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Challenging policy barriers in sustainable urban design

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Abstract. In built environment design, codes set minimum health and safety requirements, policies set aspirational targets, and incentives such as green building rating schemes set design standards. These approaches have failed to provide universal wellbeing and environmental justice (i.e. intra-generational equity), or increases in the natural life-support system that exceed depletion rates (i.e. inter-generational equity). Governments that do not ensure all citizens can obtain basic needs, life quality and resource security fail to meet their basic responsibilities. Two recent documents, one representing sustainable urban policy and principles, the other representing urban biodiversity standards, are examined against the Positive Development Test (whether the development increases the public estate, ecological base and future public options). The discussion suggests that contemporary policies and incentive schemes, as presently conceived, cannot provide the basic physical preconditions for sustainability, let alone address socio-economic inequities. An alternative design-based approach is presented to address the issues the paper identified.

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Contents:

1. Introduction

1.1. Background

Cities are far from sustainable in their present form. They are a source of resource depletion, contamination and waste, and a sink that drains regions of energy, materials, water and biodiversity. Often cities intensify floods, heatwaves, earthquakes and hurricanes, segregate races and classes, limit social mobility, and block escape routes in civil or environmental crises. Since the built environment is implicated in most sustainability issues, it is therefore central to solutions. Yet sustainable planning and design have largely only aimed to mitigate its own adverse impacts through efficiency gains. Meanwhile, on average, 58% of the Earth's wildlife, 3.8 billion years in the making, has been lost since 1970 (WWF, 2016). Much of this owes to the habitat destruction, climate change and pollution caused by resource extraction, the construction and operation of cities. To be sustainable, then, cities must reverse this trajectory and give back more than they take.

In a context of escalating environmental exploitation and degradation, cities must be transformed to increase future public options and natural and social support systems. Positive Development (PD) states that the positive ecological footprint of nature must exceed the negative ecological footprint of humans (Birkeland, 2008). PD posits that cities can create their own ecosystem services, restock their bioregions, and over-compensate for the impacts of construction. Net-positive design is possible, because cities can be retrofitted for net social and ecological gains over their lifecycle at no extra cost (Birkeland, 2004). However, this requires that urban design not just integrate nature, but create new spaces and conditions for both the 'ecological base' or means of survival (ecological carrying capacity, biodiversity, ecosystem services, etc.) *and* 'public estate' or universal access to the means of survival (essential services, social support systems, environmental justice, etc.). If redesigned on net-positive design principles, cities could generate sustainability.

Although variously defined, sustainability essentially means inter- and intra-generational equity. Cities fail to provide intra-generational equity when they limit the life potential of the socio-economically deprived and transfer wealth from the poorer to the richer. They lack inter-generational equity, because they reduce future options for survival and wellbeing and are not easily adapted to changing conditions and climates. Given the losses of biodiversity and cultures, and disparities of wealth and inequities caused by cities, they must be retrofitted to create the physical preconditions for sustainability and increase universal life quality. Yet, current urban policies, strategies and standards do not yet contemplate net-positive outcomes. While some now claim their buildings produce net benefits, this only means that, after construction, they export renewable energy or recycled water across property lines. This neither compensates for the adverse ecological impacts due to resource extraction, construction and operation processes, nor increases ecosystems and biodiversity in whole-system terms.

Two divergent orientations in sustainability are 'green growth' and 'degrowth'. Green growth calls for innovation, efficiency, and 'closing loops' or recycling at all stages of production and consumption. Theoretically, this might approach zero waste, carbon, energy while improving environmental conditions, but it only reduces relative material flows. PD adds the other side of the equation: increasing nature in excess of human consumption. Degrowth

calls for a reduction in production and consumption, through activism and democratic choice, leading to values, behavior and eventually systems change (Demaria, Kothari, 2017). While challenging cultural and ideological bases is essential, PD adds another dimension: designing out the anti-sustainability biases that are hardwired into the physical and institutional architecture. Sustainability requires not only disruptive innovations and radical worldviews, but the reformation of design and decision-making frameworks on ethics-based and eco-positive principles. Decision-making systems can make better choices, but only design can create more and better choices.

The retrofit of cities on net-positive principles is unquestionably necessary, but some would argue that better living environments cannot change behavior, values, or personal and political power relationships. Nevertheless, a different kind of living environment could reduce the causes of conflict, discontent and poor health such as inequality, and the impacts of political and economic injustices such as poverty. Physical quality and equity would not require 'more' regulation, incentives, investment or social change but simply a change of design concepts. Others would argue that the requisite institutional changes are not possible through existing market or state structures. However, because cities can increase social and ecological foundations profitably while reducing net adverse impacts and threats, design could leapfrog the impasses created by the state-market duality. A system of positive environmental governance is also proposed (Birkeland, 2008). However, this paper critiques contemporary policy and incentive frameworks, to which it now turns.

Eco-positive design is achievable. Vertical structures can increase the space for nature and community to over-compensate for (otherwise unavoidable) negative impacts of development and increase sustainability. For example, buildings with permanent building-integrated vegetation can sequester more carbon than is emitted during resource extraction, construction and operation (Renger et al., 2015), while providing ecosystem services, environmental amenities, public spaces and health benefits. However, the longstanding ethic has been 'do no harm'—instead of 'do net good'. Consequently, urban design guidelines and assessment tools do not facilitate, let alone measure, net-positive outcomes. Although design was traditionally about value adding, design tools draw narrow system boundaries in time and space, such as 'from time of purchase' or 'within property lines'. Such boundaries limit the duty of care and discount adverse bio-accumulative impacts. Therefore, PD provides informal and technical tools for net-positive design and assessment, using stationary temporal and spatial baselines, as follows:

- *Ecological baseline:* Building assessment and rating tools set standards that are relative to current practices, not sustainability. They do not envisage buildings that increase the natural environment in a global sense. Some progressive sustainable design tools aim for onsite or offsite landscape regeneration that improves upon pre-construction environments but does not increase the natural environment. This cannot offset the damage in building production, let alone increase native ecosystems or environmental justice sufficient to compensate for past harm. This is because, even if the original ecological base were restored, it could not provide enough space to support the current population sustainably (cf. Wackernagel, Rees, 1996). If development is to give back more than it takes from nature, the earth's 'effective' land area must be increased. Hence, the PD ecological standard is net increases in ecological carrying capacity or 'ecological space' (i.e. space created by vertical structures and building-integrated ecosystem services) beyond pre-industrial conditions.
- *Social baseline:* Social sustainability depends upon on ecological sustainability, but it also requires environmental and social justice. Due to current disparities of wealth and opportunity, sustainable development needs to address environmental inequities in the surrounding community. Green developments often aim to include social amenities such as public spaces, plazas or building features like green walls that clean and re-oxygenate urban air. Few, however, proactively prevent environmental risks, correct offsite environmental and equity deficits, or provide accessible refuges with inbuilt sources of food and water for emergencies. Social standards in green building tools, like their environmental standards, are 'relative'. Projects only need to

show more benefits for building stakeholders (e.g., investors, occupants and neighbors) than the norm. These tools reward amenities that provide profit, prestige and marketability anyway. The PD social standard, in contrast, is net increases in social and environmental equity on a community-wide basis, and direct universal access to basic needs.

To assess whether current sustainability policy, incentives and tools address the physical prerequisites of sustainability, or genuine bio-physical sustainability, this paper examines two recent initiatives through an eco-positive lens. First, *The New Urban Agenda* or Habitat III (2016) explicitly builds on many international sustainability declarations that emphasize the city scale. Second, the Australian Green Building Council's *Land Use and Ecology Category Review* (GBCA, 2017) proposes to integrate urban ecology into its 'Green Star' accreditation scheme. Green building rating tools are now the dominant means of setting design standards, and this scheme builds on a review of biodiversity provisions in other certification tools. Since both initiatives reflect contemporary approaches to urban policy and implementation, and both received feedback from cross-sectoral experts, they can be taken to represent best-practice urban and building scale design standards. They are examined here in terms of the gap between conventional sustainability frameworks and PD sustainability standards.

1.2. Criteria for review

This paper asks: do these representative documents address the biophysical prerequisites of sustainability? First, does Habitat III, or contemporary international urban policy goals and strategies generally, address socio-political realities? Second, does the Green Star biodiversity credit scheme, or building design standards and incentives schemes generally, address ecological issues? The criterion is the 'PD test': whether or not a development expands future options for survival and wellbeing, by increasing the ecological base in whole-system terms and by increasing social equity on an area-wide basis, to over-compensate for shortfalls or uncertainties. If not, governments are obligated to establish mechanisms for transforming urban form, buildings and infrastructure to enable a sustainable environment. This is regardless of whether or not the standards or implementation measures are delegated to industry or advisory bodies. The grounds for this obligation lie in a broad interpretation of the social contract: the basic duty of governments to their citizenry.

Democracy requires physical security in the supply of basic needs like food, shelter, water, peace, safety and social interaction. The citizenry therefore grants government the power to ensure that essential services are available. In cases of extreme disparities of wealth, however, people that are dependent on economic and electronic instruments can be effectively disenfranchised by poverty. The only reliable way to guarantee democracy and sustainability is direct physical access to the means of survival and wellbeing. This can only be guaranteed if the built environment is designed to provide them. The physical bases of sustainability can be implemented by government, business, the community, or cross-sectoral partnerships. However, if these schemes fail to provide for sustainability (i.e. ensure fundamental needs and fairness, protect the natural life-support system, enable adaptation to changing contexts and climates, and set basic safety standards and security) then the system of governance has no real legitimacy.

2. Conceptual issues raised by Habitat III

Habitat III: 94. *We will implement integrated planning that aims to balance short-term needs with long-term desired outcomes of a competitive economy, high quality of life, and sustainable environment. We will also strive to build in flexibility in our plans in order to adjust to changing social and economic conditions over time …*

This section explores policy and design *concepts* in Habitat III as they relate to the socio-economically deprived and the ecological life-support system. A preliminary observation is that by listing most urban policies without qualifiers or distinctions, Habitat III essentially calls for a 'balance' between established approaches. Balancing competing policies through 'flexible' planning does not suggest how cities might be physically transformed to reverse biodiversity losses and growing social inequities. Balancing interests is hardly transformative, which may help explain why policies fail to address

systems design issues. As discussed below, these issues include: the centralization of essential services which makes people dependent for basic needs on delivery systems that they cannot control; the rural-urban divide which is still characterized by rural-to-urban wealth transfers and forces many to move to cities; and high density (people or dwellings per land area) which often reduces access to survival needs, amenities and green public spaces.

2.1. Policy issues

Centralization and efficiency

Habitat III: 51. *We commit to promote the development of urban spatial frameworks, including urban planning and design instruments that support sustainable management and use of natural resources and land, appropriate compactness and density, polycentrism, and mixed uses, through infill or planned urban extension strategies as applicable, to trigger economies of scale and agglomeration, strengthen food system planning, enhance resource efficiency, urban resilience, and environmental sustainability.*

Habitat III presents 'efficiencies of scale and agglomeration' as a solution. The centralized production and delivery of essential services (e.g., power plants and wires, sewerage and pipes, farms and roads) may generate economies. However, efficiency through spatial concentration does not guarantee equitable distribution or universal access to basic needs. Although advocating local goods and services, it does not say how infill and urban extensions 'strengthen food planning' or organize urban food, water or energy production. Centralized services often create dependency on mechanical or monetary delivery systems that fail in crises (e.g., Puerto Rico hurricane), and compact cities cut off escape routes in emergencies (e.g., New Orleans typhoon). Further, concentric urban form has historically segregated people by class, race and income, as land values rise near urban centers. Underprivileged residents in outer areas often lack the means to commute to CBDs, which limits their employment opportunities, life choices and social mobility.

Urban-rural relationships

Habitat III: 49. *We commit to support territorial systems that integrate urban and rural functions into the national and sub-national spatial frameworks and the systems of cities and human settlements, promoting sustainable management and use of natural resources and land, ensuring reliable supply and value chains that connect urban and rural supply and demand to foster equitable regional development across the urban-rural continuum and fill the social, economic, and territorial gaps.*

Cities have been likened to 'black holes' that deplete their rural areas socially, economically and ecologically (Rees, 2002). Material flows between regions and cities are one-directional and ultimately terminal as they draw down natural and social capital (Birkeland, Schooneveldt, 2002). Habitat III does not suggest principles for spatial systems that ensure reliable rural-urban supply chains, 'equitable regional development', or for determining what 'gaps' to fill in. Nor does it indicate how planners can counteract an economic paradigm that demands cities compete to attract development. States and cities often compete for 'any' industry through various costly subsidies and incentives. The rural poor then crowd into cities, imposing additional costs on urban services. Subsequently, some industries move overseas to access cheaper labor supplies. To create eco-productive urban-rural synergies, PD aims to align systems of governance, economic and construction systems with regional resources, natural systems and cultures, along the lines of Bioregional Planning.

Urban density and extension

Habitat III: 52. *We encourage spatial development strategies that take into account, as appropriate, the need to guide urban extension prioritizing urban renewal by planning for the provision of accessible and well-connected infrastructure and services, sustainable population densities, and compact design and integration of new neighborhoods in the urban fabric, preventing urban sprawl and marginalization.*

A branch of urban design has conflated sustainability with densification. In practice, densification means spatial reduction and taller buildings to increase the number of people or dwellings per unit of horizontal land area. Efficiencies through shorter distances and less space reduce some negative

impacts, such as car mileage and may even reduce the rate of urban sprawl. Densification also creates wealth from land price inflation and increased rental rates. However, it usually eliminates urban biodiversity and reduces the capacity of urban areas to adapt to unpredictable social, political and environmental change. Reducing space cannot, in itself, increase social benefits, nature or environmental amenities. Buildings today are separated mainly by paving. They restrict future development patterns, lock-in inequitable and consumerist lifestyles and limit future planning options. Instead of fixating on numerical density, PD emphasizes creating more mixed-use public space and using multifunctional design to create synergies among ecological and social functions.

Green public spaces

Habitat III: 67. *We commit to promote the creation and maintenance of well-connected and well-distributed networks of open, multi-purpose, safe, inclusive, accessible, green, and quality public spaces to improve the resilience of cities to disasters and climate change, reducing flood and drought risks and heat waves, improving food security and nutrition, physical and mental health, household and ambient air quality, reducing noise, and promoting attractive and livable cities and human settlements and urban landscapes, prioritizing the conservation of endemic species.*

Historically, concrete barriers diverted flood waters from cities, while storm-water drains channeled rain water out of cities. These 'brittle' engineering systems exacerbated the impacts of storms and floods. However, planning for 'resilience' has generally focused more on recovery than redesign for prevention. Green infrastructure instead emphasizes prevention through the use of natural systems and services (Wesener et al., 2017). While Habitat III advocates public green space, it does not reconcile this with densification and centralization. It mentions urban food security, but does not indicate how open space will be designed to provide food and water for the underprivileged, and/or general public in emergencies. How can 'endemic species' be conserved when contemporary green buildings and landscapes only feature tokens of remnant ecosystems? In PD, integrated vertical and horizontal nature corridors would double as emergency evacuation routes when transport systems fail, while improving air quality, mitigating temperature inversions and supporting biodiversity incubators.

2.2. Design issues

Retrofitting for adaptability

Habitat III: 97*. We will promote planned urban extensions, infill, prioritizing renewal, regeneration, and retrofitting of urban areas, as appropriate, including upgrading of slums and informal settlements, providing high-quality buildings and public spaces, promoting integrated and participatory approaches involving all relevant stakeholders and inhabitants, avoiding spatial and socio-economic segregation and gentrification, while preserving cultural heritage and preventing and containing urban sprawl.*

Habitat III envisages urban renewal and retrofitting, but does not mention designing new and old buildings to facilitate retrofitting for higher environmental standards when design capacity improves. Buildings can last 100 years but are not yet designed for likely climatic conditions over their expected lifespan. For example, building heating plants are designed for the current local temperature range, while cooling loads are predicted to increase rapidly. Rigid green buildings constructed today will reduce life-quality options for future generations and impede the transformation to net-positive sustainability. 'Retrofitting for adaptability' means enabling future building modifications to meet changing technological standards, social needs and climates—not just diverse occupant needs and preferences. PD passive solar retrofit modules could significantly reduce the costs of upgrades while avoiding major structural change or heritage losses. This would cause less demolition waste, and a reduction in the resource extraction and construction impacts caused by replacement buildings.

Construction innovation

Habitat III: 75. *We commit to encourage national, sub-national, and local governments, as appropriate, to develop sustainable, renewable, and affordable energy, energy-efficient buildings and construction modes, and to promote energy conservation and efficiency, which are essential to enable the reduction of greenhouse gas and black carbon emissions, ensure sustainable consumption and production patterns, and*

help to create new decent jobs, improve public health, and reduce the costs of energy supply.

Habitat III calls for 'energy-efficient buildings and construction modes' for jobs, savings and health benefits, but does not call for changing building designs to reduce the demand for resources and the impacts of industrial supply chains that deliver construction supplies. For example, passive building design can create significant upstream savings through compound (cumulative) efficiencies. In PD, passive energy systems are maximized before energy systems are specified. Rather than endorsing proven yet marginalized passive design concepts, however, Habitat III generally emphasizes innovation. Efficiency-led innovations can increase materials processing and product sales, while reducing jobs and excluding passive eco-positive design alternatives. Buildings will soon be 'printed' (i.e. large-scale laser printing), yet Habitat III does not explore its implications for sustainability. So far, printing has been used to display otherwise infeasible and unaffordable sculptural shapes—demonstrating virtuosity not virtue. If programmed only for efficiency, printed buildings will not produce net public benefits.

Mixed and multiple functions

Habitat III: 98. *We will promote integrated urban and territorial planning, including planned urban extensions based on the principles of equitable, efficient, and sustainable use of land and natural resources, compactness, polycentrism, appropriate density and connectivity, multiple use of space, as well as mixed social and economic uses in the built-up areas, to prevent urban sprawl, to reduce mobility challenges and needs and service delivery costs per capita, and to harness density and economies of scale and agglomeration, as appropriate.*

Although not always implemented, mixed-use development has been a panacea for the monocultural land-use patterns that typified the post-WWII era. However, Habitat III does not state how to 'harness density' and 'urban extensions' for mixed land uses and multiple uses of space. On what basis should the amount of open space per capita or area be determined? Moreover, the underlying tenet of zoning has remained the 'highest *economic* use of land'. Throughout Habitat III, economics appears as the presumed lever for sustainability (economics is mentioned 73 times, ecology 2 times, biodiversity 3 times). The focus on ground-level land uses also omits the potential of vertical spaces to provide multiple benefits. PD posits that the ecological needs of land should be determined first, as most commercial opportunities are not limited to particular locations. Once urban spaces, surfaces, structures are optimized for public gain can economic goods and services be integrated.

Design for eco-services

Habitat III: 69. *We commit to preserve and promote the ecological and social function of land, including coastal areas which support cities and human settlements, and foster ecosystem-based solutions to ensure sustainable consumption and production patterns; so that the ecosystem's regenerative capacity is not exceeded.*

Habitat III states that the regenerative capacity of nature should not be exceeded, but it has already been outstripped. Further, 'ecosystem-based solutions' are not defined. 'Regeneration' has been about restoration and enhancement. Nature cannot be increased if confined to landscapes leftover by buildings. Since landscaping and green roofs cannot provide enough space to offset increasing land degradation, PD proposes 'design for eco-services', which includes the intrinsic, along with instrumental, values of nature (Birkeland, 2002). This is where natural systems support building and ecosystem functions to achieve public benefits. For instance, 'green scaffolding' creates a triple skin that can support passive thermal systems, building-integrated eco-services and the like, with little added embodied materials, energy or cost (Birkeland, 2007). It can reinforce old buildings on the exterior or interior, be structurally-integrated with new buildings, sit above urban spaces or, alternatively, above freeways to support algae fuel production or other carbon sequestration systems.

3. Institutional issues raised by Habitat III

Habitat III: 15. *… (b) recognize the leading role of national governments, as appropriate, in the definition and implementation of inclusive and effective urban policies and legislation for sustainable urban development, and the equally important contributions of sub-national and local governments, as well*

as civil society and other relevant stakeholders, in a transparent and accountable manner.

This section moves from conceptual to institutional frameworks which underlie development control processes, accountability and standards. In many countries, state and local governments are responsible for land use and development, but they have hesitated to regulate beyond basic health and safety standards, especially given the pressures of 'small government'. For example, the Australian building code has only recently included passive design strategies, widely known by the 1960s. This hands-off approach was partly due to industry power, but also because planning and building codes were prescriptive and rigid. Codes often favored established technologies, stifled innovation or had arbitrary outcomes in specific contexts. They gradually became more performance-based. Habitat III, at time of writing, has not suggested any performance criteria for management accountability or design standards that would provide indicators of genuine progress. By default, therefore, it leaves quality control and design standards to rating tools (below) which are, ironically, prescriptive.

3.1. Management Issues

Habitat III: 41. *We commit to promote institutional, political, legal, and financial mechanisms in cities and human settlements to broaden inclusive platforms, in line with national policies that allow meaningful participation in decision-making, planning, and follow-up processes for all, as well as an enhanced civil engagement and co-provision and co-production.*

Policies are meant to be flexible to avoid constraining the discretion of decision makers. Thus, they can often be paraphrased as 'commit to promote' all things for everyone. Accordingly, Habitat III lists many management values without offering principles by which accountability, quality or success can be measured. For example, it sometimes aligns economics with ecosystem-based management, long-term with short-term needs, competition and collaboration, and compact urban form with expansion. This balancing approach means that short-term financial issues will prevail in each case, due to the forces of institutional inertia and unguided commercial innovation. It overlooks the potential of environmental design to find alternative physical solutions that actually accommodate competing values, needs and interests. Thus, despite calling for a 'paradigm shift', Habitat III appears to lean unconsciously in favor of maintaining the status quo: management over design, risk assessment over prevention, incrementalism over systems change, and interest balancing over conflict resolution.

Adaptive management

Habitat III: 80. *We commit to support the medium- to long-term adaptation planning process, as well as city-level climate vulnerability and impact assessments to inform adaptation plans, policies, programs, and actions that build resilience of urban inhabitants, including through the use of ecosystem-based adaptation.*

Adaptive management has been traced to Aldo Leopold who was a pragmatic environmental manager (Norton, 2005). In the urban context, it perhaps first appeared as 'incrementalism' which meant taking small steps to avoid big mistakes (Davidoff, 1965). Adaptive management has not yet led to adaptive design, however. Climate change requires changeable physical environments, not just flexible mitigation measures. Given their long lifespans, green buildings that meet today's narrow sustainability standards will continue to increase material flows, reduce biodiversity and alienate land from potentially net-positive developments for decades. Management focuses on procedures, not on creativity, and scant attention is paid to investigating gaps between aims and on-ground outcomes (cf. Swain, 2008). For example, indirect incentive schemes sometimes have unintended consequences, necessitating more layers of regulations or incentives to redirect outcomes toward the original objectives. Regulatory and management mechanisms can constrain or reinforce bad design, but only design can create urban sustainability.

Risk-assessment

Habitat III: 78. *We commit to support shifting from reactive to more proactive risk-based, all-hazards and all-of-society approaches, such as raising public awareness of the risk and promoting ex-ante investments to prevent risks and build resilience, while also ensuring timely and effective local responses, to address the immediate needs of inhabitants affected by natural and man-made disasters, and conflicts.*

The risk-based approach in management is often, paradoxically, reactive. The tendency is still to wait until the likelihood of disasters outweighs the costs of action. For example, nuclear power plants near fault lines or coastlines were defended on grounds that nuclear plant meltdowns were far less common than earthquakes or Tsunamis, and therefore low-risk. However, both have occurred near nuclear plants. Similarly, where the risk-benefit balance seemed favorable, buildings were built on 100-year flood plains, leading to many ancillary investments. There were huge losses in the 2011 flood in Brisbane, Australia, despite a previous commitment to preventing development on the 1974 flood plain. The costs of elevating or moving buildings, or creating diversion lakes, could have been mitigated by (portable) commercial and recreational activity near or on the river. In a PD framework, the investment in prevention is determined by the costs of the worst-case scenario, not risk calculations.

Direct action

Habitat III: 129. *We urge UN-Habitat to continue its work to develop its normative knowledge and provide capacity development and tools to national, sub-national, and local governments in designing, planning, and managing sustainable urban development.*

Design implies direct action to solve problems in positive and multifunctional ways, rather than through indirect management tools alone (Birkeland, 2002). Administrative approaches tend to empower those considered the important actors: decision makers in business, industry and government—not designers and scientists. Managerial levers and pullies stimulate entrepreneurial efforts and avoid dictating particular solutions, but they generally appeal to the profit motive. For example, trading schemes and transferrable development rights allow flexibility in compensatory actions that offset negative impacts where cheapest to do so. Currently, they do not require developments to pay back their full public costs anyway. This is partly because managers seldom have training in design or ecology, and are accountable to stakeholders, not future generations or distant populations. While Habitat III calls for more tools, it does not suggest that tools must be fundamentally different. In PD, any offsetting or trading schemes would require net-positive outcomes.

3.2. Accountability and standards

Criteria and indicators

Habitat III: 91. *… We will encourage appropriate regulatory frameworks and support to local governments in partnering with communities, civil society, and the private sector to develop and manage basic services and infrastructure ensuring that public interest is preserved and concise goals, responsibilities, and accountability mechanisms are clearly defined.*

Although policy declarations leave implementation to others, Habitat III offers no hint of social justice criteria or ecological baselines to define management or professional accountability regarding urban environments. Business and industry have not demonstrated adequate ethical or ecological leadership. They are quick to adopt and market innovations that trigger irreversible systems change, such as robotic cars, without adequate consideration of the potential socio-economic and environmental repercussions. Industry reporting systems usually call for continuous improvement, which assumes current directions are positive. However, 'more good and less bad' development only slows the growing rate of species extinctions, desertification, wilderness depletion, climate change and disparities of wealth. It does not reverse direction or increase nature (Birkeland, 2005). When governments adopt industry criteria, they risk abdicating their raison-d'être (social contract) unless tangible, objective sustainability standards are included. Nevertheless, some local governments have adopted private sector voluntary rating tools as de facto design standards (below).

Ecological standards

Habitat III: 76. *We commit to make sustainable use of natural resources and to focus on the resource-efficiency of raw and construction materials like concrete, metals, wood, minerals, and land, establish safe material recovery and recycling facilities, and promote development of sustainable and resilient buildings, prioritizing the usage of local, non-toxic and recycled materials, and lead-additive-free paints and coatings.*

Habitat III appears to view buildings as being about materials, perhaps because it couches construction in an economic, not environmental, framework. The emphasis on resource efficiency (economic savings) and non-toxic building components (health savings) reflects the traditional view of design as serving to reduce costs. Materials efficiency, while important, seldom improves the natural or social environment. More resource savings, recycled building products and non-toxic materials would only reduce total material flows if there were no more new buildings. Healthier urban environments do not address the pollutants already bioaccumulating in nature. Nonetheless, building-integrated natural systems, as exemplified by 'living machines', can improve environmental as well as human health (Todd, Todd, 1994). Habitat III does not call for improvements in ecological health, let alone reverse the direction of society's unilateral relationship with nature. It is now meaningless to speak of bringing humans and nature into balance: cities must protect, restore and increase nature.

Economic justice

Habitat III: 5. *By readdressing the way cities and human settlements are planned, designed, financed, developed, governed, and managed, the New Urban Agenda will help to end poverty and hunger in all its forms and dimensions, reduce inequalities, promote sustained, inclusive, and sustainable economic growth, achieve gender equality and the empowerment of all women and girls, in order to fully harness their vital contribution to sustainable development, improve human health and well-being, as well as foster resilience and protect the environment.*

Habitat III does not suggest how needs like poverty and hunger will be addressed by settlements, or how decision frameworks might be changed to enable economic and environmental justice. It does not offer means to redress inequities and prejudice, other than to 'fully harness' the contribution of all women and girls. This appears to favor the assimilation of the socio-economically deprived into the 'modern' machine, reflecting the old view that social justice will trickle down from urban development's contribution to economic growth. Integration of the marginalized in an economic system that transfers wealth vertically is neither new nor transformative. Further, no measure of assessing inclusive, equitable growth is proffered. Even genuine progress indicators (GPI) are disregarded, which are well-established economic measures aimed at assessing life quality (Hamilton, 1999). By default, Habitat III tacitly endorses gross domestic product (GDP), widely understood as recording financial transactions that have harmful outcomes as positive.

Social equity

Habitat III: 134*. … to expand their potential revenue base, such as through multi-purpose cadasters, local taxes, fees, and service charges, in line with national policies, while ensuring that women and girls, children and youth, older persons, persons with disabilities, indigenous peoples and local communities, and poor households are not disproportionately affected.*

In a world where eight men have the equivalent wealth of half the global population (Elliott, 2017), ensuring that the disadvantaged are 'not disproportionately affected' does not mean a reduction in social stratification or discrimination. Projects that increase social inequities (e.g., gated communities) are typically approved as-of-right if they meet code requirements. Even in the absence of exclusionary zoning, other socially-detrimental land uses, such as casinos, occupy space. Land use is progressively becoming zero sum. The burden of evidence in development disputes rests upon those adversely affected to show why and how they are injured, despite the borderless quality of environmental impacts. This is a legacy of the view that wealth creation brings 'progress' which ultimately trickles down to everyone. In contrast, PD calls for project 'purposes' to be considered in development approvals. A Hierarchy of Innovation is provided to assess a project's net contribution to public welfare (Birkeland, 2008).

3.3. Summary comments

To review, Habitat III, or *New Urban Agenda*, is a welcome call to action. Despite an extensive list of urban design policies, however, it does not resolve the basic contradictions behind them. Decision makers are left to balance competing values and interests with conventional methods and strategies. This is the 'fallacy of the middle', where solutions fall outside the spectrum created by traditional

dualisms. Existing physical and institutional structures cannot correct the problems with which they co-evolved. Since customary incremental approaches do not deal with sustainability imperatives and barriers, the question is whether gaps in policy are plugged by implementation strategies and incentives schemes. The primary instrument for improving sustainable design quality is now green building rating tools, so they are briefly described first. Then a leading-edge urban biodiversity design tool, the BCS (biodiversity credit scheme; see section 4.1), is examined to see how it addresses the ecological deficits that are ignored in contemporary urban policy.

4. Green building rating and marketing tools

Green building rating and marketing tools are industry-led, membership-based, voluntary accreditation schemes. They were introduced from 1990 by green building councils that emerged in response to the growing reach and complexity of building and planning codes and environmental impact assessments. Rating tools certify designs that promise high operational efficiency and healthier living environments. They have elevated the status of sustainable design in the building industry, and spawned a variety of tools for predicting the performance of designs. Their use has grown rapidly; for example, there were 1,715 Green Star certified buildings in Australia by 2018. Being voluntary, however, most construction is not affected. Also, the priority has been on uptake by developers, so they raise the bar slowly. Many cities have now added industry-led rating tools to their development approval processes. This means that local governments have begun to (figuratively) deputize the private sector to establish and verify design standards.

The early rating tools focused on energy and resource efficiency, since efficient equipment, insulation, water recycling, healthy materials and so on, benefit investors and owners financially. They eventually pay back through operational savings, status and branding. However, resource efficiency can only delay environmental destruction. While rating tools have gradually included more social and environmental criteria, they still only count improvements over contemporary site conditions, conventional buildings, or construction management practices. They do not compare building proposals against sustainability standards. Also, rating tools do not count the cumulative ecological losses caused by certified green buildings. That is, they do not aim to be better than no building at all. Moreover, since project proponents only need to gain a certain number of points across a range of categories, they can pick the low-hanging fruit. Thus, as was noted years ago, some highly-ranked buildings only achieved average energy efficiency (Newsham et al., 2009).

Regarding policy gaps, rating tools almost never address urban-rural imbalances, rectify poverty or inequities of economic opportunity, increase ecological carrying capacity or net biodiversity, provide local food and water security, or access to basic needs, physical safety and essential services. Further, they generally only count operational (post-construction) impacts, omitting embodied materials, energy, water and waste. Despite occasional language like 'public benefits', 'net gains' or 'positive', they do not contemplate or measure net-positive contributions to the surrounding social and ecological conditions. When rating tools omit negative impacts and label reductions as 'net positive', they effectively label less harmful features as sustainable. In effect, they grant 'indulgences' to unsustainable projects and delay change. Interestingly, by using systems boundaries and thresholds to exclude remote impacts, rating tools simplify the analyses, but bypass environmental impact assessment. The proposed BCS (biodiversity credit scheme; see next section) begins to reverse this by including several kinds of environmental impact assessment, 25 years later.

4.1. The Green Star biodiversity credit scheme

The Australian Green Building Council's *Land Use & Ecology Category Review* proposes a biodiversity credit scheme, or 'BCS'. The BCS aims to incorporate ecological issues into the Australian 'Green Star' accreditation scheme. It is intended to go beyond other rating tools to improve biodiversity and ecological outcomes in the urban environment.

The proposal includes an appendix on urban biodiversity in general. It is arguably the most advanced biodiversity component in a rating tool so far, as most simply promote the use of surrogates like ground-level 'permeability' or species 'richness' (number of targeted species) in broad terms. A key question is: would the BCS increase biodiversity in a whole-system sense, or just relative to what was there before with or without a new building? Like Habitat III, the BCS is abridged here and is subject to modification, so current versions should be inspected. First, a few preliminary observations should be made.

The BCS proposes a key role for the community in identifying ecological values, in part to inculcate a 'human-nature connection'. First, the value of ecosystem services as currently perceived by humans is not a reliable measure of worth. Second, this implies that environmental protection must wait for environmental awareness or cultural change. While public engagement and awareness-raising is vital, the potential role of the physical environment in social transformation has been overlooked (Birkeland, 2014). Cities designed to feel and function like living landscapes could arguably increase ecological awareness more than an impending sense of loss. Another concern is that most rating tools simply add up points, and the BCS does not appear to do otherwise. Since the BCS assesses the categories of protection, impact minimization and enhancement separately, a project may get enough points for the 'assessment activity' required for each of these categories without achieving on-ground positive outcomes.

4.2. BCS (biodiversity credit scheme) proposed actions and outcomes

The BCS desired *outcomes* are to: increase the amount of green spaces in cities; increase biodiversity to ensure the healthy functioning of ecosystems; connect landscapes and habitat to support biodiversity; create links between natural and human-made landscapes to support biodiversity and ecological function; promote responsible restoration of the environment not just locally, but for the surrounding landscape. The desired *actions* are: the selection of sites within current urban boundaries or sites with limited initial ecological value; early engagement with local governments to promote aligned responses to increase urban biodiversity; the protection or enhancement, including creation, of any environmental qualities of the site; the creation of habitats and ecosystem services on-site and across the landscape that increase the resilience of the city; and the consideration of the use of ecological offsets to further promote land or ecosystem restoration domestically. The principles for awarding *credits* are each summarized and then discussed below.

'Protect ecological value'

Protect ecological value by using sites with limited ecological value, reusing previously developed land, remediating contaminated land, avoiding ecologically-sensitive land, and protecting existing ecological features on sites or borders during site preparation and construction. A high-level and timely 'baseline assessment' should identify, map and assess terrestrial and aquatic habitats to determine: their recovery potential; opportunities for protection and restoration; adjacent and connected habitats and values; distance to significant biodiversity values; direct and indirect site impacts; and functional and structural connectivity requirements. A 'biodiversity management plan' should then be undertaken to protect and improve ecological values on site and at local and regional scales. (Note that this provision actually concerns landscapes, not buildings.)

Discussion: This provision does not preclude non-certified, ecologically-damaging projects on or near ecologically-sensitive sites. Such projects do not pay for green building certification and are not subject to these criteria. Any building and landscape construction, even if on remediated land, uses manufactured products that usually involved the fragmentation of native species habitats and reductions of the natural environment. Moreover, this credit applies mainly to new buildings. In a new development, the addition of green spaces and/or links to existing habitats would seldom compensate for the ecological damage caused during construction. PD, in contrast, suggests that (otherwise unavoidable)

negative construction impacts could be offset by retrofitting other buildings with building-integrated eco-services and biodiversity nurseries.

'Minimize ecological impact'

Minimize ecological impact by limiting changes to on-site ecology that have indirect or offsite ecological impacts, promoting retention of ecological values, and conducting an 'offsite impact assessment' that maps the condition of local and regional terrestrial and aquatic habitats. To demonstrate impact minimization, a 'baseline assessment' and a method 'with metrics' is required for measuring pre- and post-construction changes in biodiversity: the percentage improvement of the site's ecological value from time of purchase to after construction. This should include the permeable surface areas for rainwater drainage and reduce run-off, and a detailed 'habitat assessment' that lists habitat types, site condition, site context and connectivity, existing and potential species and their habitat requirements.

Discussion: These assessments focus on the ecological values of the old and new landscape around buildings from time of land purchase. Again, relying on landscaping to increase ecosystem functions and services will seldom compensate for the building's physical footprint (ground coverage), let alone the ecological footprint. More landscaping and permeable surfaces on leftover ground areas are not sufficient to increase nature beyond even pre-construction conditions. Also, on smaller projects, ecological assessments of landscapes can be impractical, so certification will not likely be sought. Where biodiversity losses in the construction lifecycle cannot realistically be calculated, a PD rule-of-thumb is that the volume of new ecological space in buildings should equal the gross floor area.

'Enhance ecological value and biodiversity'

Enhance ecological value and biodiversity by allowing off-site actions that provide "additional' benefit, while prioritizing on-site biodiversity actions and management practices. The minimum requirement is conservation of existing high-quality biodiversity values and a measurable expansion of urban biodiversity values. Enhancing and creating onsite ecological values may require that the 'additional benefit' of offsite actions improve onsite and offsite connectivity. Value creation is achieved by structures that create habitats, such as nesting boxes, green roofs and bio-swales. A 'biodiversity management plan' should assess the change from pre-construction conditions, consider off-site ecology, show evidence of public engagement and recommend actions to facilitate connectivity in the local area, as agreed with local authorities and ecologists.

Discussion: Improving the pre-construction ecological conditions on an old urban building with no surrounding open space could provide an excuse to replace rather than retrofit a building, causing toxic demolition waste. There is no reference to incorporating building-integrated ecological space, beyond 'nesting boxes, bird boxes, artificial chimneys' (designed to exclude predatory species is omitted). Suggested 'ecological enhancements' include offsite connectivity improvements like 'amphibian tunnels under highways' and green roofs or walls. Facelifts cannot compensate a new multistory building's addition to material flows; however, some tall double-skin buildings have dedicated entire floors to gardens (for ventilation purposes, not biodiversity). PD would compare the new building and retrofit options as if neither structure yet existed.

'Connect ecological networks'

Connect ecological networks by maintaining corridors across the landscape to minimize long-term impacts, ensure structural and functional landscape connectivity and increase species cover and richness. Ecological patches should be connected, barriers to connectivity reduced, and/or existing green chains, corridors or habitat 'stepping stones' should be extended. A 'landscape and habitat plan' should recommend actions to support an increase in biodiversity, to establish and maintain ecological networks, and measure the level of connectedness and changes in species richness, both onsite and offsite, over time. The landscape plan should establish pre-construction conditions to set biodiversity enhancement benchmarks based on changes from the baseline (time of purchase) using 'appropriate' metrics and thresholds for measuring improvements.

Discussion: Connectivity is vital to biodiversity protection. However, green corridors can be tokenistic or even ecologically problematic. Measuring connectedness and species richness does not control disease or invasive species. Thus, urban ecosystem enclaves and biodiversity incubators are also necessary to reseed the bioregions. All buildings should eventually be retrofitted with above-ground natural landscapes so that cities become a living landscape. Where buildings cannot be eco-retrofitted, selected sites could be converted into parks or multilayered biodiversity preserves. Development rights could then be transferred to other properties in more suitable locations (Register, 2006). However, where offsite buildings are retrofitted for net-positive offsetting purposes, PD recommends that the net impacts of both projects should be tallied.

'Manage on-site and restore off-site'

Manage on-site and restore off-site enhancements by establishing an adaptive management framework for urban ecology in the local and regional area to ensure the long-term management of biodiversity, habitats and landscapes through on-going maintenance or improvements, and monitoring and 'performance evaluations' to establish, maintain and improve biodiversity values, habitats and ecological networks. This involves 'long-term reporting' and collaborative arrangements with key stakeholders. The participatory, adaptive approach is expected to result in future conservation actions and landscape interventions. Offsite compensation should not substitute for on-site actions and should be carefully managed, monitored and evaluated. (Note: 'offsetting' concerned many BCS participants because it has been used to permit the destruction of relatively pristine environments.)

Discussion: The BCS recognizes that offsets can be tokenistic. Offsite restoration activities seldom compensate for the full lifecycle impacts of construction works, and there is usually a net loss in nature. Restoring damaged offsite ecosystems should not absolve developments for negative onsite impacts. Nevertheless, offsetting systems are essential. PD therefore calls for 'net-positive biodiversity offsetting' (Birkeland, Knight-Lenihan, 2016). For example, substituting monocultural agriculture with vertical urban/rural plant farming could restore vast amounts of land to near-native conditions while saving resources and reducing net impacts. While restoring farmland to native conditions does not increase ecological space beyond pre-human conditions, it may qualify as net positive where combined with building-integrated biodiversity incubators and enclaves.

5. Conclusion

In conclusion, current sustainable built environment policy declarations such as the *New Urban Agenda*, and implementation schemes such as the Green Star biodiversity credit scheme, as presently conceived, will not deliver the basic physical prerequisites of ecological sustainability and socio-economic justice. Managerial approaches that seek incremental improvements upon unsustainable development templates, or at best restorative actions, will only achieve 'less bad growth'. Ambiguous notions of balance, resilience, engagement, connectivity, regeneration and flexibility can be claimed by almost any development. More awareness, management and accounting activity does not translate into proactive strategies or direct design action, let alone lead to the systems change that sustainability requires. Since there are irreconcilable differences between human constructs and biological ecosystems, the former must change. To this end, PD proposes a set of fixed sustainability standards along with different systems of design, planning and decision-making to realize an ecologically- and socially-positive urban living environment (1).

Note

(1) This article is part of the 40th issue of *Bulletin of Geography. Socio-economic Series* entitled "Sustainability—differently", edited by Mirek Dymitrow and Keith Halfacree (Dymitrow, Halfacree, 2018).

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