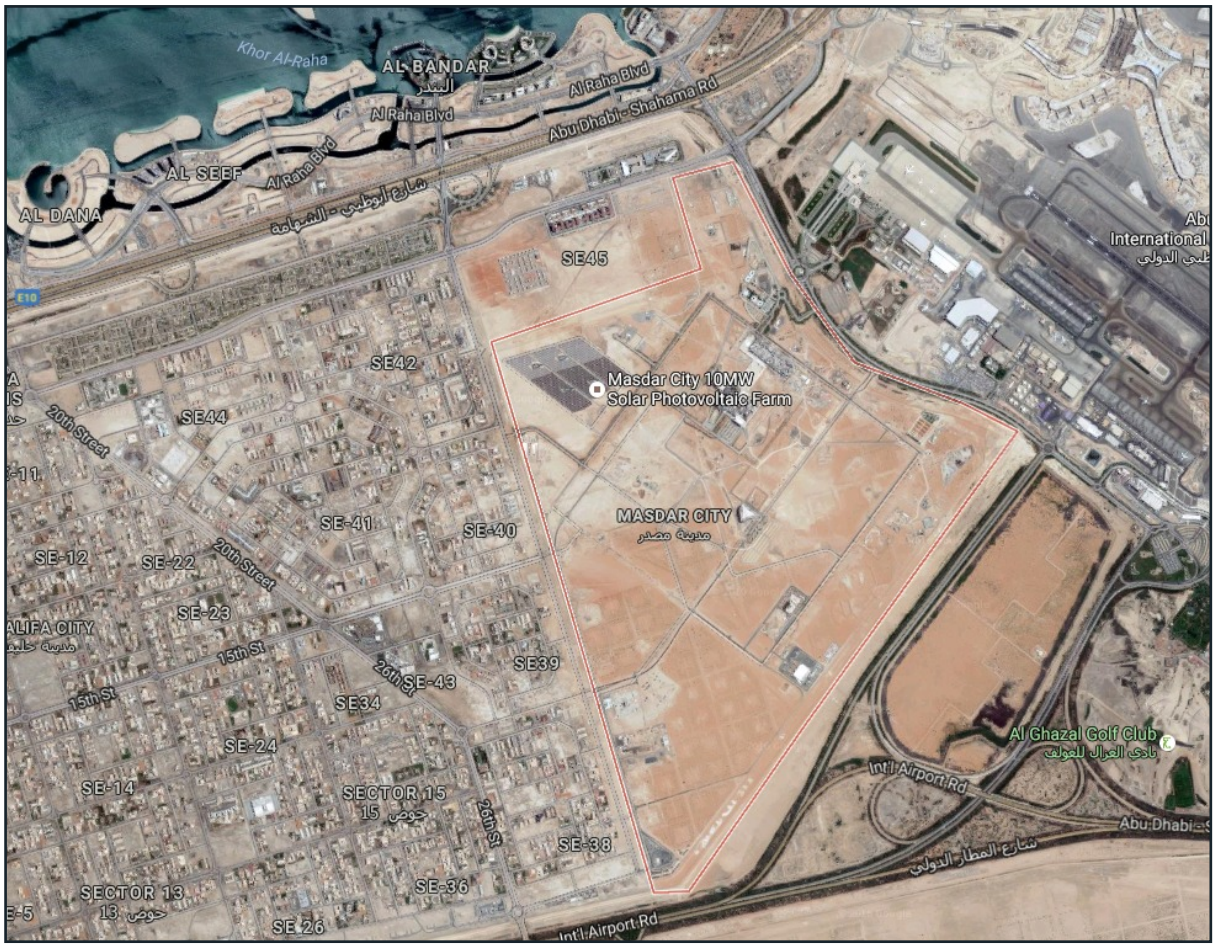

Figure 1: The undeveloped void of Masdar City, Abu Dhabi, walled off from surrounding industrial areas. Source: Imagery - Digital Globe (2016), Map data - Google (2016).

The reputational benefits of such exclusions of industry are made clear in the marketing of the insular Västra Hamnen district in the archipelagic city of Malmö:

> Is Malmö and sustainability for real? Yes. When industry left Malmö to its fate the city started building for the future at Western Harbour, or Västra Hamnen in Swedish. This former heavily polluted industrial area has been regenerated into an attractive residential and business district that runs on 100% local and renewable energy, has low energy housing and buildings and living green roofs (VisitSweden, n.d.).

In this narrative, the city has coped with the retreat of heavy industry through spatially focused renewable energy initiatives and cutting-edge architecture. The city seeks to build its ecotourism industry, drawing visitors who wish to behold its "sustainable attractions" (VisitSweden, n.d.). Far from being triumphs of sustainable development policy, islanded smart eco-cities frequently represent monuments to restricted ambition. Although smart eco-cities are often branded as role models for future sustainable development, the prevalence of smart eco-cities on islands suggests recognition of their limited scalability. When analysing Caofeidian Eco-City, an envisioned green island enclave in one of the world's most heavily industrialised regions, Joss and Molella (2013: 123) note:

> There seems to be a disconnect between the eco-city – as a separate 'environmental space' – and its hinterland, with contradictory approaches to sustainable development [...]: while Caofeidian Eco-City may in itself achieve a relatively low carbon footprint and act as a model of sustainable urban living once completed, its significance as part of the wider regional development may end up being quite limited.

Localised self-sufficiency does not necessarily contribute significantly to global or regional sustainability. By islanding a smart eco-city, planners simultaneously create a distinct zone for high-value investment and disclaim responsibility for extending sustainable urbanism out into the city's hinterlands. Drawing upon the island metaphor, Gandy (2015: 152) comments that "even the most elaborate applications of ecological urbanism remain essentially islands within the wider dynamics of capitalist urbanization." This a failure of the expectation that protective niches will not only sustain local innovation but also help such innovation spread. Indeed, it may be suspected that some such niches are unreproducible by design.

The efforts to isolate islanded smart eco-cities from their surroundings or conceptually link them to existing cities in a highly controlled manner is evident in the absence of linked-up approaches to smart eco-city development. Thus, for example, in China, where national policy has encouraged sustainable development (Sze, 2015: 38), numerous state authorities in a single area may pursue unconnected and uncoordinated smart eco-city initiatives, each with their own measures of success (Joss & Molella, 2013: 119). The islanding of a smart eco-city through walls or water borders allows it to adopt a deliberately ambiguous relationship to its hinterlands. It is conceptualised simultaneously as an eco-zone, which is greened through its contrast to the surrounding urban environment, and as an ecological good that provides value to its wider city. Urban authorities are often playing both sides.

5. Smart eco-cities as icons of sustainability

We have seen that island spatiality is conducive to creating value, measuring success (at least quantitatively by creating bounds for the calculations), and communicating success with regard to smart eco-cities. We have also had reason to question the extent to which islanded smart eco-cities genuinely contribute to wider sustainability. Indeed, there is a risk that such initiatives may hinder the movement toward global-scale sustainability.

The advance of smart eco-cities takes place in a global context of heightened concerns regarding environmental impacts of development. Nevertheless, as Gibbs *et al.* (2013: 2151) note:

> At the same time as governments, planners, environmentalists and private interests are actively calling for these new ['sustainable'] urban development imaginaries [...] a discourse of market triumphalism has been continuing to sweep its way through different

> spatial scales of government. States – local, regional and national – seem to be rolling back their own authority and rolling out market-based approaches to urban development.

Urban sustainability is deployed as an argument for special zones in which sustainability discourse can be aligned with economic growth. Paradoxically and invidiously, this often becomes an argument in favour of sustainable development by deregulation. This is in part because islanded smart eco-cities frequently coincide with and share rationales with special economic zones, forming part of a global 'infrastructure space' (Easterling, 2014) through which capital and elites can flow freely. In the words of Caprotti (2014: 1290), smart eco-cities:

> often serve the function of highly visible symbolic "anchors" for wider spatial economic and political networks aimed at bringing about particular, often neoliberal and potentially inequitable visions of socio-technical transition. In particular, there has been a recent trend towards placing new-build eco-cities at the centre of highly specialised special economic zones (SEZs) where new transition economies can be trialled and, if successful, rolled out on a wider scale.

One spectacular example is South Korea's Songdo International Business District, which brands itself as "a $35 billion smart and sustainable city that is setting new benchmarks for urban development" (Songdo IDB, 2015). Songdo hosts the offices of organisations working toward social and environmental sustainability such as the Green Climate Fund, World Bank Korea, the Green Growth Institute, and the United Nations Office for Sustainable Development. It seeks to be a global role model for green living. Yet the city is part of a free trade zone and has been constructed on a reclaimed island atop a sensitive tidal flat ecosystem (Moores, 2014). Another example is Forest City (Figure 2), a new-build smart eco-city sponsored by the Malaysian government and constructed on reclaimed islands offshore from Johor. Forest City (2016), billed as a 'smart eco-city' and a 'sustainable smart city', is intended to function as a duty-free environment for high-value companies and consumers in the vicinity of Singapore.

Figure 2: One of the islands of Forest City, Malaysia during the construction process. Forest City's marketing slogan is 'The Role Model of a Sustainable Smart City Well ahead of Its Time'. Source: Imagery - CNES / Astrium (2016), Map data - Google (2016).

Islanded smart eco-cities not only lead by example but also draw attention away from their not-so-green hinterlands and internal contradictions. They tend to be built on reclaimed land (such as islands constructed in the sea or on brownfield land) because this helps distinguish them from surrounding landscapes of impoverished migrant labour, heavy industry, and rampant urbanisation (Caprotti, 2014: 1294). Building on reclaimed land also helps developers avoid community claims to public space (Grydehøj, 2015b). In the case of a smart eco-city special economic zone or other such exceptional regulatory space, green branding diverts attention from the ascendency of a global corporate elite and the city's drive toward deregulation (and frequently, de-democratisation) to facilitate this new economic, social, and political order (Easterling, 2014).

This represents another aspect of the use of geographical distinction to heighten a smart eco-city's imageability. The self-consciously islanded smart-eco city serves as a closed circuit of environmentalism, futurism, and economic justice. As long as the outside world is cut out from the equation, the smart eco-city can be assessed on its own terms and function as a marketable icon of sustainability. Although the responsible government bodies may indeed regard such iconic projects as contributing to global sustainability, the implicit or explicit added value that such projects offer to urban place brands through their purported ability to serve as role models of sustainability results in a confusion of motivations and may give undue credit to otherwise-unsustainable cities.

Furthermore, smart eco-cities' direct environmental benefits may be outweighed by the disadvantages of their monetisation of the environment. Environmental role-model projects may be of significant economic value but of questionable environmental and social value. Role models (inasmuch as they are successful) encourage their own reproduction elsewhere: that is, the creation of other eco-icons of limited environmental value (Grydehøj & Kelman, 2016). They also lead to a global *devaluing* of urban development processes that contribute to sustainability but are not designed with iconic or symbolic properties in mind. Thus, for example, we find that the genuine provision of a city with renewable energy may be less attractive to municipal authorities than the symbolic provision of a city with renewable energy through a highly visible, artistic, or communicable (and typically more expensive) process.

One example is the solar-power generating 'supertrees' and overall "principles of environmental sustainability" enshrined in Singapore's Gardens by the Bay (n.d.a) development, an enormously expensive eco-theme park constructed on a presqu'île of reclaimed land. Another example is the Swedish urban archipelago of Malmö, which explicitly trades on its green role model status, placing special emphasis on aesthetic values and highlighting how its "modern architecture is combined with ecological sustainability" (Malmö stad, 2016). Such projects are not necessarily regressive in themselves, but they make a worrisome contribution to the internationally competitive aspect of urban sustainable development, directing thoughts and energies away from less spectacular but perhaps more suitable ideas – especially ideas that would integrate the eco-initiatives with residents of the island city rather than creating separation through showpieces.

Wealthy jurisdictions and developers may favour such highly visible and aesthetically focused urban sustainability initiatives in part because their acceptance as the gold standard for smart

eco-cities offers competitive advantage to those who can afford them. It is in the interests of the entrepreneurial state to possess icons of sustainability that less well-endowed places cannot acquire, and it is in the interests of private suppliers of smart eco-city dreams to emphasise the construction of premium cities at premium prices. Islanded smart eco-cities are becoming increasingly costly in their conceptualisation, construction, and operation – and to a large extent in their deliberate separation from the day-to-day lives of existing or potential residents. As a result, they tend to exacerbate divides between rich and poor, between environmental haves and have-nots, and between contributions to residents and flashy attractions for outsiders.

6. Smart eco-cities as secessionary enclaves

The emphasis placed on iconic design and separation leads to an association between expensiveness and the islanded smart eco-city. This implicitly separates the smart eco-city from genuinely sustainable urbanism, for it turns the smart eco-city into a commodity attainable only by the few, into a home for the global elite. This operates not only at the level of global inter-city competition but on an intra-city level as well. Islanded smart eco-cities frequently serve as 'secessionary networked spaces' in which "security, urban design, financial, infrastructural and state practices in combination [...] separate the social and economic lives of the rich from those of the poor" (Graham & Marvin, 2001: 222). The self-consciously iconic and distinctive smart eco-city creates ever-clearer distinctions between elite and less-privileged segments of society, exemplified by outsiders coming to see and gawk, compared to residents seeking livelihoods and daily routines. The differentiation of infrastructure networks that accompanies such initiatives – as particular urban spaces are equipped with exceptional IT, energy, water, transport, and other infrastructure while others are left to languish – leads to "the gradual withdrawal of the practices of social and geographical cross-subsidy" (Graham & Marvin, 2001: 233). That is, once elite communities depend on privatised or otherwise-distinct infrastructural networks, the urban poor and excluded sectors are more easily left to their own (meagre) resources. An especially egregious example is Eko Atlantic, a smart eco-city being constructed on a reclaimed presqu'île as an extension to the island city of Lagos. Eko Atlantic represents a retreat of wealth from the socially and environmentally vulnerable city, the ensconcing of privilege within a protective enclave (Graham, 2016).

Eko Atlantic may be an extreme case, but it is not unique in its essentials. Urban megaprojects such as new-build smart eco-cities often exceed the economic capacities of even the wealthiest municipal authorities, requiring a combination of public and private investment (Alusi *et al.*, 2011: 15). This leads the state to mobilise "heavy public subsidies, infrastructural contributions and seductive grants [...] to lure in the international real estate capital that has the muscle to make such projects work" (Graham & Marvin, 2001: 227). The very megaprojects that are sold to governments and to the public as means of restoring or securing the city's, region's, or country's place in a competitive world transform the state's role into that of a facilitator of finance on the one hand and a last refuge for the dispossessed (if they are not excluded entirely) on the other.

It is no exaggeration to speak of these projects being 'sold', for they are often proposed, led, and developed by globally active city design companies "with responsibility for feasibility studies,

masterplanning, finance and development" (Joss *et al.*, 2013: 63). The smart eco-city of Ørestad in Copenhagen is an example of a sustainable urbanism initiative gone wrong and of the exploitation of the state by powerful developers. Majoor and Jørgensen (2007) highlight how the speculative and entrepreneurial development of Ørestad lost its whole-city perspective: The aim of developing reclaimed land on Copenhagen's island of Amager in order to strengthen Copenhagen in its entirety was gradually replaced by an emphasis on urban competitiveness. Epitomising this process was the overturning of a longstanding municipal ban on out-of-town shopping centres. The ban had been designed to protect city-centre businesses, but in the face of lack of demand for plots of land in Ørestad, the ban was overturned in order to permit a foreign company to establish Denmark's largest shopping centre on the site. This was intended to heighten interest in Ørestad and increase public transport income, thereby providing a much-needed boost to the semi-public developer's ailing finances (Majoor & Jørgensen, 2007: 183). Ørestad also justified construction of a new and enormously costly metro/rapid transit public transport system, the initial routes for which prioritised accessibility for speculative high-value (as opposed to existing high-density and transport-poor) populations.

Now, two decades after construction on Ørestad began, it is among the least-appreciated neighbourhoods in Copenhagen, hosting offices and housing yet little community life, few retail opportunities outside of the shopping centre, and (unusually for Copenhagen) poor pedestrian access. What Ørestad does possess is iconic architecture. Terming it an "architectural pearl," the VisitCopenhagen tourist office describes Ørestad as "a green neighbourhood [...], built around nature, water and architecture" (VisitCopenhagen, n.d.; *translation our own*). Yet as O'Sullivan (2016) comments:

> Ørestad lacks the density to create a sense of street life and design choices have aggravated the problem; the mall, for example, turns inward. The ample parklands around the new blocks remain vacant and windswept. There's a lack of basic amenities such as corner grocery stores, while selling office space along the new metro line has proved harder than expected. Overall, the area retains the feel of a costly exhibit: impressive but kept aridly pristine behind security ropes.

Although marketed as a means of funding the island city of Copenhagen, making the city more competitive, and serving as a green role model, Ørestad has directly and indirectly drained funds, prestige, and opportunity from the city's existing residents and businesses. It draws resources out of the city while capturing adjacent undeveloped land in the service of the city's semblance of sustainability. Ørestad competes with the rest of Copenhagen just as surely as it competes with other cities – and since Ørestad is an elite, high-value development, it tends to win this financial competition relative to the rest of Copenhagen. Nevertheless, actors in Copenhagen continue to promote Ørestad as a showcase smart eco-city (Cleantech, 2015) even though its 'green' credentials seem grounded in symbolic architectural characteristics (Lowenstein, 2009): The aesthetics of iconic, green-looking buildings and landscapes to a great extent stand in for urban living that is actually less environmentally harmful and more socially sensitive. Ørestad even includes a single showcase wind turbine.

Islanded smart eco-cities as secessionary enclaves gain power and value through their exclusivity – the antithesis of an integrated, sustainable community. They must outcompete other neighbourhoods and other cities in order to attract the capital that makes such premium urban megaprojects possible.

7. Conclusion: Rescaling the ambition of smart eco-cities

Cities built from the ground up on small islands are increasingly being marketed – by both states and corporations, to both domestic and international publics – as the way forward, as role models of sustainable urbanism. As we have seen, these initiatives sometimes amount to little more than cynical branding exercises, and even when purposeful strides are made toward sustainable living on the island, these may be of little significance in the overall scheme of things.

From our examples, we have seen that the boundedness associated with island spatiality offers three primary benefits for those seeking to construct smart eco-cities:

- *Ease of creating value:* Environmental goods are easier to lay claim to and conceptualise within a clearly delimited space.
- *Ease of measuring success:* Unambiguous spatial boundaries permit the exclusion of factors (such as polluting industries, large numbers of residents, and true footprints over space and time) that complicate efforts to assess a place as sustainable.
- *Ease of communicating success:* Spatial limitations enhance imageability and the impact of iconic structures, making it easier to disseminate information concerning a smart eco-city and help people comprehend a place as a smart eco-city.

These benefits are more or less illusory when it comes to making meaningful progress toward sustainability. They contribute to the appearance of sustainability rather than the fact of sustainability. Just because niches are good for protecting innovation, it does not mean that all innovative uses of niches are equally good for the world.

The challenge and opportunity of smart eco-cities is essentially one of scale. Governments and private actors deploy the smart eco-city concept as a means of gaining competitive advantage relative to other nearby and distant cities when it comes to attracting business and investment. Although we might perhaps imagine this resulting in a race to the top, as cities grow ever greener (or are said to do so), in the case of islanded smart eco-cities, we instead see increasing emphasis on arbitrary and spatially restricted sustainability benchmarks as well as spectacular, futuristic architecture, which makes the city *look* the way we expect cities of the future to look. The emphasis on specialised sustainability benchmarks reflects use of small island spatiality to restrict the scope of the smart eco-city's ambitions, permitting the city to demonstrate exceptional sustainability – but on a scale that does not really matter for sustainability and in a manner that sets unrealistic standards for true cities to live up to, even when the island entity is explicitly designed to demonstrate how a transition to sustainability can be achieved. The emphasis on spectacular architecture is perhaps worse still, for it underlines the smart eco-city as an exceptional place, one that is instantly recognisable as unique – and that is beyond the means of the average city-dweller, favouring instead elite interests.

Furthermore, the techno-environmental focus of smart eco-cities distracts from many underlying issues of urbanism and islandism that are not always prominent in the drive for visible sustainability. City design is being examined to balance gendered needs (Cuthbert, 2011) while small islands, as with all other locations, are not immune to horrific abuse and social problems (Trenwith, 2003). The smart eco-cities discourse in theory and practice too often neglects many social topics, such as gendered spaces, ghettoisation, accessibility for people with cognitive and intellectual disabilities (physical disabilities are often, but not

always, considered), the authoritarianism-by-design of comprehensively preplanned cities, and perhaps most notably the sociological challenges of living in small and dense spaces (e.g. Winsborough, 1965), instead focusing on the opportunities, with the sociology based on environmental and technological potentials.

Island spatiality encourages the deceptive scaling of sustainability, the drawing of lines around the city so as to include that which is beneficial and exclude that which is best ignored. The enhanced imageability and self-evident borders that accompany island spatiality make it easier to regard a smart eco-city as both an independent entity and as a special site within a larger urban context. This relational ambiguity allows the wider city to overstate the significance of island green spaces and enclaves of sustainability while at the same time allowing the smart eco-city itself to exclude the wider city from its internal assessments of sustainability.

If islanded smart eco-cities are to genuinely contribute to global sustainability, it is necessary that we resist efforts by local, regional, and national authorities as well as by corporations to exploit an ambiguous relationship between the smart eco-city and its surroundings. It is instead necessary to take a whole-city or – better yet – regional or national perspective on sustainability – even scaling up the old mantra 'Think global, act local'. This is indeed what many sustainable city initiatives that do not focus on bounded spatiality seek to achieve.

At the risk of privileging pragmatic incrementalism – moving step-by-step without trying to do everything at once – over the possibility of making revolutionary progress toward a greener future, it is necessary to recognise that high urban density (which is not usually an attribute of islanded smart eco-cities but which is an attribute of many urban islands) is itself conducive to assumed greater global sustainability, precisely because the costs *and* values of environmental services arising from this density are largely externalised. Efforts to reduce resource consumption within existing cities and sustainably densify urban areas may not be as visible, dramatic, or marketable as is possession of an iconic, premium islanded smart eco-city, but it would be a great tragedy if the potential for genuine sustainable development were lost to the proliferation of greener-than-thou elite enclaves and special economic zones.

Islanded smart eco-cities can thus simultaneously represent innovation, secessionary enclaves, and the selling of sustainability. This innovation includes technology and environmental design, for which many successes can legitimately be claimed. The innovation also involves an iconisation and branding exercise to sell potentially deceptively packaged sustainability. While our examples and analysis demonstrate that islanded smart eco-cities are not entirely lacking environmental, technological, and sociological innovative value, their true value is sometimes obscured by the construction of what we want smart eco-cities to represent. This paper is a call for more balance and realism in how island urban sustainability is presented and represented, to ensure that future urbanism fulfils its potential for providing significant and imitable contributions to global sustainability.

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