Millennial Pivot: Sustainability-Purposed Performance Zoning Guidelines in Urban Commercial Development

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# MILLENNIAL PIVOT: SUSTAINABILITY-PURPOSED PERFORMANCE ZONING GUIDELINES IN URBAN COMMERCIAL DEVELOPMENT

Michael N. Widener*

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I. Introduction

In this paper I argue that economic competitiveness compels cities and towns to reimagine their zoning codes by incorporating technology advances to implement resource sustainability in commercial real estate development. I further argue that the optimal means to accomplish this is by resuscitating performance zoning, thereby engineering resolutions to problems stemming from increased urban core development intensity in transit-oriented and other high-density zoning districts. This initiative is optimal because urban development communities have a better grasp of means for mitigating negative externalities than does the “bureaucratic state.” This paper argues that the goal of community competitiveness to lure Millennial-managed enterprises to occupy and own resource sustainability – focused realty projects in urban centers is advanced by implementing performance zoning conventions. This paper proceeds in Part II by reviewing land use tenets of community competitiveness; in Part III by describing the Millennial generation’s identification with sustainability benchmarking and its implementation; and in Part IV by describing technology devices and Millennial interest in their incorporation in commercial projects driving a new era of sustainable building performance in competitive cities. Part V explores how performance zoning induces municipal sustainability gains while incentivizing private developers to leverage sustainability to grow profitability and their institutional reputations; and Part VI reminds readers that technological innovation in design tools and monitoring systems enables Millennials to design and build projects sustainably.

*© 2015, All Rights Reserved by the author, Adjunct Professor, Arizona Summit Law School, Zoning Adjustment Hearing Officer, City of Phoenix, and Of Counsel, Bonnett, Fairbourn, Friedman & Balint, P.C. This paper is for the late Michael J. Curley, Esq., a fine land use lawyer, civic leader and ever-generous man and for Humberto Hidalgo Espeleta, sustainability jefe in Tortuguero, Costa Rica.

I use the term “natural resource sustainability” in this Part I to distinguish it from other “definitions” of what has become an overused and badly-understood term addressing efficiency at times but nurturing our planet at others. See, e.g., A New Green Wave, ECONOMIST SCHUMPETER, Aug. 30, 2014, http://www.economist.com/news/business/21614152-few-pioneering-businesses-are-developing-sustainability-policies-worthy-name-new (“Sustainability can refer to anything from building wind farms to combating social inequality. The idea crops up everywhere from Starbucks to the deliberations of the United Nations (whose governments are in the middle of working out a set of so-called Sustainable Development Goals for 2015-30). An ill-defined, controversial notion is no basis for coherent policy.”)
and to control and modify buildings’ sustainable features and systems indefinitely, so long as developers and end-users are aided by enlightened, flexible, local spatial regulatory policies.

II. Community Competitiveness Themes

Cities compete in many realms. In the United States, municipal competitive focus usually rests on economic development: competing with peer communities to attract businesses that grow the tax base. More recently, however, great importance in competing is placed on enticing businesses that provide employment base growth to open in a community – in other words, recruiting jobs generators. Specifically of late, urban competitiveness mavens trumpet the need to increase cadres of “knowledge workers,” possessing the skills sets to lead innovative companies or to form new companies employing workers in long-tenured jobs paying decent salaries and benefits. Following the recession of the later years of the 21st Century’s first decade, the challenge of replacing living-wage jobs was amplified by increased automation as workplace proxies for human labor.

Much writing describes the basic recipe for community competitiveness. Richard Florida, for example, made a career from opining that the key to economic development is luring a subset of knowledge workers (primarily, though not exclusively, Millennials) he calls the “creative class.” These individuals, Florida supposes, will enable startup enterprises in urban areas to drive productivity and incomes, as this class has a “substantial effect on regional economic growth.” He populates his hypothetical creative class from persons with skill

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categories characteristic of knowledge-intensive industries producing new ideas and products arising from creative problem-solving. Luring these persons to a city turns on provision of four elements: Technology, talent, tolerance and territorial assets, the last of these constituting an attribute of place. Florida argues that these elements, quality of place not the least, must be augmented by communities determined to lure a talent pool of creative persons working for innovative companies or inventing their own businesses models. These persons and their tastes in cities contribute mightily, many pundits believe, to a community’s jobs growth, thereby attracting even more creative people to the mix of residents through promoting high value-added, information-based work opportunities.

Florida’s call to compete for creatives spawned city rankings on quality of urban life, several of them grounded in sustainable development, confirming that environmental sustainability is a core dimension of municipal competitiveness today. SustainLane’s U.S. City Ranking, performed by a “green media company,” evaluated major American cities for several years on their livability based partially on their ecological footprints. This ranking assessed a city’s ability to maintain healthy air, drinking water, parks and public transit systems, as well as promoting through, among other things, planning and land use policy, a robust sustainable local economy featuring green building, farmers’ markets, renewable energy and alternative fuels.

effects economic growth independent of a community’s endowment of human capital. See, e.g., David McGranahan and Timothy Wojan, Recasting the Creative Class to Examine Growth Processes in Rural and Urban Countries, 41 REG’L STUD. 197, 216 (2007).

Florida 2014, supra note 4, at 197.

Florida refers to this alternatively as “quality of place,” see Florida 2014, supra note 4, at 203. It consists of the dimensions of combined built and natural environment, or “setting”; the diversity of dwellers in the community; and the vibrancy of street life, see id.


See Hu, supra note 8, at 1842. The indicators most pertinent here are conservation and quality of air, water, waste treatment, transport use and available green space, see id.

See PETER A. WALKER AND PATRICK T. HURLEY, PLANNING PARADISE: POLITICS AND VISIONING OF LAND USE IN OREGON 158-9 (2011). SustainLane ceased ranking cities after Warran Karlenzig left that organization. Another ranking recently was conducted by Mother Nature Network, see ANGELA
In June 2013, The Economist Intelligence Unit ranked 120 global cities by their respective capacities for garnering capital investment, businesses, talent and visitors, looking at eight thematic indicator categories of competitiveness, one of which is “environmental and natural hazards.” Additionally, the 2015 ARCADIS Sustainable Cities Index, conducted by the Center for Economics and Business Research ranking 50 cities in 31 countries, assumed three dimensions of sustainability – the demands of societies, economies and environment, or “people, profit and planet.”

Community administrators are heeding these gurus and “evaluators” of competitiveness. One adherent, former New York Mayor Michael Bloomberg, has opined that “talent attracts capital,” and that “a city that wants to attract creators must offer a fertile breeding ground for new ideas and innovations.” Regions in other nations are intrigued as well by this formula; municipalities and alliances of communities now market themselves as vibrant centers of creativity and the knowledge economy, acting to strengthen their profiles in these respects. Among other initiatives, they employ incentive programs for creative and knowledge-intensive

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**11** See **ECONOMIST INTELLIGENCE UNIT, HOT SPOTS 2025: BENCHMARKING THE FUTURE COMPETIVENESS OF CITIES**, 5, 21 (2013), available at http://www.citigroup.com/citi/citiforcities/pdfs/hotspots2025.pdf. According to this report, Chicago ranks first among American cities on its “environmental governance and ability of dealing with environmental challenges.” *Id.* at 8. Five percent weight was allocated to the survey benchmark for “environment and natural hazards,” *id.* at 22; this presumably is a reference to municipal resiliency policies and initiatives.

**12** See **JOHN J. BATTEN, 2015 ARCADIS SUSTAINABLE CITIES INDEX**, https://s3.amazonaws.com/arcadis-whitepaper/arcadis-sustainable-cities-index-report.pdf. A forward, guest-authored written by Eugenie L. Birch, offers that “as this index demonstrates, the more sustainable an urban area is, the higher the quality of life, greater prosperity and lower per capita greenhouse gas production it possesses.” The “planet” sub-index rates city energy consumption and renewable energy share, recycling rates, greenhouse gas emissions, natural catastrophe risk, drinking water, sanitation and air pollution. *Id.* at 1.


**14** See Bontje and Musterd, *supra* note 7, at 844.
industries. One popular initiative is to build or repurpose centrally-located commercial properties to establish “creative” milieus.

Some observers scoff at these endeavors, alleging the public sector’s concurrent pursuit of competing policy agendas of “competitiveness” and “sustainability” is fraught with obstacles unless pursued beyond urban institutional boundaries into the regional realm, incorporating principles of “smart growth” as a vehicle for collaborative, multi-municipal policy-making. Tassilo Herrschel, for one, argues that regional coordination allows sustainability to be presented as a core economic quality and community bedrock, demonstrating that combined municipal endeavors are “smart” and, therefore, appealing to the creative class. Other pundits hold that urban competitiveness merely has evolved from its economic growth-centeredness to incorporate multiple city “performance” dimensions inviting to business operations, with environmental sustainability being consequential if not dominant among these attributes. Therefore, when urban competition focuses on attracting capital, businesses, talent and visitors, the community’s environment is a determining factor. When competitiveness focuses on property – linked business strategies, ecological footprint and environmentally-responsible land

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15 Id. at 845.
16 See id. These authors observe that EU nations on the local level at present are more cautious in policy development to be “all in” where creative person attraction is concerned; they prefer instead to build economies in which when a particular sector’s failure does not bury the region it is offset by other, better-performing sectors, see id. at 849. There is anecdotal evidence that the Europe faces challenges in fostering the “startup culture” in many communities, as educated Millennials seem more attuned to entering more conservative, “institutional” employment than to risk-taking enterprises, see Tom Fairless, Europe is Struggling to Foster a Startup Culture, WALL ST. J. TECH BLOG May 18, 2015, 7:34 P.M. EST, http://www.wsj.com/articles/europe-is-struggling-to-foster-a-startup-culture-1431992065?tesla=y.
17 See Tassilo Herrschel, Competitiveness AND Sustainability: Can “Smart City Regionalism” Square the Circle? 50 URB. STUD. 2332, 2333, 2338 (2013).
18 See id. at 2340, 2345.
19 See id. at 2342; Hu, supra note 8, at 1852 (noting that regionalism fuses competitiveness and sustainability through policies advocating for innovation, collaboration and co-ordination). Herrschel views regional scale as a “mediating platform” addressing local and global considerations of competitiveness and sustainability policies, see Herrschel, supra note 17, at 2344.
20 See Hu, supra note 8, at 1840-1.
21 See id. at 1841.
development policies herald success.\textsuperscript{22} The question is how best to plan and execute policies driving such public goods.

One enduring recipe for community competitiveness is for their governments’ administrations to abandon hierarchical structure in favor of enabling “institutions that promote a decentralized process of industrial self-organization without sacrificing individual autonomy or flexibility.”\textsuperscript{23} Annalee Saxenian’s regional network formula, along with her postulate that encouraging emigrant “brain circulation” (in opposition to fearing “brain drain”) results in increased domestic economic opportunities,\textsuperscript{24} dovetail with Florida’s creative class thesis, as entrepreneurial knowledge-workers are independent, diverse and variety-seeking persons in their leisure and working lives as well as being nimble in migrating.\textsuperscript{25} These economic development credos dictate that optimal policy direction in land use administration more resembles a partnership approach between government actors and private sector players, underscoring “civic cooperation.”\textsuperscript{26} In this partnership approach, these joint communities’ citizenry will be included in the sustainability conversation for optimal resulting policy initiatives.\textsuperscript{27}

\begin{footnotesize}
\begin{enumerate}
\item See id. at 1841. An “ecological footprint,” Hu observes, is the measure of the quantity of land needed to supply those resources demanded to sustain local residents, see id. at 1845.
\item ANNALLEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128, 165 (1996). Otherwise stated, the logic of urban competition is to make regulations as “light as possible” and administrations business-friendly, so as to position cities as “change agents, not just social structures.” See North and Nurse, supra note 8, at ¶8. North and Nurse’s statement of the municipal task, in response to climate change and resource depletion is to “bring public, private and community-based actors together to develop a consistent urban narrative of place and a governing coalition enabling it to be successfully delivered.’ Id.
\item Begg, supra note 2, at 807.
\item See Kent E. Portney and Jeffrey M. Berry, Participation and the Pursuit of Sustainability in U.S. Cities, 20 URB. AFF. REV. 1, 3 (2010) (arguing for citizen “buy-in,” as such initiatives and policy statements cannot “simply be orchestrated from the top, even if some sustainability experts would wish it so.”).
\end{enumerate}
\end{footnotesize}
Civic cooperation optimally occurs on a regional, rather than on a municipality-by-municipality basis, including in sustainability matters. In part this is because (as recent studies indicate) two subsets of "creative class" businesses exist, those focused in the arts and those in science and technology. The latter are typified by established firms with campus-like offices and lab buildings adjacent to highway access in lower-density suburban locations. The former, downtown-focused creative businesses (graphic design, advertising, galleries, software firms etc.) tend to develop in store-front rental spaces and converted industrial brick-and-beam buildings with bike racks and a streetcar stop nearby along vibrant, walkable streets nearer to where these creative workers live. Millennials in this subgroup of the creative class are dispersed among dense urban cores, exurbs or suburban centers and quieter neighborhoods. Moreover, the regional impacts of ecological footprints transcend fixed municipal political boundaries, so cooperation must be obtained across community lines in view of the need to bargain with other municipalities and neighborhoods or to overcome factionalism.

III. Knowledge Workers, Millennials and Sustainability

28 See KAREN CHAPPLE, PLANNING SUSTAINABLE CITIES AND REGIONS: TOWARDS MORE EQUITABLE DEVELOPMENT 30-35 (2015), Herrschel, supra note 17, at 2340, 2345; SAXENIAN, supra note 23.
30 Id. at 896. Thus, large tech companies like Google, Facebook, Yahoo, Ebay, and so on occupy sprawling, campus-like office parks in Silicon Valley. However, one of the fastest-growing software companies today is Salesforce, a concern that started out of urban shared spaces in San Francisco; while Google opened an office in Manhattan. One must not place too much emphasis on these contrasting sub-regional geographies, because there may be explanations beyond left-and right-hemispheric function, such as affordability of workspace for the functions of the companies engaged in knowledge work and the availability of types of housing that Millennials desire. See URB. LAND INST., AMERICA IN 2015: A ULI SURVEY OF VIEWS ON HOUSING, TRANSPORTATION AND COMMUNITY ii, 11 (2015) (Millennials say they want single family homes, and ¾ of their number plan to move from smaller quarters in the next few years).
32 See Portney and Berry, supra note 27, at 3-4.
33 See id. at 4-5.
A. Millennial Sustainability Sensitivity

This Part describes the objects of the considerable community investment in attracting highly-skilled digital savants. Knowledge workers and other Millennials, and perhaps Generation Z shortly to enter the workplace, know the salience of sustainability without being committed to the planet’s salvation. Indeed, recent research indicates Millennials think “sustainability” refers to a consumer product’s longevity, rather than linking sustainability with energy conservation or ethical trade (as a sustainable business model). Millennials respond

34 Incessant references to “sustainability” have led to public fatigue with the term, but the one used here is natural resource-based only. Sustainability exists where the use of materials and technologies in the construction of offices and their neighborhood contexts (such as common areas), and the exploitation of the surrounding environments, that does not overtax or deplete the relevant ecosystem’s capacity to regenerate resources. See OUR COMMON FUTURE: REPORT OF THE WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, Chapter 2, Introduction, paragraph 1 http://www.un-documents.net/ocf-02.htm. (“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”).

35 “Millennials” are categorized as those with birth years ranging from and after 1980 to the early 2000s, generally speaking. For data on this generation, see Samantha Raphelson, Amid the Stereotypes, Some Facts About Millennials, NPR NEW BOOM, Nov. 18, 2014, 5:23 P.M. ET, http://www.npr.org/2014/11/18/354196302/amid-the-stereotypes-some-facts-about-millennials; PEB RESEARCH CENTER, MILLENNIALS: CONFIDENT. CONNECTED. OPEN TO CHANGE. 4 (Feb. 2010). “Generation Z,” so called, consists of persons born between the commencement of this century and the date of publication of this paper; a rule of thumb is that such persons barely are entering the American workforce. Some view Gen Z as a subset of Millennials, a “tail end of the generation” cohort. Differentiating between them is inexact science, but Millennial “elders” adapted to successive digital computing advances, while Gen Z members were born (in developed nations) into an environment richly populated with digital devices that are their instant and constant companions; also, Gen Z appears more heavily committed to continuous use of social media, see generally DELOITTE, MIND THE GAPS: THE 2015 DELOITTE MILLENNIAL SURVEY (2015).


38 Likely this Millennial reaction is due to the fuzziness of the concept of sustainability, together with the complexity of implementing sustainable development, given the vague and (until lately)
better to direct, concrete calls to environmental action, such as saving electricity or reducing water consumption, than to more general messages about the environment.\textsuperscript{39} (But Millennials seem not prepared to sacrifice consumer product quality in the name of sustainability, some research shows.)\textsuperscript{40} Frequent calls for action reversing or arresting climate change seemingly fails to resonate, in part from perceptions that there are few (if any) individual actions that will make any difference in reducing greenhouse gas emissions.\textsuperscript{41} This reality stems from the realization that whatever its cause or velocity, global warming cannot be reversed.\textsuperscript{42} In truth, many Millennials, even those more enlightened about carbon footprint and similar principles, are sufficiently distanced from the places (those denaturing – threatened flora and fauna habitats) where the greatest ecological damage results from human consumption habits that they seem hardened.\textsuperscript{43}

While not experts, Millennials know that the built environment contributes greatly to global energy use and greenhouse gas emissions,\textsuperscript{44} especially when fossil fuel energy powers immeasurable facets of the concept at its intersection with land use planning, see Walter Musakwa and Adriaan Van Niekerk, Implications of land use change for the sustainability of urban areas: A case study of Stellenbosch, South Africa, 32 CITIES 143, 144-5 (2013).

\textsuperscript{39} See David Benady, What Really Inspires Millennials to Live More Sustainably? The GUARDIAN, Dec. 22, 2014, http://www.theguardian.com/sustainable-business/2014/dec/22/what-really-inspires-millennials-to-live-more-sustainably. Benady cites work by Olivier Oullier, see, e.g. SMI, CASE STUDY EYE TRACKING & EEG: SUSTAINABLE CONSUMPTION, available at http://www.smivision.com/fileadmin/user_upload/downloads/case_studies/smi_cs_wef_sustainable_consumption_etg.pdf (last visited July 31, 2015) (Millennials have no common concept of “sustainability” but understand messages that break down the concept into elements they make sense of, such as saving energy or polluting less; and sustainability does not just mean “green”, so companies can also focus their messaging on the utility of products (in quality and durability)).

\textsuperscript{40} See id.; Katherine Taken Smith & Tracy R. Brower, Longitudinal study of green marketing strategies that influence Millennials, 20 J. STRATEGIC MKTG. 535 (2012).

\textsuperscript{41} Jonathan Franzen, Carbon Capture: Has Climate Change made it Harder for People to Care about Conservation? NEW YORKER Apr. 6, 2015, at 56, 59; but see TOMORROWLAND, Walt Disney Productions/A113, 2015, available at www.thescr iptlab.com (observing that optimism about the future combined with humankind’s ingenuity are as consequential in rescuing the planet from environmental calamity as are facts of the moment).

\textsuperscript{42} See Franzen, supra note 41, at 60; Franzen’s argument in part is that since climate-related actions produce no discernable result, they are eschatological, at best postponing the inevitable, see id. at 63.

\textsuperscript{43} See id. at 64.

\textsuperscript{44} See Morley Winograd and Michael D. Hsis, Millennial Momentum: How a New Generation is Remaking America, 230-34 (2011).
commercial buildings. Accordingly, they know that so-called green buildings (also referred to as green-intent buildings) by definition reduce their environmental impacts by using less energy in their construction and operation. Buildings featuring natural ventilation capabilities (contrasted with centralized climate-controlled buildings with HVAC), for example, are typically acknowledged as “green” buildings. Green buildings have greater thermal variations compared to their 20th Century counterparts in which centralized HVAC provides static indoor temperatures to its occupants all-year round. According to some researchers, green building users are more forgiving of their buildings; apparently, “green” buildings best are meshed with “green” occupants, since those expressing higher levels of environmental sensitivity were more accepting of occasional temperature discomfort.

The major green office building attributes in demand by today’s American indoor workers, from those few research findings in the United States, are:

a. Natural light availability in the building’s interior;

b. Conveniently located public transportation;

c. Good building indoor air quality (“fresher” air); and

d. Temperature control,

suggesting that people dominate over profit motives in green building consumer value measures.

This sampling of opinion is supported in larger-scale surveys. Consultant GVA Project Control Group Pty. Ltd. (PCG), an independent corporate real estate, design and project

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47 See Deuble & de Dear, supra note 45, at 26.
48 See id.
49 See Simons, supra note 46, at 213, describing the “people-oriented benefits” deemed most important by those surveyed.
50 See id. at 221-2. This was a small sample of 48 “focus group” participants (within seven focus groups interviewed in four American cities, see id. at 221).
51 See id. at 222. Notably, a building’s LEED certification status was not highly rated nor were such elements as availability of bicycle racks, recycling of refuse and water conservation. See id.
52 See id. at 223; see also text at note 12, supra.
management partner for leading Australian tenant and owner-occupant employers, interviewed 2,400 employees in 20 businesses in 2011. After analyzing the resulting responses, PCG identified six critical criteria for optimal 21\textsuperscript{st} Century built-workplace conditions:

1. Environment, defined as comfort afforded by light, views, air quality and temperature;
2. Privacy, both acoustical and visual, allowing for concentrated work within or outside the “personal workspace”;
3. Amenity, including the quality and number of staff facilities easing working at unconventional times;
4. Flexibility, accommodating growth and changing team structures with minimal cost and work disruption;
5. Image, reflecting the culture and values of the particular workplace; and
6. Interactivity, conveniently affording opportunities to meet colleagues in myriad workplace environments.

Three of the six criteria (environment, flexibility and image) identify closely to sustainability concerns among this youngest workforce generation, which, by 2025, will constitute as much as 75\% of America’s workers. Yet even if later-stage Millennials were entirely indifferent to


environmental causes and persistent challenges accompanying greenhouse gas emissions, they still would champion two dimensions of building performance in urban core workplaces they occupy. The first dimension is their obsession with technological devices, while the second is the relationship between aesthetics and the built environment. I consider the latter aspect initially.

B. Aesthetics of the Built Environment

Aesthetic is consequential in youthful consideration of workplace sustainability. The psychology of consumerism in technology products reflexively endorses “the latest thing,” to be sure. But the experience of young adults’ use of products transcends mere gadgetry and mass psychology of consumption. Millennials’ consumerism (especially in the “green ethos”) favors beauty and simplicity over functionality in use of tools and technology services. A hierarchy of virtues was advanced by Steve Jobs, a guru in the technology sector among older Millennials. Jobs’ hierarchy demanded that the consumer’s environment must integrate, in a digital-hub environment, her primary digital device to a variety of portable tools that seamlessly manage

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56 This paper heavily emphasizes office building and similarly-structured, whiter-collar work environments. Common commercial building workplace types also include industrial buildings, portions of college and university plants, hotels and motels, and retail projects. I do not ignore these alternative workplaces as potential loci of sustainability in construction and building management; but these other building types, generally being dispersed across larger floor plates, typically do not house as many individual full-time employees per square foot of floor area as do offices. While first-class hotel managements (and their owners) fawningly cater to visitors, in the process lifting the employee “boat” in sustainability matters, industrial building developers are less so inclined. (Industrialist indifference to health matters was the genesis of Euclidean zoning, after all.) Retail buildings house temporarily shoppers and educational institutions house temporarily staffs and students, and their employee occupants usually are more transient than office workers in the U.S. For discussion of retail property sustainability issues, see Karla Zens, Retail Sustainability: Do Shoppers Even Care? NAT’L REAL EST. INVESTOR, Feb. 26, 2015, available at www.nreionline.com (citing a Forrester Research, Inc. study involving retail center sustainability).


58 See, e.g., NIGEL WHITELEY, DESIGN FOR SOCIETY 61 (2006) (“technology makes the new model possible and so it is self-evident, according to the logic of consumerism, that we should want to possess it.”).

59 See id. at 60.
digital content. For Jobs, the plugged-in devices, like the hub itself, must foremost be objects of beauty. Aesthetics of design was the highest virtue in the Jobsean hierarchy, surpassing “friendliness” of the devices to the user, the second highest virtue. After beauty and simplicity (or friendliness) came functionality, in Jobs’s ecosystem of digital integration. Computing capacity yielded, as needed, to more compact dimensions, to an “insanely great” interface and to affordability. Jobs understood that the value proposition in technology products had less to do with functional capability than with presenting a compelling package, and this philosophy permeated America’s consumer psyche. In so influencing the masses, Apple’s products captured worldwide public imagination.

Older Millennials in management and digital natives soon to enter the workforce will increasingly apply this hierarchy to the built environment. Consequently the aesthetic experience of the future workspace must exceed livability, in pursuit of “greatness.” If the hub of the live-interaction working environment is interior space, then maneuverability around the space, and ease of communication with all those sharing that space, become paramount virtues. Functionality is identified with these initial two factors; however, the seamless technological

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60 See WALTER ISAACSON, STEVE JOBS 373 (2011); Walter Isaacson, American Icon, Time, Oct. 17, 2011, at 35 (hereinafter, “Time Essay”). For this reason, Jobs resisted allowing Apple software running on another company’s inferior hardware, or unapproved applications running on an Apple device. Id.

61 However, Jobs believed that aesthetic tastes could be taught, and that it was Apple’s job to teach the consumer aesthetics, see WALTER ISAACSON, supra note 60, at 265.


64 See ISAACSON, supra note 60, at 110-11, 166, 169.

65 See id. at 71, 173.

66 See id. at 160.

67 Cf. Quentin Hardy, The Monuments of Tech, N.Y. TIMES TECH. Mar. 1, 2014, http://www.nytimes.com/2014/03/02/technology/the-monuments-of-tech.html?_r=0 (noting the distinctiveness of the new work spaces at the same time that they are simple and functional); Alfons H. van Marrewijk, Corporate headquarters as physical embodiments of organisational change, 22 J. ORG. CHANGE MGMT. 290 – 306 (2009) (noting interdependency of corporate architecture and organization cultural change, as corporate headquarters have become symbols of corporate change ambitions).
capacity (sufficient building tenant computing power and interior artifact presence) of the space, like sustainability elements of the project, are viewed by the employer’s Millennial management as integral to the landlord’s leasehold package.  

This hierarchy of built-environment virtues includes entrance into the building (so-called ‘common areas’ features), landscaping, “green elevators” and other environmental elements, and interior impacts of windows.

**C. Millennial Commitment to Technological Devices and their Utility**

PriceWaterhouseCooper’s paper on the connected employee experience explains why employers must align their management practices and priorities to reflect some Millennial values, and fundamentally, to increase the level of worker trust. PwC’s white paper urges engaging workers via social media tools to

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expand an employee’s capacity to engage and transact with people and information — anywhere, anytime, on multiple devices, and across organizational lines. As a result, it’s possible for employees to more easily learn about and “own” brand value and customer offerings. Employees at every level can be heard and acknowledged through dialogue and collaboration up and down and across traditional organizational reporting structures.73

So, managerial reporting of non-pecuniary corporate social responsibility and sustainability achievements to Millennial employees is crucial in recruitment and retention.74

Millennials have fused their social lives with technology objects that are data transmitters.75 The youngest members of this generation are convinced that serial advances in technology promise ever-greater efficiency in time utilization.76 A recent survey conducted by Jones Lang LaSalle, Inc. unsurprisingly noted seventy percent of Millennials desire to work with cutting edge technology.77 Nor is one fazed by the real estate development industry’s initiative

73 See PwC 2014, supra note 71, at 5. Grossi suggests that in the future live data on building air quality may be integrated with dashboards viewable by building occupants, see ERIN GROSSI, DAWN OF THE BUILDING PERFORMANCE ERA 11 (Dec. 2014), http://library.ul.com/wp-content/uploads/sites/40/2015/02/Dawn-of-the-Building-Performance-Era.pdf, (Indoor air quality has become an issue of more concern due to the publicity about toxic mold and the attending litigation, see id. at 9; see also Monika Frontczak, Stefano Schiavon, John Goins, Edward Arens, Hui Zhang, Pawel Wargocki, Quantitative relationships between occupant satisfaction and satisfaction aspects of indoor environmental quality and building design, 22 INDOOR AIR 119-31 (2012). Ironically, LEED certification can lead to a Platinum rating without any credits being awarded for air quality; and the average LEED-certified building achieves only about 14 percent of its total points for “indoor environmental quality,” see John Wargo, LEED Building Standards Fail to Protect Human Health, YALE ENV’T 360 Aug. 16, 2010, http://e360.yale.edu/feature/leed_building_standards_fail_to_protect_human_health/2306/.

74 GROSSI, supra note 73, at 6. In addition, as consumers, Millennials familiar with sensors, monitors and dashboards integrated into building systems are increasingly aware of the ways their office and retail employment venues are managed to conserve natural resources and providing occupants healthy air to breathe, see id. at 3, 12.

75 See PwC 2014, supra note 71, at 6.


77 See Chris Pesek, Want to Hire Millennial Talent? Can the Free Beer Stereotype and Take These 6 Steps, FORBES, Sep. 18, 2014 12:01 P.M.,
ensuring Millennials are educated in principles of “smart buildings” and technology elements like integrated energy management contributing to environmental sustainability.78 Indeed, the Chief Economist of Underwriter Laboratories opines that America is on the cusp of the “building performance era.”79 Ms. Grossi also states that it is the sustainability movement that “set the building industry on a new path for the future,” and that Millennials expect building automation technologies to be a fact of standard operations by the time they assume management positions in corporate workplaces:80

They understand the environmental and health challenges they are poised to inherit, and they already naturally look to their trusted technology sources to provide answers. In the midst of an Information Age, where software’s inevitable journey to disrupt and transform virtually every major industry on the planet has just begun, it is the Millennials that appear best positioned to really put technology to work to solve man’s most pressing environmental problems and achieve a higher-quality of life for the masses in the process.81

Communities that seek to be competitive in attracting knowledge workers into their urban cores as professionals and managers in commercial enterprises must encourage developers of new commercial projects to innovate for sustainability, especially by implementing smart technologies in workplaces. This makes perfect competition-driven sense, since companies in the “sustainability industry” space count on the technology savvy possessed by many Millennial


78 See id. “Smart Buildings” is a term referring to a high functioning building where a technology and human interface combines data and action to keep occupants and building owners comfortable and productive at the lowest feasible cost. See A.H. Buckman, et al. What is a Smart Building? 3 SMART & SUSTAINABLE BUILT ENV’T, 92 – 109 (2014) (such buildings address both intelligence and sustainability issues by utilizing computer and intelligent technologies to achieve the optimal combinations of overall comfort level and energy consumption).

79 See GROSSI, supra note 73, at 1.

80 See id. at 12.

81 Id.
generation members. These persons are expected to be among the key early adopters and the sophisticated consumers of innovative sustainability initiatives. Indeed, nearly half of the most “super connected” Millennials (high-frequency users of social media) believe that a fundamental purpose of business is to improve society, one metric being protection of the environment.

Sustainable communities fuse renewable energy generation and storage technologies with energy-efficient transportation, business development, job creation and authentic local social activities. And this interactivity stimulates in-migration of knowledge workers by making a compelling case for progressively more sustainable communities, growing community agility. Part IV below forecasts the role commercial buildings’ developers will play in inducing occupancy by Millennial and later cohorts of business owners and managers.

**IV. Sustainability Initiatives Promoting Performance Standards, Community Competitiveness and Building Developer Marketing Advantage**

Office and to a degree retail buildings inexorably are moving toward being self-sustaining both because the technology is developing to permit this, affordably, and because sustainability today is a principal value proposition in the commercial leasing marketplace (as evidenced by the Leadership in Energy and Environment Design certification system in America). Millennials’ apparent preference to work for companies (building occupants) with...

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83 See id.


86 E.g., WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT, *supra* note 34, at ix (sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs).

strong environmental sensitivity credentials is another source of momentum in this direction, along with developers’ tax incentives. Twenty five states and the District of Columbia have enacted so-called Property Assessed Clean Energy (or PACE) legislation under which special taxing districts finance energy sustainable upgrades to private property, including commercial buildings, by recovering the costs through property tax surcharges. Thus, market forces and tax advantages favor the shift of office and retail building developers and owners to build or retrofit projects to be self-sustaining to the degree affordable.

The staffs of commercial buildings’ occupants are more productive when feeling happier, and incorporating sustainable and environmentally responsible products and materials

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See Nancy Rothbard, Put on a Happy Face. Seriously. WALL ST. J. Oct. 24, 2011 at R2, (virtuous and vicious cycles influence the mood of employees depending on their feelings of contentment at the beginnings of their work day, and good moods impact the quality of work performed; and management will understand their desire to encounter beauty and stimulation in the work environment based on their own preferences).
into their business environments make “digital immigrants” and “digital natives” Millennial generation employees eager to produce and collaborate in atmospheres resonating with these amenities. As commitments to sustainability become deeper, the availability of “green” technologies, and Millennials’ attraction to new ways of saving fossil fuels, induce companies to seek quarters demonstrating institutional commitment to sustainability, at least in part as an employee recruiting and retention tool. Such quarters reveal not just the sense of corporate social responsibility but also reflect a company’s “edginess.” What seems to be “fringe architecture” in 2015, like Seattle’s Bullitt Center or Amsterdam’s Edge building will be dem

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93 See, e.g., LPA’s Sustainable and Collaborative San Diego Office, Office Snapshots, http://officesnapshots.com/2012/08/22/lpa-san-diego/ (depicting conversion of 1924 Wonder Bread building in San Diego to corporate quarters of architecture firm seeking a modern work environment while showcasing the building’s historic character and original materials such as grain silos and demonstrating achievable sustainability construction methods).


rigueur - even passé – as capacity increases to innovate in sustainability dimensions. Following are six areas of resource sustainability many commercial projects implement to achieve energy efficiency and, in that process, entice Millennial business owners identifying strongly with sustainability initiatives.

A. Bringing the Outside Indoors

Ground level green space often is lost in urbanized cores as a result of high-density developments. At the same time, most humans seek to surround themselves with living vegetation, a phenomenon called biophilia. A trend developing in recently-built commercial and retail workspaces is increasing plant material in projects, integrated through an initial design process evaluating indoor and outdoor spaces. Vertical indoor gardens is viable in areas of a building where natural light abounds leads to green living walls. Using natural processes of imbedded vegetation, these walls mitigate negative consequences attending increased density. For instance, living walls address successfully the urban heat island effect, enhancing a

the roof and on every surface of the southern façade of the building not occupied by windows, see id., and the power produced operates, 130 meters below ground, a thermal system heating and cooling the building, see id. Rainwater flushes toilets and irrigates the greenscape on the building’s rooftop terrace and curtilage surrounding the Edge, see id.

98 See Savvas, supra note 96.
building’s thermal performance and improving indoor air quality. In addition, the plant-covered layer acts as a solar barrier, reducing absorption of solar energy by reflecting solar radiation. Living systems also contribute to managing on-site storm water by retaining water on rooftops and removing contaminants.

Wood, Bahrami and Safarik have identified fifteen benefits at the “urban scale” and “building scale” levels of these types of installations. Besides heat island effect reduction, neighborhood benefits include improvement of the local air quality, sequestering of carbon, providing biodiversity and augmenting animal natural habitats, sound dampening and the psychological impact on passers-by, in part due to the aesthetic appeal of such walls. The building scale benefits include improvement of the subject building’s energy efficiency, enhanced indoor air quality, air filtration and oxygenation (and attending health improvements of occupants), reducing internal noise and gaining LEED® sustainability rating system credits. Initial efforts at such integration of growing organic plant life are visible in projects such as Riverwood 100, a 23-story office tower near Atlanta, featuring a curved greenhouse on three upper floors as well as the base of the tower’s setting in a sunken garden; the project’s parking garage is recessed into an existing ravine beneath the building.

This decades’ new office buildings will begin to feature integration of the exterior environment into the interior space. Full integration of park-like spaces, gardens, water

102 See id.
103 See Savvas, supra note 96.
104 See Wood, supra note 100, at 20-24.
105 See id. at 20, 24-28. While there is doubt about the influence of certification when there is only one percent or less of LEED® compliance by overall American building stock, see Grossi, supra note 73, at 6, Millennial workers still pay attention to corporate social responsibility metrics (like environmental sustainability) disclosed for potential employers.
107 Additionally to other initiatives referenced here is available integration of urban spontaneous landscaping, that is, the plant material growing on essentially unattended vacant parcels, see Peter Del Tredici, The Flora of the Future, PLACES Apr. 2014, available at
features and outdoor exercise centers (as opposed to the conventional indoor “fitness center”), for multi-purpose recreation and social gatherings will be conventional. Solar-concentrating devices and retractable roofs will enable the “garden office” to support growing organic plant materials (not containerized) inside worker collaboration space, such as sunken gardens or groves of trees. One illustration of this potential is Bosco Verticale in Milan. The project is two residential skyscrapers of 76 and 110 meters, respectively, completed in 2014. The project houses 780 trees, each ranging from three meters to nine meters and over 2,000 plants. According to Boeri Architects, this equates to 7,000 square meters of forest.

https://placesjournal.org/article/the-flora-of-the-future; Izabela Riano, Just a Bunch of Weeds: An Interview with Peter Del Tredici, SCENARIO 02: PERFORMANCE, Spring 2012, available at www.scenariojournal.com/article/peter-del-tredici/. While this plant material cannot be spontaneously cultivated in a working cubicle or sales counter, an intentionally vacant but open courtyard produces seasonal vegetation with essentially no carbon footprint, left to its own flora-devices.


See NIGEL DUNNETT, NOEL KINGSBURY, PLANTING GREEN ROOFS AND LIVING WALLS 236-7 (2008).


Not everyone is convinced “vertical forests” are viable biologically or economically, see Tim de Chant, More Reasons to Stop Putting Trees on Skyscrapers, PER SQUARE MILE Apr. 23, 2013, www.persquaremile.com; Tim de Chant, Can We Please Stop Drawing Trees on Top of Skyscrapers? PER SQUARE MILE Mar. 7, 2013, www.persquaremile.com.
Indoor water features will progress from conventional forms, so that flowing streams and waterfalls are commonplace. Office indoor space increasingly will merge with features of outdoor life, appealing to the aesthetic and experiential cravings of management and employees alike. Water pools indoors may serve as communal gathering places for occupants (or areas for relaxation and escape) in addition to being noise buffers. Moreover, water is connected to other building functions like plumbing, wastewater treatment, irrigation and stormwater protection. Captured rainwater can both be fill pools in indoor water features and used for watering indoor gardens, as in the case of the Alterra laboratory and administration building in Wageningen, The Netherlands.

B. Power Generation or Self-Sufficiency

To achieve a certification as a LEED® Platinum office in 2015, standards require on-site generation of power (wind or solar) or recycling of storm water or grey-water. Most recent-

115 See, e.g., Anthony P. Pagorek, supra note 109; Johnson County's Sunset Drive Office Building in Olathe, Kansas, integrates an indoor stream, see Szczepanski, supra note 109.
118 See, e.g., WILD CENTER, supra note 116. The staff of tomorrow’s offices are more productive when happier, see Nancy Rothbard, Put on a Happy Face. Seriously., WALL ST. J., Oct. 24, 2011, at R2 (noting that virtuous and vicious cycles influence the mood of employees depending on their feelings of contentment at the beginnings of their work day, and good moods impact the quality of work performed); and enlightened managements recognize their desires to encounter beauty and stimulation in the work environment based on their own preferences.
119 See ANTONY WOOD, PAYAM BAHRAMI & DANIEL SAFARIK, supra note 100, at 47, 64; DUNNETT & KINGSBURY, supra note 111, at 25-6.
121 See HAIKE FALKENBERG, INTERIOR GARDENS: DESIGNING AND CONSTRUCTING GREEN SPACES IN PRIVATE AND PUBLIC BUILDINGS 194-5 (2011); see also Kellert, supra note 74, at 105.
122 See Tucker, supra note 87, at 99.
vintage offices have roofs engineered to be able to support photovoltaic solar panels. Current technology allows inexpensive retrofitting of older offices for heat insulation via spray-on insulation coating applied to glass windows or building tiles to increase reflectivity. However, new technologies in the solar power generation field, such as thin-film, allow converting absorbing surfaces to generating modules. So-called building integrated photovoltaic (BIPV) systems are integrated directly into the design of a structure. For instance, transparent solar panels are usable as facades, roof lights and canopies, and are installed over existing windows and doors. Thin-film solar laminate technology is being combined with roofing membranes to create highly efficient rooftop solar generating systems even under low light atmospheric conditions. A variant of thin film currently under development employs nano-particles.

123 Indeed, at the Adam Joseph Lewis Center for Environmental Studies on the campus of Oberlin College (a two-story building that houses classrooms and offices), a roof-integrated, 60-kW photovoltaic (PV) system covers most of the roof and is connected to the building’s electrical system but has no battery backup device. See Shanti Pless, Paul Torcellini and John Petersen, Oberlin College Lewis Center for Environmental Studies: A Low-Energy Academic Building 1 (2004).


125 Thin film cells are manufactured by applying thin layers of semiconductor material to inexpensive materials like glass, metal or plastic. These cells require less semiconductor material than the conventional crystalline silicon based semiconductors and are simpler and less costly to manufacture, although they are less efficient at energy conversion to date. Examples include cadmium telluride and copper-indium-gallium-diselenide materials. See Eric Peeters, TCE Advanced Materials, TCE: The Chemical Engineer, Issue 837, at 34, 35 (Mar. 2011).


sprayable onto glass and other material surfaces to create a thin solar film. A third option would glaze buildings with panes covered in semi-transparent perovskite cells. Thus, every existing window on a structure, or even the structure’s walls themselves, can be converted to a low-current electricity generating module in the near term. Elevators in all likelihood will be solar-powered in new construction, as commercial building owners and managers reach toward the nation’s vision of net-zero energy consumption.

http://e360.yale.edu/feature/will_new_technologies_give_critical_boost_to_solar_power/2832/ (outlining a new generation of materials that can harvest the sun’s energy far more efficiently than traditional silicon photovoltaic cells).

Konarka’s organic polymer material, called “power plastic” is composed of carbon-based polymers suspended in an inexpensive ink, allowing the maker to print solar cells at a far lower cost than silicon cells production. See Russell Gaudiana & Christoph Brabec, Organic materials: Fantastic plastic 2 NATURE PHOTONICS, 287 - 289 (2008). The material works in low light and for longer periods of time than their silicon counterparts, see Mark Stevenson, An Optimist’s Tour of the Future 218-21 (2011). Another manufacturer, Nanosolar, also uses a thin-film process involving coating material with nanoparticle ink. Id. at 226.


See Starre Varlan, Solar Windows? How the Latest Technology Makes it Possible, MOTHER NATURE NETWORK Jan. 14, 2014 at 3:33 P.M. http://www.mnn.com/earth-matters/energy/stories/solar-windows-how-the-latest-technology-makes-it-possible. Those puzzled about how energy is transferred from the windows to the building’s electrical grid need only read up on resonant inductive wireless energy transfer. See Andre Kurs, et al., Wireless power transfer via strongly coupled magnetic resonances, 317 SCIENCE (5834) 83–86 (2007). An office’s building materials – its spine – may itself become a selling point for occupants, as developers market buildings constructed of volumes of recycled waste, such as “green steel,” made in part from plastics and waste tires and forged in electric arc furnaces; this steel-making was invented by the SMaRT Centre at the University of New South Wales, see Cheryl Jones, Adapting “green” steelmaking to other industries, AUSTRALIAN Jul. 14, 2014 at 6, available at http://smart.unsw.edu.au/sites/default/files/uploads/Innovation%20Challenge-Adapting%20%27green%27%20steelmaking%20to%20other%20industries%2C%20Steelmaking%20in%20electric%20arc%20furnaces%2C%20The%20Austral%20Steel%20Association%20-%20June%202014.pdf.

See Otis Introduces its First Solar-Powered Elevator in France, UNITED TECHNOLOGIES PRESS RELEASE Apr. 3, 2015, http://www.utc.com/News/BIS/Pages/Otis-Introduces-its-First-Solar-
All focus should not be devoted to solar radiation and electricity generation in commercial building development. Tower Two at the La Jolla Commons in University Town Center, San Diego, opened for business in 2014. This tower, encompassing about 415 thousand square feet, reportedly is the largest carbon-neutral commercial office building in the United States.\textsuperscript{134} Eighty eight percent of the building’s water is recycled and used to irrigate landscaping as well as to operate the HVAC system.\textsuperscript{135} Yet novelty about Tower Two is that building's three fuel cells converting natural and methane gas into electricity. Besides using regular natural gas, the system uses biogas created from nearby landfills and sewage treatment plants. The biogas produced during biological decomposition is captured, condensed and cleaned before delivery into the same pipes carrying processed natural gas; the combined gases then are converted to electricity by the fuel cells generating 4.3 million kilowatt hours a year.\textsuperscript{136}

\textbf{C. Energy Savings through Technology Platforms and ICT}

Smarter buildings that are self-sustaining gradually are becoming more attractive tenant alternatives in the office leasing and build to suit markets.\textsuperscript{137} Proving the \textit{bona fides} of the landlord sustainability value proposition is therefore increasingly consequential. Computing in the cloud will ensure continued development of tools measuring and verifying energy use.\textsuperscript{138}

\begin{footnotesize}
\begin{itemize}
\item See SHANTI PLESS & PAUL TORCELLINI, NET-ZERO ENERGY BUILDINGS: A CLASSIFICATION SYSTEM BASED ON RENEWABLE ENERGY SUPPLY OPTIONS, NREL/TP-550-44586 TECHNICAL REPORT iii, Jun. 2010, http://www.nrel.gov/sustainable_nrel/pdfs/44586.pdf (in NZE buildings, efficiency gains have been made such that the balance of energy needs can be supplied with renewable energy technologies).
\item See id.
\item See id.
\item See, e.g., M. Victoria Moreno, Benito Úbeda \textit{et al.}, \textit{How can We Tackle Energy Efficiency in IoT Based Smart Buildings?} 14 SENSORS 9582-9614 (2014); Alan Rose, Subramanian Vadari and Lorie Wigle, \textit{How the Internet of Things Will Enable Vast New Levels of Efficiency}, 2014 ACEEE SUMMER STUDY ON ENERGY EFFICIENCY IN BUILDINGS 9-295, available at
\end{itemize}
\end{footnotesize}
Additionally, the Living Building Challenge illustrates the opportunity for increased performance-based type accreditation. While LEED® and other environmental standards pre-certify buildings based on conformance of design specifications with adopted best practices, the Living Building Challenge approves buildings only after a rigorously-documented 12-month occupancy phase. The LBC monitors 20 so-called design “imperatives” across seven categories: site, water, energy, health, materials, social equity, and beauty. These mandates, including net-zero energy and water use, must be maintained over the full trial year of occupancy.

Beginning in 2011, cloud computing and analytics software combined to monitor closely heating, cooling and lighting in 13 Microsoft buildings consisting of 2.6 Million square feet and forming a portion of its headquarters campus in Redmond, Washington. By equipping these buildings to be “smarter,” able to power-down the use of utilities in real time during periods of

http://aceee.org/files/proceedings/2014/data/papers/9-832.pdf. The Internet of Things, or IoT, was briefly explained this way by Tim O’Reilly: IoT’s “characteristics are that things are contingent with other data. They are on demand. They are load-balanced, and aware of other parts of the system. . . . The core now is the sensors, usually in two-way connections, so they deliver data and respond to changing conditions. . . . There is big data analysis on the back end, understanding and managing things.” Quentin Hardy, Tim O’Reilly Explains the Internet of Things, N.Y. TIMES BITS Feb. 4, 2015, 7:00 A.M., http://bits.blogs.nytimes.com/2015/02/04/tim-oreilly-explains-the-internet-of-things/?_r=0.

139 The Living Building Challenge sets substantially higher performance requirements across a more comprehensive set of criteria than required by zoning and building regulations, or any LEED®-style rating system currently in use. Project developers striving to meet these Living Building criteria need to employ innovative strategies and systems not contemplated in the current maze of regulations governing non sustainability-oriented projects. See DAVID EI Jensen AND SONJA PERSRAM, REPORT: LIVING BUILDING CHALLENGE: CODE, REGULATORY AND SYSTEMIC BARRIERS AFFECTING LIVING BUILDING PROJECTS 1 (Jul. 29, 2009) (hereinafter “Barriers”), http://living-future.org/sites/default/files/photos/09-0729%20code%20paper%20Eisenberg%281%29.pdf. “Net Zero Energy” building certification processes and standards are described at the Living Building Challenge Website, http://living-future.org/living-building-challenge/certification/certification-paths/net-zero-energy-building-certification-0. Essentially, zero energy certification confirms that one hundred percent of a building’s energy needs on a net annual basis must be supplied by on-site renewable energy, see id.

140 See id.

workplace inactivity,\textsuperscript{142} greater efficiency can achieved without serial and expensive retrofits, and upfront investment in new construction is offset by shortened “payback” durations.\textsuperscript{143} Cloud-based architecture has the scale to process “big data” on this subject affordably, and to implement complex algorithms to refine heating, air-conditioning and lighting patterns concurrently, in multiple buildings.\textsuperscript{144} Data-driven energy management combines smart meters and management software (EMS) to perform real-time monitoring and adjustment (such as of temperature settings) of every building mechanical device running on electricity.\textsuperscript{145} Progress in individual building components themselves, such as smart windows that reduce cooling loads in buildings,\textsuperscript{146} will augment substantial savings to building owners and their operators from these monitoring platforms. Garages themselves are smarter, containing sensors in the parking stalls that a smart phone application (or in newer vehicles, the vehicle’s onboard computer) can receive

\textsuperscript{142} See Derek Clements-Croome & Alan Johnstone, \textit{Intelligent Buildings Management Systems}, in \textit{Intelligent Buildings: An Introduction} (Derek Clements-Croome, ed.) (2011). For example, wireless radio technology devices already are the application standard in more than a quarter million buildings, enabling building HVAC controls to be placed at building management’s discretion for optimal efficiency without substantially retrofitting the structure. Among other functions, occupancy sensors turn off lights in vacant rooms, saving up to 40 percent on energy and operating costs. See Enocean.com Website, http://www.enocean.com/building-automation/ (last visited May 19, 2015). Building IQ Pty Ltd. has developed a software platform that automatically tunes building management systems to redirect building power consumption by up to 30 percent using advanced artificial intelligence algorithms; see BuildingIQ Products Webpage, http://www.buildingiq.com/products/buildingiq-platform/(last visited May 19, 2015).

\textsuperscript{143} See ACCENTURE, \textit{supra} note 137, at 8, 13, 20.


notice of a stall’s availability, reducing inefficient parking-seeking behaviors.\footnote{See MeshNetics smart detection sensor development devices (ZigBee) in parking lots \url{http://www2.ee.ic.ac.uk/t.clarke/projects/Resources/ZDK_v2.0_Complete/Product%20Information/M-253-02-(ZigBee%20Parking%20Automation%20Case%20Study).pdf} (last visited Jul. 30, 2015).} Smart parking meters along the curb similarly cooperate with drivers to minimize “stall-search” traffic mileage.\footnote{For example, SmartGrains, French inventor of ParkSense, has developed a system of wireless sensors providing an updated view of available parking spaces, see Sarfraz Nawaz, Christos Efstratiou and Cecilia Mascolo, \textit{ParkSense, a Smartphone Based Sensing System for On-street Parking} MOBI\textsc{co}M’13, \textsc{september} 30–\textsc{october} 4, \textsc{miami}, \textsc{fl} (2013), \url{http://www.cl.cam.ac.uk/~cm542/papers/mobicom2013.pdf} and Streetline, Inc., the American application developer for smart phone and in-car navigation systems; its free “Parker” application links drivers to those merchant providers of parking registering with ParkEdge, and Streetline delivers data to the vehicle or driver on parking availability, see Press Release, \textit{Real-Time Information Directly From Parking Spots: Introducing ParkerData\textsuperscript{TM} Availability API}, Mar. 24, 2014, \textit{available at} \url{http://www.bizjournals.com/prnewswire/press_releases/2014/03/24/AQ89457}.}

\textbf{D. Transportation and Partnerships in Land Use Controls}

Millennials approach travel differently than earlier generations do. They are "multimodal," meaning they choose the best mode of transportation, such as driving, transit, biking or walking, based on the trip they are planning.\footnote{See Neela Sakaria & Natalie Stehfest, \textit{Millennials & Mobility: Understanding the Millennial Mindset} 3 (2013), \url{http://www.apta.com/resources/reportsandpublications/Documents/APTA-Millennials-and-Mobility.pdf}.} They consider public transportation the best option for digital socializing and one of the most likely ways to connect with the communities they live in.\footnote{Transit Center with RSG, Inc., \textit{Who’s On Board: Mobility Attitudes Survey}, ii, 31, 41, 47 (2014) ("Transit Center") \url{http://transitcenter.org/wp-content/uploads/2014/08/WhosOnBoard2014-ForWeb.pdf}.} They also say that transit allows them to work while they travel.\footnote{Tony Dutzik, Travis Madsen and Phineas Baxandall, \textit{A New Way to Go: The Transportation Apps and Vehicle-Sharing Tools that Are Giving More Americans the Freedom to Drive Less} (2013). There has been "an extraordinary shift" in how people travel, said Phineas Baxandall, co-author of this PIRG report: "For eight years in a row, Americans have been driving less on a per-person basis than the year before." At the same time, the report notes, there have been increases in the use of the Internet, cellphones and smartphones; and younger Americans more likely to own a smartphone, with an expected 80% market penetration of these devices by 2020, see \textit{Planet of the Phones}, Economist Feb. 28, 2015, \textit{available at}}
However, fundamentals like travel time, cost and maintenance of reliable schedules are the most important features in decision-making.\textsuperscript{152}

Transit companies are developing, with co-investment by traditional commercial developers, parking structures that directly connect (at times on elevated platforms atop some structures) to intra-core people movers, enabling service to those who drive private vehicles.\textsuperscript{153} The transit stations incorporate vertical gardens to cool and heat at the appropriate seasons and to filter air. Such a route is scheduled to open in 2013.\textsuperscript{154} The Irisbus Civis technology of the Solar Energy Belt features a Siemens Optiguide system that primarily uses white lines painted upon pavement for vehicle guidance.\textsuperscript{155}

Development of office cores with built-in transit components in megapolitan areas affords a competitive advantage to their venues, as much for the status of “environmental consciousness” as any other factor. Princeton University’s Arts and Transit Neighborhood integrates multiple transportation modes having housing, retail, office buildings and performing and other arts venues.\textsuperscript{156} The Princeton Township and Princeton Borough each created a new zoning ordinance, an Arts and Transit overlay district of sorts, to accommodate the mixed uses and the university’s endeavor to improve standards of sustainability while addressing traffic congestion challenges.\textsuperscript{157} Construction proceeds in 2013 on the North Lot (Stadium Place) Development, a 3.85 acre project programmed for multistory housing buildings and as much as 420 thousand square feet of office and hotel space; the 675,000-square-foot residential complex has two apartment towers — The Nolo and The Wave — that share a podium filled with retail

\textsuperscript{152} See TRANSIT CENTER WITH RSG, INC., supra note 150.
\textsuperscript{153} See MetroTram Website, available at http://www.metrotram.it/ (the Solar Energy Belt, a system designed by Iosa Ghini Associati that links the City of Bologna, Italy with the Marconi International Airport atop a viaduct (except at ground-level stations) and that outfits stations and the viaduct with photovoltaic panels along its 5 km, tram on tires route).
\textsuperscript{154} See also Greenmuze, Italy’s Solar Energy Monorail, http://www.greenmuze.com/climate/travel.
and parking. The project is adjacent to an intermodal regional transit hub at King Street Station. The project will allow visitors and residents alike to access the Washington State ferry terminal, with light rail running between the airport and downtown Seattle, the Sounder Commuter Rail connecting Tacoma and Everett with Seattle, and the Amtrak Cascades line in addition to dozens of King County Metro busses. Given the Seattle knowledge worker’s commitment to sustainability issues, it is likely Millennials will regard Stadium Place as a template for occupy-able future office development. DMB Pacific Ventures proposes to develop Redwood City Saltworks, a primarily residential project scheduled to integrate a privately-funded transit system connecting to the proposed ferry terminal in the Port of Redwood City and other public transit options, including CalTrain. The Seaport Britannia Centre, a 622,000 square-foot office/R&D business park immediately west of this site, and the Stanford Medical Center will be among immediate beneficiaries of the Saltworks Community development, should that project receive the needed entitlements.

Pent-up demand among Millennials for walkable urban development in megapolitan areas increasingly will be served. Walkable urban development is defined as high-density development where transportation is provided multi-modally yet many trips are completed on foot. Walkable urban places are at least five times more intense in floor area ratios than

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159 See the North Lot Website, http://www.northlotdevelopment.com/.
162 The project has been delayed by EPA Region 9 intervention to determine whether the liquid contained in the saline ponds on site is “water” subject to the jurisdiction of the federal Clean Water Act, see Annie Snider and Debra Kahn, Water Policy: Salt Pond Saga Raises Questions About Feds’ Regulatory Reach, E & E PUBLISHING, LLC, Mar. 12, 2015, 4:16 P.M. EDT, http://www.eenews.net/stories/1060014942/.
164 TRANSIT CENTER WITH RSG, supra note 150, at 3, 5, 41.
165 Id.
drivable suburban areas.\textsuperscript{166} That intensity of development is viewed as desirable by knowledge workers because of the offsetting convenience and stimulation that accompany density of buildings and concentration of workers.\textsuperscript{167} “Smart city” becomes defined by reference to environmentally sensitive transportation infrastructures in addition to green buildings, parks and place-making. This requires two mobility features. First is that provision of complete accessibility to and from transit stops and final destinations by means of personal mobility devices or driverless “swarm cars” that solve departure and arrival challenges.\textsuperscript{168} Second is that more persons acquire financial and personal incentives (such as investing in reducing carbon footprints instead of in parking rates tied to demand) to store their vehicles long term (not in public stalls or typical garage structures), except for weekend use in recreational travel or to undertake major shopping expeditions. All of these opportunities are to be facilitated by mobility apps like SFPark, ParkNOW and Waze.\textsuperscript{169} Parking of private vehicles is receiving increased local government scrutiny under demand-based protocol programs such as ParkDC.\textsuperscript{170} In a demand-based parking program, rates for public parking (sometimes known as “surge pricing”) are based on how many spaces are available (or not) at any given time in a particular district.\textsuperscript{171}

Transit provision will fuse with office development because megapolitan area development requires comprehensive multi-modal worker delivery to places of business: light rail and alternative fuels-consuming bus stations in dedicated pathways located down the centers of arterial streets, with roadway vehicular lanes reduced to 20 feet in width in opposing directions to encourage self-driving vehicles. This width will be sufficient to support emergency

\textsuperscript{166} Id.
\textsuperscript{167} Id.
\textsuperscript{169} See id.
access to bordering buildings while affording room for bicycle lanes, curbside parking and sidewalks. Roadway speeds in these areas will be reduced to provide no incentive, except in bad weather, to use passenger-operated vehicles as opposed to bicycles or mass transit transportation alternatives. Movement of workers from fixed-path transportation routes into office projects will be facilitated through public-private partnerships in urban cores motivated to satisfy worker preferences for navigation in the first and last “legs” of their commutes. These partnerships may also invest in technologies transporting people by single track, above-ground conveyances powered by sustainable energy sources.

Transit-oriented districts will feature pedestrian access (integrating transit malls) to fixed guideway systems and buses using dedicated lanes linked to commerce nodes and transit

172 See Luigi dell'Olio, Angel Ibeas & Jose Luis Moura, Implementing Bike Sharing Systems, 164 PROC. ICE–MUNI. ENG’R, 89 –101 (2011) (discussing a location model for fixing bicycle pick-up and drop-off stations aided by a geographical information system, along with maximum tariffs to charge in order to guarantee satisfactory levels of consumer participation).

173 See, e.g., Asha Weinstein Agrawal, Marc Schlossberg & Katja Irvin, How Far, By Which Route and Why? A Spatial Analysis of Pedestrian Preference, 13 J. URB. DESIGN, 81–98 (2008) (addressing interconnected issues of obesity, sprawl, and quality of life, the study’s purpose was to understand how far Americans will walk to transit and environmental factors influencing them).

stations. These office-with-transit infrastructure initiatives ultimately will lead to performance zoning overlays accommodating not just mixed uses districts but integrated work and living spaces within individual buildings and multi-building projects. Transit usage thrives when the highest-density development (expressed in intense allowable floor area ratios) occurs near fixed transit routes, typically located nearest to transit stations. This creates two sustainability opportunities. The first is removing gas-powered motor vehicles entirely from use in those areas, thereby eliminating heat islands created in asphalt-paved parking lots and reducing fuel consumption. The second is diverting excess electric power to amplify the transit cars’ electrical requirements. Communities need to offer incentives to maximize transportation sustainability partly by selling (or trading for density increases) surplus electrical output (the product of so-

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176 The City of New York’s evolving zoning code illustrates that city’s transition to “contextual” zoning within certain districts since 1989, more broadly addressing its unique development projects by adding or subtracting development capacity (for instance, increased heights) to some lots while adding new contextual form requirements to others without explicitly changing the intensity of permitted development, see Simon McDonnell, Josiah Madar & Vicki Been, *Matching Words and Deeds? How Transit-oriented are the Bloomberg-era Rezonings in New York City?* in TRANSPORTATION AND ECONOMIC DEVELOPMENT CHALLENGES 171-73 (Kevin Button & Aura Reggani, Eds., 2011). In Phoenix’s CBD, the Downtown Code (a form-based Code effective February 15, 2013, see PHOENIX, ARIZ., CODE APP. A. (ZON. ORD.) Ch. 12, § 1201 et seq.,) calls out, in the Business Core (Sec. 1209) and the identified Downtown Gateway (§ 1212), among other districts, for frequent service by multiple modes of public transit; this Downtown Code endorses various neighborhoods and character areas becoming mixed-use development nodes, see id., http://www.codepublishing.com/az/phoenix/. Phoenix’s Interim Transit-Oriented Development Overlay Districts further encourage mixed use development in other parts of the city, see METRO LIGHT RAIL, TRANSIT-ORIENTED DEVELOPMENT IN PHOENIX 4-5, available at http://www.valleymetro.org/images/uploads/lightrail_publications/TOD_Brochure.pdf; Carol Atkinson-Palombo and Michael J. Kuby, *The geography of advance transit-oriented development in metropolitan Phoenix, Arizona, 2000–2007*, 19 J. TRANSP. GEOG. 189, 191-2 (2011).
called “net metering”)) to transit operators or supplying it to publicly-available electric vehicle chargers in these intensely developed districts where self-driving vehicles are in demand.\(^{177}\)

Integrating future development into transit nodes is becoming standard procedure within the development industry. Instead of community emphasis on “offsets” for new development increasing the burden on transportation resources together with public-private conflict over appropriate “proportionality” of exaction standards,\(^ {178}\) bureaucracies must focus upon rewarding developers that facilitate worker commuting and movement within mass-transit corridors. In vicinities where intersections of two or more transit nodes (for example, heavy rail and streetcars, or ferry and bus terminals) occur, developers will probe devising linkages to their projects’ front doors (through loaned-bicycle stations and other means of individual conveyance\(^ {179}\)) and to those of their neighbors to comply with performance standards in the transit realm resulting in density increases.\(^ {180}\)

Transportation infrastructure and its accessibility dividend will play a key role in developing office use-intensive clusters\(^ {181}\) providing “people movers” uniting transit stations with office projects either above ground via technologies like magnetic levitation\(^ {182}\) or at buildings’ ground level.\(^ {183}\) Transit companies interested in intra-urban core transportation\(^ {184}\)


\(^{181}\) *See id.*


\(^{183}\) Indraswari Kusumaningtyas & Gabriel Lodewijks, *Accelerating Moving Walkway: A review of the characteristics and potential application*, 42 TRANSP. RES. PART A: POL’Y & PRAC. 591-609 (2008). *But see* note 174 *supra*, for discussion of Sydney people mover. These conveyances have to relocate people between critical points of origin and destination to drive usage.
and sustainability, such as Veolia, which has both an environmental services and a multimodal transportation division (as does Transdev\(^{185}\)), are likely partners in such integrated transit station-with-office projects. Transit avenues will capture knowledge workers’ businesses as neighbors when their leaders see maximum efficiency of worker movement contributes recruiting and retention advantages as well as the benefits of worker productivity increases (and healthcare cost decreases) from employee working, shopping, exercising, socializing and dwelling within a five minute-walking radius.

New office projects will increasingly feature “vehicle to grid” technologies, through which electrical vehicles parked in garages either slow down their charge rates or supply electricity to power lines feeding the grid, keeping it thereby in balance.\(^{186}\) These vehicles coordinated in this process decrease electricity costs by selling surplus production to the electrical utility,\(^{187}\) thus eliminating the need to build new power substations when combined

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\(^{184}\) Historically, American transportation companies, especially railroads, were involved in land development. For example, Plant Hall, a historic monument at the University of Tampa, was originally the Tampa Bay Hotel, developed by Henry B. Plant, owner of the Tampa and Thonotosassa Railroad, a part of the Plant Rail System; this hotel was built near the Tampa terminus of this line. See Henry B. Plant Museum, Henry Plant Hotel 1891, http://plantmuseum.com/henry-plant-museum/plant-hotel-1891.

\(^{185}\) Transdev is the largest private sector provider of public transportation systems worldwide. Transdev is the delegated manager of all public transit for the New Orleans Regional Transit Authority, see Richard Rainey, New Orleans RTA Signals Post-Katrina Pivot with New 5-year Management Deal, NOLA.COM/TIMES-PICAYUNE Apr. 2, 2015, available at http://www.nola.com/politics/index.ssf/2015/04/new_orleans_rta_signals_post-k.html. Veolia’s Environmental Services Division specializes in solid waste management services like recycling, see http://veolia.co.uk/our-services/our-services/recycling-and-waste-services (last visited Jul. 30, 2015). A company with multiple, intersecting areas of expertise will be much in demand as planning and execution partners where people movement and sustainability are jointly vital dimensions of an office development.


\(^{187}\) Under Delaware law, electric utilities are required to compensate owners of electric cars for electricity sent back to the grid at the same rate those owners pay for electricity to charge their auto batteries. See 26 Del. C. §1014(g) (2009).
with developer-installed solar or wind generation systems integrated into their buildings’ infrastructures.

E. Nourishing Sustainable Project Occupants

In Tokyo’s Pasona Urban Farm, a glimpse emerges of the future of food sustainability in dense urban projects. Pasona is a 43,000 square foot garden that grows up, down, and across a nine story-high, 215,000 square foot corporate office building housing Pasona Group, a personnel recruitment company.\(^{188}\) The vertical garden boasts 200 species of plants, incorporating fruits, vegetables and rice, that are harvested, prepared and served in building cafeterias. This project represents the largest and most direct farm-to-table initiative of its kind achieved inside an office building in Japan. It is not, however, a nirvana of sustainability; evidence shows that since the gardens utilize a mix of hydroponic and soil-based farming, they require very specific climate controls within the building, keeping these spaces warmer than comfortable for American workers’ standards of occupancy.\(^{189}\) Meanwhile, the Brooklyn Grange Farm comprises two and a half acres of growing space on the rooftops of a pair of office buildings. Brooklyn Grange LLC grows more than 50,000 pounds of food each year, which it sells through farmers markets, CSA subscriptions and wholesale accounts.\(^{190}\) In addition to boosting New York City's local food supply, the farm also absorbs more than 1 million gallons of storm water every year, reducing the load the city's systems must manage.\(^{191}\) Urban Harvest’s


\(^{191}\) Sarah Shemkus, *Next-gen urban farms: 10 innovative projects from around the world*, THE GUARDIAN SUSTAINABLE BUS. BLOG Jul. 2, 2014, 11:19 EDT,
STL’s Food Roof Farm received a $135,000 grant from the Metropolitan St. Louis Sewer District to reduce overflows from the combined storm and waste sewerage system for its two-story building rooftop operation.\textsuperscript{192}

**F. Waste Elimination and Total Recycling in Commercial Projects**

Some cities high on “sustainability” ratings scales have introduced aggressive programs to reduce commercial community waste, if not to eliminate it entirely.\textsuperscript{193} New York’s Earth Day 2015-announced plan (part of the OneNYC plan), to reduce commercial waste disposal by 90 percent by 2030, includes city-wide implementing of single-stream recycling\textsuperscript{194} to facilitate everyone’s contributions; expanding the city’s composting program to every residence by 2018; restricting the sale of non-recyclable and non-compostable items; and offering tax incentives to businesses complying with the “Zero Waste”\textsuperscript{195} waste-reduction goals. Awaiting implementation is artificial intelligence-using machine agents (coordinating with robots) to recognize, in those office and retail buildings having recycling programs, distinctions among paper, plastic and organic, compost-worthy materials, and to direct their collection in the


\textsuperscript{192} See Joe Gose, *In St. Louis, an Urban Farmer Uses a Rooftop and Food to Spur Renewal*, N.Y. TIMES COM. REAL. EST. Jun. 30, 2015, http://www.nytimes.com/2015/07/01/realestate/commercial/in-st-louis-an-urban-farmer-uses-a-rooftop-and-food-to-spur-renewal.html?_r=0; the owner will derive most of its revenue from nearby residents who will pay an upfront fee to pick produce throughout the growing season, and it is renting garden beds to as many as 20 residents of the apartment building, see id.


\textsuperscript{194} In a single-stream process, all recyclable materials are deposited in a single container (a convenience growing commitment from recyclers), to be sorted by a complex process that cannot address the problem of contaminated (such as by grease or other residue) commingled recyclable materials. See Cole Rosengren, *Single-Stream Recycling: Simple for Residents, Complex for the City*, CITYLIMITS.ORG May 20, 2015, http://citylimits.org/2015/05/20/single-stream-recycling-simple-for-residents-complex-for-the-city/. That re-sorting process, naturally, requires more non-renewable source energy and produces higher carbon emissions – and it cannot reclaim the lost value of soiled paper-based products. See PAUL CONNETT, THE ZERO WASTE SOLUTION: UNTRASHING THE PLANET ONE COMMUNITY AT A TIME, 151, 225-6, 245-9 (2013).

\textsuperscript{195} Under Zero Waste policies, no recyclables are burned or buried in landfills, see CONNETT, supra note 192, at 10, 217, 276 (2013).
appropriate containers for later processing. Machine agents already have learned how to do human facial recognition to some degree of accuracy\(^\text{196}\); adapting that set of algorithms permitting agents to “learn” automatically\(^\text{197}\) to recognize and sort-as-deposited recyclables before reusable materials leave a commercial project is not far downstream.\(^\text{198}\) This initiative assumes substantial importance due to discovery in 2014 of new classes of recyclable thermosetting polymers known as poly(hexahydropyridazine)s or PHTs. PHTs are rigid, resistant to heat and tough; they should replace all forms of unrecyclable thermosets and become ubiquitous in newly manufactured goods by 2025.\(^\text{199}\) This breakthrough in plastics chemistry will accelerate the “circular” economy, enabling substantial reduction in landfill plastics waste. Avoiding increased carbon footprint in the recycling process itself will become a competitive cities’

\(^{196}\) *Rise of the Machines*, ECONOMIST, May 9, 2015, (hereinafter, “Machines Rising”) http://www.economist.com/news/briefing/21650526-artificial-intelligence-scares-peopleexcessively-so-rise-machines?zid=291&ah=906e69ad01d2ee51960100b7f502595 (describing an algorithm called DeepFace that can recognize specific human faces in images roughly 97% of the time, even when the faces are partly hidden or poorly lit).

\(^{197}\) “Machine learning” refers to the process to cause computers to know things when they see them by producing for themselves the “rules” their programmers cannot specify; this involves statistical analysis of large volumes of data. *See id.* NELL, the Never-Ending Language Learning project from Carnegie Mellon University, is a computer system that not only reads facts by crawling through hundreds of millions of web pages but attempts to improve its reading and understanding competence in the process, to perform better going forward, *see* [CARNegie MELLon UNIVERSITY, NELL, THE COMPUTER THAT LEARNS, available at](http://www.cmu.edu/homepage/computing/2010/fall/nell-computer-that-learns.shtml).


keystone resonating with the knowledge worker class seeking sustainable communities for domicile.

Ultimately, the United States will implement ecocity initiatives. An ecocity, loosely defined by the declaration of the World Ecocity Summit 2008, is\textsuperscript{200}:

> an ecologically healthy city. . . . [E]cocity development requires the comprehensive understanding of complete interactions between environmental, economic, political and socio-cultural factors based on ecological principles.\textsuperscript{201}

Digital technologies coupled with IoT drive disruption of customs and practices in realty development, property management and spatial regulation. Aspirations directed to ecocity-lifestyle optimizing, however “futuristic” they seem today, propel urban planning and regulation toward mandates for carbon emissions reduction, resource efficiency, economic development goal-setting and built environment designs promoting healthy and socially sustainable communities.\textsuperscript{202} Administrators of prescriptive zoning regulations are overmatched against these waves of innovative property development elements; such new approaches defy easy categorization as “permitted uses” or even ancillary uses under a rigid, use-based zoning scheme. Part V below argues that reaching desired sustainable development objectives, the optimal 21\textsuperscript{st} Century American land use regulatory scheme to administer commercial projects is grounded in performance zoning strategies.

\section*{V. Performance Zoning: Sustainability’s Regulatory Champion}

\textbf{A. History, Features and Application of Performance Zoning Systems}

Performance zoning was conceived in the early 1950s, when Dennis O’Harrow concluded that typical industrial nuisances could be measured scientifically and, therefore, were


\textsuperscript{201} See \textit{id.}

manageable through objective controls. Thus, its initial launch was to accommodate industrial uses that otherwise (under prescriptive codes) might be banned. The first performance zoning regimes transcending heavy industrial applications were introduced in the middle 1960s, and the concept enjoyed sustained attention through the mid to late 1970s and into the 1980s, perhaps reaching its zenith around 1985. Among planning administrations, this coincided with three incidents, beginning with publication of Layne Kendig’s model performance zoning ordinance, which regulated permitted uses by addressing the undesirable “by-products” that each use seemingly addresses.

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204 See Gillespie, Industrial Zoning and Beyond: Compatibility through Performance Standards, 46 J. Urb. L. 723, 742, 751 (1969); Note, An Analysis of Planned Light Industry Zoning, 7 Duke L. J. 88, 97-8 (1958); the Note author notes the Building Zone Ordinance of the Town of Yorktown, New York (amended in 1957) provides that certain industrial uses would be acceptable upon complying with fixed standards regarding emissions, see id. at 98.


Kendig boldly asserted that “performance zoning protects the environment.”208 Second, in 1981, New York City drafted a proposal to refocus upon development on the West Side that attracted substantial citizen interest.209 One approach suggested in the draft plan was to adopt a performance system permitting the developer more than the conventional number of design options afforded by prescriptive zoning.210 The aim of the performance process was to simplify the negotiating process for developers by implementing certain unconventional approaches to evaluating a proposed building’s impact on the environment.211 Accordingly, city planners proposed that new projects would be tested under four criteria, awarding “points” that must (for approval) exceed a certain threshold; these criteria were “daylighting” (how a building relates to the light and air on its adjacent streets), street wall height, street wall length and structural reflectivity.212 The local chapter of the American Institute of Architects urged adoption of the performance system establishing broad design goals rather than those myriad details characteristic of the less flexible prescriptive system.213 It admonished “the Planning Commission to find a suitable and creative balance between the demands of the continuous urban fabric and the single building of fine design. . . .”214 The architects argued that each part of midtown must realize its own character, “to which end we stress our strong preference for performance zoning bulk controls which will stimulate architectural creativity and diversity. . . .”215 This was the first public conversation among stakeholders about the benefits of performance-based zoning in a major metropolitan area.

207 See LANE H. KENDIG, PERFORMANCE ZONING (1980). Kendig at one time was Director of Community Planning for Bucks County, PA, see note 206 supra.
208 Id. at 91.
211 See id.
212 See id.
213 See Horsley, supra note 209.
214 See id.
Third, in the early 1980s, Houston adopted a billboard ordinance (removing some immediately while amortizing others’ survival) and a development ordinance that prescribed block lengths and minimum street setbacks – and little else; these innovations together still earned the city the designation as a pioneer of “performance zoning.” Yet performance-driven regulation faded gradually into the background as New Urbanism assumed the forefront among its adherents and their followers. Form-based Codes, so-called, seemed to accomplish what New Urbanists sought to achieve in terms of walkability and disposing of the auto-centric planning domain. Regardless, performance zoning’s claim was, as it remains, that it provides for greater flexibility, avoiding detailed specification of “acceptable” uses for specific parcels in particular districts inherent in traditional Euclidean zoning. It vests greater discretion by a regulatory jurisdiction at the time developments are proposed, at the same time establishing specific standards for the exercise of legislative discretion. Those standards reflect community goals but the regulated party is empowered to decide how best to meet those goals.

Under performance zoning, land development and use are regulated by a series of performance standards addressing known, frequently quantifiable specific impacts of a proposed development. Performance standards limit, for example, the intensity of development, impacts of development on nearby land uses and effects of development on public infrastructure while protecting the natural environment, so as to control a project’s ultimate building volume or percentage of lot area that must be vegetated. For example, Metro Nashville passed an ordinance in 2007 requiring all new buildings or existing-building additions exceeding five thousand gross square feet of occupied space or two million dollars in construction costs to be LEED® certified.

\[217\] Reportedly, of the eight local American governments introducing performance-based planning systems, most dropped or revised the system, see Eiji Torisu, et al., Competitive Cities: A New Entrepreneurial Paradigm in Spatial Development 71 (2007); however, it is unknown whether the reporting parties actually had identified all communities with such regulatory systems (for instance, Havana, Florida’s) or how they defined those sets of ordinances in terms of their “pure performance standards” orientation, as opposed to a hybrid fashion of land use regulation. 
\[218\] John R. Ottensmann, Market-Based Exchanges of Rights within a System of Performance Zoning, 1 PLAN. & MKT. 1, 4 (1998). In this respect, performance zoning does not regulate the parcel’s intended use but instead those adverse impacts anticipated by a use of the type intended. 
“Silver” - or better. Performance standards can be negative or positive. Thus, they can set a maximum level for the noise impacts on adjacent property or they can require specified types of physical buffers to be established between certain types of land uses. Performance standards encourage environmental conservation through using green roofs or installing impervious surfaces by specifying the amount of “on-site stormwater retention” a project must achieve.

Since 1990, the Town of Havana, Florida, population 1,709 (2013 census), has had a performance zoning code. Such a code was adopted fifteen years later by the Town of Hyde Park, New York, population 21,571 (2010 census). The startlingly candid exposition of purpose in the first section of the Havana Zoning Ordinance states:

Every effort has been made to make uses a matter of right subject to performance criteria capable of nondiscretionary, objective administrative evaluation, thus reducing the number of times that ad hoc decisions need be made. This greatly increases the potential uses or choices available to individual property owners. The ad hoc decisions appear to

220 See NASHVILLE METRO. C. Ch. 16.60.050 (Sustainable Development Design Standards). While a laudable effort to set municipal performance standards, some argue that LEED® certification ratings adopted by governments barely scratch the surface of sustainability potential in building performance. See Sarah B. Schindler, Following Industry’s LEED®: Municipal Adoption of Private Green Building Standards, 62 FLA. L. REV. 285, 328 (2010) (noting a market-based standard, when converted to a government mandate, fails to build an effective green building regime).


223 See Jourdan, supra note 219, at 334-5.

224 See TOWN OF HAVANA PERFORMANCE ZONING ORDINANCE, Jan. 2005, available at www.townofhavana.com/(click on Online Forms, click on” Zoning Ord 2005 final”). Havana’s zoning ordinance has four zoning districts and two – neighborhood conservation and industrial – severely limit allowed land uses (the former allows only single family dwellings on minimum lot sizes, while the latter segregates industrial uses). See Susan Freiden and Richard Winters, Performance Zoning Helps Key City’s Comeback, AM. CITY & CNTY. 70 (Jun. 1997). The urban core and development districts allow most non-heavy industrial uses so long as performance standards are met; these are based on the type of adjacent development, see id.

reduce the certainty of protection to neighbors and to increase the potential for adverse
impacts to the Town of Havana. This ordinance contains performance criteria intended to
insure that neighbors are protected from adverse impacts. The ordinance also contains
performance criteria to protect the community's general welfare.

Where performance criteria severely limit the use of properties, the ordinance has gone to
considerable extremes to provide the landowners with a range of choices, flexibility, and
options for development.\textsuperscript{226}

In the same vein, the Hyde Park ordinance, originally adopted in 2005 and revised in
2008, indicates in its statement of purposes:

To establish clear, efficient and flexible land use review procedures and standards for
future projects.

\dots

To encourage the conservation of energy and the appropriate use of solar and other
renewable energy resources.\textsuperscript{227}

Consistent with these purposes, Hyde Park’s zoning code has just 12 districts, of which 5 are tied
to distinctive enclaves in the town having peculiar character.\textsuperscript{228}

To the uninitiated, performance zoning may sound like a form of forbidden contract
zoning, an incorrect conclusion. Contract zoning, illegal in most states,\textsuperscript{229} refers to an agreement
between a property owner and a local government where the owner agrees in advance of a public
hearing to certain conditions in return for the government’s rezoning or enforceable promise to

\textsuperscript{226} See TOWN OF HAVANA PERFORMANCE ZONING ORDINANCE § 1001, Commentary. The Ordinance
is 187 pages long as formatted (12 pitch).


\textsuperscript{228} See DUTCHESS COUNTY PLANNING & DEVELOPMENT, TOWN OF HYDE PARK ZONING MAP

\textsuperscript{229} See David W. Owens, Contract Zoning, Apr. 2014, https://www.sog.unc.edu/node/940; Philip L.
Fraietta, Contract and Conditional Zoning without Romance: A Public Choice Analysis, 81
rezone. But performance zoning is not the result of bilateral negotiations. Instead, the community adopting the performance standards has a pre-existing understanding with all potential development parties that if prescribed criteria are met, either (a) mitigating certain negative externalities (for example, carbon dioxide emissions and potable water waste), or (b) achieving specifically quantified community development goals such as jobs relocation, affordable housing development or carbon-footprint reduction, then the zoning vests without implementing collateral agreements with the developer. (Indeed, there are no collateral agreements in most cases, as it is up to the developer to decide (as in the case of Havana, Florida), how to achieve the community’s goals. “Hit the targets, build the project” is the essence of performance zoning. Communities can use a “points total” calculation system to

230 James D. Lawlor, Annotation, *Validity, Construction, & Effect of Agreement to Rezone, or Amendment to Zoning Ordinance, Creating Special Restrictions or Conditions Not Applicable to Other Property Similarly Zoned*, 70 A.L.R.3d 125, 131 (1976); cf. Collard v. Incorporated Village of Flower Hill, 421 N.E. 2d 818, 821-22 (N.Y. 1981) (“absent proof of a contract purporting to bind the local legislature in advance to exercise its zoning authority in a bargained-for manner, a rule which would have the effect of forbidding a municipality from trying to protect landowners in the vicinity of a zoning change by imposing protective conditions based on the assertion that that body is bargaining away its discretion, would not be in the best interests of the public. The imposition of conditions on property sought to be rezoned may not be classified as a prospective commitment on the part of the municipality to zone . . . .”)

231 See, e.g., the Warm Springs/South Fremont Community Plan 9, https://www.fremont.gov/DocumentCenter/View/24622 (strategies to create a hub of innovation “are designed to encourage flexibility and experimentation while setting performance standards for consistently high quality in the public realm.”) In terms of building performance to mitigate excessive energy use, design professionals are urged to “follow the relatively strict standards that prescribe minimum acceptable performance of crucial building parameters or they can choose to freely use any combination of building parameters, as long as it can be demonstrated through energy modeling that the design meets, or exceeds the established set of Energy Performance targets for Warm Springs/South Fremont . . . .” Id. at 94. In the words of Fremont consultant Noah Friedman, Fremont’s zoning “doesn’t tell you how to achieve the standard, just that you need to achieve that standard.” See Anthony Flint, *Braving the New World of Performance-Based Zoning*, ATLANTIC CITYLAB Aug. 12, 2014 http://www.citylab.com/housing/2014/08/braving-the-new-world-of-performance-based-zoning/375926/.

232 Nicole Stelle Garnett asserts that form-based codes are equivalent of “highly technical performance-zoning overlays” surmounting other zoning regulations, see Nicole Stelle Garnett, *Redeeming Transect Zoning?* BROOK. L. REV. 571, 580 (2013). But physical appearance is more consequential in form-based codes than are negative outcomes mitigation or public policy goal achievement. Performance zoning also is different than “performance bonuses” that are
accomplish approval of the intended use, altering the project’s performance as seems appropriate to reach the required total as it moves through the administrative process to permitting.

Compliance with performance standards usually is based upon assessing the proposed development by using specified handbooks or formulas to determine the impacts of the development. For example, trip generation could be assessed by determining the trip counts associated with the proposed use by using a handbook of trip generation factors. Compliance with the standard would depend upon the ultimate user of the development, whether owner-occupied or leased. There would not necessarily be any attempt made after completion of the development to measure actual trip-generation. Rather, as long as the proposed use is not changed, the property owner would be deemed to be in compliance with the trip generation standards. Thus, enforcement would not be any different from the enforcement of the use requirements under a traditional zoning ordinance. (Jurisdictions imposing requirements for trip reductions below those normally associated with a given use would need to undertake subsequent monitoring of actual trip-generation, for which digital devices bearing microprocessors-driven counters easily and accurately can handle that task.) Performance characteristic of incentive zoning, see, e.g., CITY OF PORTLAND BUREAU OF PLAN. & SUSTAINABILITY, MIXED USE ZONES PROJECT CODE CONCEPTS REP. 8-9 (May, 2015) available at http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CCgQFjACahUKEwjyhO6fHzfGAhXJo4gKHfjXAOU&url=http%3A%2F%2Fwww.portlandoregon.gov%2Fbps%2Farticle%2F531987&ei=xMi2VfKSK8nHogSIr4oDg&usg=AFQjCNFbix14maJgFhLshx9D35XXKX_32ggAg&sig2=EfbAS0L6oAwBicOSJrIsw&bvm=bv.98717601,d.cGU (noting bonus floor area is to be available following “reporting for compliance” of achievement of items such as an on-site “publicly available plaza,” energy efficiency targets within buildings, “tree canopy coverage,” or green building roof areas); J. Spencer Clark, Rocking the Suburbs: Incentive Zoning as a Tool to Eliminate Sprawl, 22 BYU J. Pub. L. 255, 264 (2007).

See Jourdan, supra note 219, at 338.

See id.


See id. at 61. The ITE Trip Generation Manual (9th ed. 2012) is the “gold standard” in most municipalities for determining traffic burdens generated from commercial uses.

See Ottensmann, supra note 218, at 6.
standards associated with the adequacy of existing public facilities are assessed at the time the building permit is pending. In this way, issues with respect to continuing compliance based upon possible future changes in the provision of public facilities are avoided. Finally, some performance standards may require measurement of impacts after the permitted use is complete, for instance, a maximum noise standard. In most cases, the need for such measurement and subsequent enforcement actions, if any, would likely be required only in a small minority of cases, usually undertaken in response to public complaints. While this may seem hazardous in the context of some impacts, such as transit or bicycle performance effects of the project, mass transit service expansion for occupants, traffic signal coordination and bicycle usage amenity additions remain available to mitigate transportation impacts of new development.

Goal-achievement systems promoted under performance zoning are not unlike the affirmative obligations included in private covenants appearing in community benefits agreements. While performance zoning involves government regulation, imposed and enforced by public administrators, private covenants are agreements among private landowners, enforceable by those parties with contract privity. Performance zoning is closely tied to the planning process because the local government initially must identify planning goals and then draft regulations specifically advancing the stated goals. This process is superior to relying on one-time sets of restrictive covenants providing stakeholder protection, given the substantial

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238 See, e.g., Kosoglad v. Zoning Bd. App. of City of Chicago, 198 N.E.2d 216, 218 (Ill. App. 1964) (holding city can require applicant’s showing that performance standards will be met before a special use permit issues).

239 See, e.g., Alejandro E. Camacho, Community Benefits Agreements: A Symptom, not the Antidote, of Bilateral Land Use Regulation, 78 Brook. L. Rev. 355, 355, 367 (2013) (CBAs specify public benefits a developer will provide in a project in return for community groups relinquishing the right to challenge project entitlements, thereby fostering community building; as such, they are a vehicle to promote flexibility and certainty in the regulation process); Patricia E. Salkin and Amy Levine, Community Benefits Agreements and Comprehensive Planning: Balancing Community Empowerment and the Police Power, 18 J. L. & Pol’y 157, 178 (2009) (commitments contained in CBAs include means to address land use, housing, transportation and environmental standards, among others).

240 See Salkin & Levine, supra note 239, at 159. Sometimes “public CBAs” are negotiated directly with the government authority, engaging governments in their terms’ implementation and enforcement; in other cases, CBAs become incorporated in community development agreements. Camacho, supra note 239, at 361-2.
difficulty of reaching agreement upon and imposing private covenants within an already-developed area having ownership dispersed among many parties or containing many stakeholders but only a few vocal community groups. Because performance zoning is imposed through government action, performance zoning affects all properties identically, providing uniform standards across a jurisdiction’s boundaries.

Performance zoning creates three classes of rights holders. First is the property owner granted the rights to develop freely subject only to complying with the baseline standards like vehicular trip generation. Nearby property owners is the second party with rights, primarily the right to be free of prescribed negative externalities such as noise pollution. The larger community is the third rights-holder, with rights such as freedom from roadway congestion as a result of over-development. An important result of identifying performance standards driving rights inhering in each stakeholder group is creating a marketplace through which those rights can be traded for other rights or sold (in either case relinquished). For example, in the case of adjacent dwellers, the developer may pay cash compensation to neighbors potentially adversely affected by a project. Individual property owners can gain from such trade without compromising the interests of the broader community; but it is conceded that some performance outcomes may harm more distant property owners instead of more directly affected persons.

**B. Opportunities Available under Performance Zoning Codes**

Performance zoning bears opportunities and constraints, many of which are identified in this and the following subpart. The key aspect of performance zoning lies in its regulation of land use through the establishment of explicit standards calculated to achieve defined public

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241 See Camacho, supra note 239, at 368-72.
243 See id.
244 See id. In that respect, a marketplace closely resembles Community Benefit Agreement negotiation, except for the fact that the goods available for exchange (the rights of stakeholders sought to be protected from negative development impacts) are specified in advance under the terms of the performance zoning ordinance, cf. text at notes 239-40, supra.
245 Ottensmann, supra note 242, at 41.
objectives. If one public objective is to limit the negative impacts of land uses on adjoining uses, undesirable levels of such impacts are carefully defined, and authorities develop standards to prohibit these altogether or to substantially mitigate them. To assure that development takes place within the capacity of the public infrastructure, capacity levels are established and development is limited based upon specific infrastructure-based impacts and limitations. (For example, the effect of development on the transportation system can be controlled via standards involving maximum levels of trip generation and developer infrastructure required per acre developed.) Properly done, such standards are quantifiable and less susceptible to interpretation.

Quantification carries several spillover effects. First, performance standards encourage stakeholders in planning better to visualize functions and appearances of their communities and increases citizen inputs. Second, it provides a path to preserve a community’s environmental features and enhance its green infrastructure through better site planning. One illustration of this is Berlin’s Biotopflächenfaktor, enabling that city’s sustainable site design on private property through analysis of a “green area ratio,” sometimes abbreviated GAR. GAR’s

246 Id. at 40.
247 See id.
248 See id. at 41.
249 See RICHMOND RPDC, supra note 235, at 18. Craig Arnold distinguishes between “primitive” and “precision” standards, with the former preventing nuisances like odors, noise, gas, heat, glare, smoke and other impacts beyond boundary lines that are more difficult to enforce and the latter standards being developed by distilling scientific or engineering data that is more accurate, objective and therefore leaves less discretion to a community zoning administration, see Craig A. Arnold, Planning Milagros: Environmental Justice and Land Use Regulation, 76 DENV. U. L. REV. 1, 118 (1998); see also Robert J. Blackwell, Overlay Zoning, Performance Standards and Environmental Protection after Nollan, 16 B.C. ENVTL. AFF. L. REV. 615, 616-17 (1989). As I argue later, fewer primitive standards exist today than Arnold believed existed fifteen years ago, as most have been transmuted into precision standards by technology.
250 See id.
251 Green infrastructure compatible in urban areas consists of elements such as conventional street-side landscaping (trees and shrubs), green roofs, green facades, permeable pavements, rain gardens and stormwater treatment swales, see Melissa Keeley, The Green Area Ratio: An Urban Site Sustainability Metric, 54 J. ENVTL. PLAN. & MGMT. 937, 938 (2011).
252 See id.
253 See id. at 939.
components are (a) a set of ratings, (b) a set of targets and (c) a ratio derived for each parcel or project, those first two components being set by the land use regulators; the third component, a calculation generated by the parcel owner, establishes how the tract’s GAR plan meets formulated targets.\(^\text{254}\) For component (a), planning professionals rate sustainability techniques in property development by weighing or prioritizing each for their environmental serviceability; while for (b), administrators set the minimum percentage of each parcel’s area incorporating green infrastructure and related environmental services, typically mandating preserving existing on-site green amenities while encouraging implementing new green technologies such as those described in Part IV.\(^\text{255}\) Berlin’s GAR point system allows technologies to be mixed, affording choice and flexibility in meeting on-site requirements.\(^\text{256}\) Calculations allow developers to evaluate various scenarios to achieve the GAR plan’s implementation.\(^\text{257}\) The property owner or developer submits a GAR plan to the city together with its building permit initial drawings for plan approval; thus, existing buildings and projects predating the Biotopflächenfaktor’s adoption are exempt from complying until a new occupancy certificate is needed.\(^\text{258}\)

Performance zoning, being inherently flexible, affords a business – friendly atmosphere without undercutting a community’s character.\(^\text{259}\) By reducing community conflict undergirding

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\(^{254}\) See id. at 940.

\(^{255}\) See id. at 940-1, 948. Based upon allowable lot coverage, Berlin’s target values dictate how much green infrastructure must be integrated on a site, see id. at 948; this approach avoids the ephemeral question of how much green infrastructure or environmental services is “sufficient,” see id. Keely observes that overly ambitious greening targets could push community development outward to less densely developed areas where developer compliance costs are more reasonable, see id. Keely also notes that geodata gathering substantially aids in environmental benchmarking by mapping locations where green best- management practices prevail and where urban heat islands have developed. This enhances opportunities for: Creating neighborhood-specific performance rankings; monitoring developer compliance with GAR commitments; estimating developers’ implementation costs; and refining municipal GAR target-setting, see id. at 949, 954; see also Schindler, supra note 220, at 334 (information gathered on innovative green buildings’ performance can be used to modify future iterations of a community’s ordinance).

\(^{256}\) See id. at 951.

\(^{257}\) See id. at 951.

\(^{258}\) See id. at 944.

\(^{259}\) See RICHMOND RPDC, supra note 235, at 18.
Euclidean zoning scheme “contests,” limited time and fiscal resources can be focused on quality development instead of on rallying the opposition, lobbying governments and exhausting appeals. Perhaps reaching to refocus its resources, Seattle adapted Berlin’s GAR system to its land use regulatory scheme in late 2006, labeling GAR as the “Seattle Green Factor.” Implemented in 2007 and revised in 2009, the Green Factor calculates point values for each functional element (such as rain gardens, green roofs or walls and stormwater planters) occupying any new non-residential project containing more than four thousand square feet or any new parking lot containing more than 20 stalls. The city’s project requirements are based on developers implementing a sufficient number of “functional systems,” not upon developers’ adherence to rigid standards, which enhances design diversity while encouraging connections between architectural form and landscape to improve municipal ecological systems. Seattle’s planners therefore develop greening targets relating to the landscaping potential for each zone but focusing on on-site amelioration of development impacts through increased green infrastructure.

Because performance zoning dispenses with the large numbers of narrowly-defined and highly-specific use districts typical of prescriptive zoning, the former allows all possible uses while establishing a uniform system of performance standards (such as the Seattle Green Factor)

261 See RICHMOND RPDC, supra note 235, at 18.
262 See Keeley, supra note 250, at 952-4; Seattle Ord. No. 122311 (2006). The ordinance amended all commercial and neighborhood commercial districts and the industrial commercial district within urban village or urban center boundaries see Seattle Muni. C. §§ 23.47A.016 and 23.50.038.
264 See id. at 1.
265 See Keeley, supra note 250, at 954.
266 Seattle is not alone in its fervor for green infrastructure; Indy Rezone, Indianapolis-Marion County’s new zoning code adopted in 2015, introduces a tool into the plan submittal and review process changing landscaping plan requirements from simply depicting placement of vegetation on a site to a more integrated functional landscape, and Green Factor values (with scoring) have been established for all zones other than single family districts. See METRO. DEV. COMM’N CONSOL. ZONING & SUBDIV. ORD. 2015-AO-02, Sec. 744-509 (pp. 532-5), available at http://www.indy.gov/eGov/City/DMD/Planning/Zoning/ordinances/Indy%20Rezone%20Docs/Indpls%20Zoning%20Ord%20-%20MDC%20Approved%206-17-2015%20NO%20footnotes.pdf.
throughout a jurisdiction. Some systems of performance zoning, however, provide for specifying a relatively small number of generalized zones, with some broad restrictions on types of use and varying standards being applicable in each particular zone. Limiting the number of zones will reduce the magnitude of rezoning requests, freeing bureaucracies from administrative paperwork and time dedicated to processing cases and approving site plans.

In trying to achieve public objectives relating to land use, performance zoning is more flexible and ultimately more powerful than traditional Euclidean zoning. Performance standards can potentially be established to achieve virtually any legitimate public objective, including the goal of environmental justice. The National Academy of Public Administration in a 2003 report to the U.S. Environmental Protection Agency noted that performance zoning strategies would greatly advance this goal, recommending that local governments should “adopt more flexible zoning techniques, such as . . . [u]sing performance zoning to regulate the adverse impacts of nuisance-like activities, such as noise and odor; . . .” Increased flexibility further allows for land development and use to be more responsive to market forces, resulting in more economically efficient outcomes. Furthermore, performance zoning provides a framework enabling exchange of certain rights that can address greater responsiveness to the market while preserving the public objectives sought by local land use control. Moreover, performance

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270 See Keeley, *supra* note 250, at 952. Keeley notes that when the environmental impacts of new development are defrayed at the source, instead of “shared” among the other users of city infrastructure, disproportionate burdening of those who cannot afford to share in the environmental costs of development is mitigated, *see id.* However, Keely also notes that GAR may negatively impact provision of affordable housing and residential opportunity diversity, *see id.*
standards’ malleability better partners with emerging technologies in the realty construction and building performance fields.274

C. Constraints under Performance Zoning Processes

One common critique of an outcome-mitigation regulation orientation is that while performance zoning is more flexible than its land-use categorization predecessors, it can be difficult to administer due to its concurrent complexity and indeterminacy.275 Writing precise


275 See, e.g., DONALD L. ELLIOTT, A BETTER WAY TO ZONE: TEN PRINCIPLES TO CREATE MORE LIVABLE CITIES 25-6 (2008); Jourdan, supra note 219, at 336; Alan C. Weinstein, Performance Zoning: A Silver Anniversary Evaluation, 21 ZONING & PLAN. L. REP. 7, 56-7 (Jul.-Aug. 1998). Elliott, supra, explains that the untrained planning staff in some circumstances lacks technical expertise, thus would have to “take the builder’s word for it” on issues of compliance with performance standards. A recent illustration of public concern about this type of flexibility arose in the Millennium Hollywood Project in Los Angeles, which was the subject of a “Land Use Equivalency Program,” see MILLENNIUM HOLLYWOOD PROJECT LAND USE EQUIVALENCY PROGRAM, http://clkrep.lacity.org/onlinedocs/2013/13-0593_misc_07-11-2013.pdf (last accessed May 30, 2015). Two neighborhood groups filed suit to stop the project, concerned about traffic, obstructed views and seismic safety, see Howard Fine, Judge Halts Millennium Hollywood Project, L.A. BUS. J. Apr. 30, 2015, available at http://labusinessjournal.com/news/2015/apr/30/judge-halts-millennium-hollywood-project/. On April 30, 2015, Superior Court Judge James Chalfant attacked the equivalency program’s lack of specificity. See Opinion in StopTheMilleniumHollywood.com. et al. v. City of Los Angeles et al., BS 144606 (Tentative Decision on Petition for Writ of Mandamus), at 28-30, http://documents.latimes.com/court-ruling-millennium-hollywood-project/. That program specifies maximum environmental impact (identified in the Environmental Impact Review) allowed from the range of uses, and allows the developer to adjust plans to address market conditions by demonstrating to the City Planning Department that the change does not exceed the specified “maximum impact.” Judge Chalfant also said the city failed to clearly outline the scope of the project beyond specifying two office towers, meaning the full impacts of the project could not be analyzed appropriately in the environmental review. Opinion, at 29-31 (“uncertainty about market conditions or the timing of its build-out is insufficient ground for the ambiguous and blurred Project Description . . . the project description must provide sufficient information about the project and reviewing agencies to evaluate the project’s environmental impacts.”). The Judge noted that the program did not indicate how the Planning Department would make the proper determination and
but adequately specific standards and administering them were time-consuming during the period when performance zoning was most intensely considered by community regulators;\textsuperscript{276} such activities required extensive research and a deft political touch when facing opposition from the development community to proposed standards.\textsuperscript{277} According to critics, this is why no major city has replaced Euclidean zoning with performance zoning “across the board,”\textsuperscript{278} although Chicago has applied performance-based provisions to certain of its industrial zoning districts.\textsuperscript{279} In the 1980s and 1990s, skeptics decried local administrators’ unfamiliarity with dimensions of technical specifications in the adoption and monitoring of standards’ compliance\textsuperscript{280}; thus, concerns arose that planners would fail to grasp the effects performance standards might have on a project’s visual impacts, or that collectively standards might unduly restrict development intensity.\textsuperscript{281} This critique predated the widespread use of the Internet\textsuperscript{282} (including the IoT),

| 277 ELLIOTT, supra note 272, at 25.
| 279 Ottensmann, supra note 237, at 41.
| 280 See Tasman, supra note 273 (noting performance zoning was horrible for place-making, exacerbated dependence upon motor vehicles and enabled a lack of connectivity [between places]; and it was “unpredictable and a nightmare to administer.”)
| 281 See RICHMOND RPDC, supra note 235, at 18.
| 282 Prior to the 2013 publication of the Jourdan, et al. study, supra note 219, prior performance zoning commentary was concentrated in the early 1990s, see, e.g., Martin Jaffe, supra note 227, at 3; Acker, supra note 135; in that moment, public use of the Internet was minimal, while the Internet of Things (see note 138, supra) was an abstraction. Until 1994 when the National Science Foundation
microprocessors driving sensor and camera devices and machine intelligence. Local planners can learn today, via the sharing of existing research and so-called best practices through direct communications with counterparts operating in the sustainability performance-standards realm or via online seminars. When community administrators feel inadequate to the task of standards adoption, trade groups of contractors and property developers and professional associations in engineering and design fields are available to consult on developing suitable specifications addressing adverse impacts of densely-developed projects; many such standards already exist, for instance in the realms of ambient noise caps, street configurations for accommodating commercial vehicular and pedestrian traffic patterns and parking burdens.


Three points are noteworthy here. First, the United Kingdom is one nation among EU member states to adopt an overtly spatial performance-based zoning system on a regional basis, see PLANNING AND COMPULSORY PURCHASE ACT 2004, PART 1 available at http://www.legislation.gov.uk/ukpga/2004/5/contents; see also WENDY STEELE, STRATEGY-MAKING FOR SUSTAINABILITY: AN INSTITUTIONAL APPROACH TO PERFORMANCE-BASED PLANNING IN PRACTICE 56-9, 307-8 (2009), available at https://www120.secure.griffith.edu.au/rch/file/7188dc55-9580-7ce9-3e72-12cadd520b4b/1/Steele_2010_02Thesis.pdf. Prof. Steele identifies five key reform themes in that legislation fostering performing planning systems able to support and promote sustainability. See id. at 57. Much can be learned from sharing experiences with Great Britain. Further, since Millennials are characterized as being fond of and naturally turned toward collaboration, shared learning experiences should be second nature. See Michele Monaco, Malissa Martin, The Millennial Student: A New Generation of Learners, 2 ATHLETIC TRAVEL. ED. J. 42, 43-4 (2007). Third, non-traditional building features like passive solar and photovoltaic technology are already the subject of standards like published energy codes, see, e.g., MARTHA G. VAN GEEM, ENERGY CODES AND STANDARDS, WHOLE BUILDING DESIGN GUIDE Mar. 24, 2014, available at http://www.wbdg.org/resources/energycodes.php.

When performance zoning standards expressing community goals are met, the developer can decide what project uses to implement, an idea not resonating well with all stakeholders in the zoning process accustomed to the separation of uses. Monitoring issues in performance zoning draw skeptics. Concerns include that staff have substantial learning curves before launching an ordinance and community expenditures increase for personnel training and equipment; that adopting myriad performance standards lengthens the site plan administrative review process; and that more administrative resources must be expended to conduct site inspections and investigate neighbor complaints concerning the actual performance of a permitted project. The last issue arises from doubts about follow-through intentions of developers constructing under performance standards, but local agencies easily can adopt President Reagan’s advice to “trust but verify.” This practice can be applied to the stage of project permits close-out, where implementing performance standards is confirmed by community representatives as a condition to releasing previously posted developer security such as cash bonds or letters of credit. Collateral-at-risk usually deters developers failing to deliver on promised performance standard compliance.

The U.S. General Services Administration with the U.S. Energy Department analyzed building performance in 22 federal buildings, a study completed in 2011. Data sets analyzed for these buildings included carbon dioxide equivalent emissions, aggregate operations costs for electricity, gas and water usage, waste generation and recycling costs, occupant commute times

285 See Flint, supra note 228.
and occupant satisfaction. The GSA concluded that it could successfully monitor building compliance and contrast these public buildings’ performance with comparable structures in the private sector. Nothing prevents local governments from following the lead of the GSA in testing performance against established standards for resource conservation and energy savings of privately built buildings.

Clearly developer performance of mitigation obligations can be monitored by unbiased, intelligent instruments of control governing complex systems of data-generating sensors. This can be done by local authorities as easily as their federal counterparts, as demonstrated by Chicago. Chicago compiled and disclosed results of a 2014 survey of very large commercial building performance standards through its Energy Benchmarking Report. This work began with Chicago’s Building Energy Use Benchmarking Ordinance adopted in 2013. For 2015, the Ordinance requires owners and managers of commercial (and municipal) buildings larger than 50 thousand square feet to report their buildings’ performance via “property profiles” on a City Web interface that details their whole-building energy use data (derived from energy bills) for calendar year 2014. This ordinance enabled the City of Chicago to implement the Retrofit Chicago’s Commercial Building Initiative, under which participating owners and managers

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290 See id. at viii-xiii.
294 See CHICAGO ENERGY BENCHMARKING, http://www.cityofchicago.org/city/en/progs/env/building-energy-benchmarking---transparency.html/. To comply, covered buildings must track whole-building energy use, report to the City annually, and verify data accuracy every three years after the year of initial reporting. See id.
voluntarily attempt to increase energy efficiency in older large commercial buildings by 20 percent within five years.\textsuperscript{295}

Even if local governments lack the skills sets and resources to conduct municipal audits of developer compliance with development standards, such analysis can be outsourced. The Internet of Things implants microprocessors in myriad devices to provide internal building management or outside parties with rich reporting of performance metrics in real time.\textsuperscript{296} Machine intelligence applying tested algorithms in the not-distant future will monitor performance and make adjustments as needed to ensure compliance with water, power and other “grid”-like utility conservation.\textsuperscript{297} Sensors embedded in curbs or street lamp supports can track traffic volumes and parking stall availability, verifying if impacts of greater density are mitigated by project developers.\textsuperscript{298} While some jurisdictions are positioned to implement performance zoning, others may struggle with the decision to abandon tried and true systems imbedded in prescriptive land use regulatory environments. The next subpart reminds readers why conventional zoning protocols may be impractical during this period of urban sustainability emphasis.

\textit{D. Local Land Use Administration Impairment of Developer Sustainability Focus}

Fundamentally in traditional local administration, separating regulatory authority based on disciplines (building, land use/zoning, environmental impact, sustainability public health, transportation, utilities, etc.) or jurisdictions rarely matches the complex and interrelated realities of the regulated activities and their risks.\textsuperscript{299} For example, the division of planning and the regulation of land use (zoning, site plan review) and building in many local governments results in fragmented regulation of activities and outcomes that cross many regulatory boundaries.\textsuperscript{300}

\textsuperscript{296} See note 138, supra.
\textsuperscript{297} See text and notes 141-5, supra.
\textsuperscript{298} See text and notes 147-8, supra.
\textsuperscript{299} See BARRIERS, supra note 139, at 22, 38.
\textsuperscript{300} See id. at 38.
Transportation departments may object to the use of pervious pavement or alternative street designs intended to minimize hardscapes because they diverge from currently-accepted policies and standards.\textsuperscript{301} Zoning laws in the Euclidean mold typically require more parking than sustainable land use and development practices recommend, particularly where there is suitable access to public transportation.\textsuperscript{302} Reducing parking requirements facilitates urban densification while engaging the public with alternative modes of transportation, but getting buy-in to the proposition that denser cities are more sustainable\textsuperscript{303} is difficult.

Developers with high performance building goals frequently experience delays from appeals and out of sequence approvals processes, especially where a number of agencies are involved in approvals.\textsuperscript{304} Variances and appeals can extend project durations by years, resulting in costs that may not be recoverable by the developer.\textsuperscript{305} The sequencing and timing of approvals present obstacles during permitting. Building permits usually must be secured prior to the issuance of demolition permits, both for existing building renovation and site demolition and for deconstruction for new development.\textsuperscript{306} The administrative provisions of codes provide building officials with invaluable authority and legal protection to use their judgment to interpret the codes; but they also can lead to conflicting policies toward code enforcement across jurisdictions.\textsuperscript{307} Building officials may be unaware of rulings or changes that set new precedents for approval of a green design strategy.\textsuperscript{308} Moreover, unfamiliarity with “green” alternative building systems will lead to permitting officials insisting on inappropriate changes, plans details or additional application requirements.\textsuperscript{309} In summary, there have been and there remain significant challenges to adding appropriate decentralized alternatives into the mix of community

\begin{itemize}
  \item \textsuperscript{301} See id. at 39.
  \item \textsuperscript{302} See id.; David Shoup, The High Cost Of Free Parking 75-111 (updated ed., 2011).
  \item \textsuperscript{303} See Edward Glaeser, Triumph Of The City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier And Happier, 209-10, 217, 267-8 (2012).
  \item \textsuperscript{304} See Barriers, supra note 139, at 36, 39-40.
  \item \textsuperscript{305} See id. at 40.
  \item \textsuperscript{306} See id.
  \item \textsuperscript{307} See id. at 40-2.
  \item \textsuperscript{308} See id.
  \item \textsuperscript{309} See id. at 42.
\end{itemize}
approvals processes, even where alternatives can supplement in a more integrated fashion inadequacies in centralized bureaucratic systems.  

These observations emphasize that competitive communities in the related realms of economic development and providing quality of life need to employ innovative strategies and systems not present or contemplated in the current maze of zoning and building regulations governing non sustainability-oriented projects. Properly crafted so that flexibility affords opportunity for continuous sustainability innovation in the private development sector, performance zoning strides toward reducing community environmental injustice in densely populated urban cores.  

This in turn will produce different and improved vision, policy and planning governance responses among community leaders. For example, community-wide conservation of non-renewable energy resources (by drastically reducing their consumption) increases their supply, favorably affecting consumer prices. In another illustration, local initiatives to recycle recurring community resources like rainwater or effluent will increase their application to urban plant and animal life as well as availability to human dwellers in cities, greening the public spaces afforded to all and improving public health.

VI. Unburdening the Developer, Enabling Millennial Administrators and Building the Sustainable Community

In respect to Smart Codes or form-based codes, Nicole Stelle Garnett recently urged local officials to

consider an option that I have previously defined as “[m]ixed-[u]se [z]oning without the [s]trings”—that is, simply amending zoning laws to permit a greater degree of land use diversity while eschewing the regulatory details that pervade most transect-zoning schemes. This would achieve a core goal of transect zoning—more mixing of land uses.

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310 See id. at 50.
312 See Houston, et al., supra note 311, at 84-5.
313 Garnett, supra note 44, at 587.
Indeed, if developers can mitigate entirely negative outgrowths of new urban-core development — like additional parking burdens, increased traffic movement conflicts, ambient noise, enhanced carbon footprint and energy waste — then why should local government prescribe most land use dimensions of their projects? If sustainability concerns are paramount in cities with high growth rates then, in the realm of sustainability, certainly developers should be permitted far greater control of their projects while they satisfy articulated community sustainability goals.

Underwriters Laboratories’ Erin Grossi argues that the sustainable building movements in Europe and the United States have led the developed world to the cusp of an era of focus on building performance. If Grossi is correct, then the time is ripe for innovative local legislation addressing new construction and development processes engaged in producing efficiencies. That land use legislation is performance zoning. Here, communities can set goals to eliminate or severely staunch negative impacts - and allow the development industry to meet those goals on

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314 I do not here (a) advocate abandoning plans review in fire and safety codes compliance nor (b) suggest that cities and developers are free to ignore in their projects the contextual dimensions of their projects, essentially, their regional impacts. Instead, my point affirms Isaiah Berlin’s concept of “negative liberty”: that individuals are to be protected from the state, see Isaiah Berlin, Two Concepts of Liberty, in ISAIAH BERLIN, LIBERTY 166 (Henry Hardy, ed., 2002). I do not propose abandoning all state control over development even if the developer “solves all identified problems” attached to its project under development; citizens expect more from their governments, especially where personal health and safety are at stake. In addition, administrations are elected and paid to see the “larger picture,” such as evidenced by the shade impact of one project upon another in the immediate vicinity, see, e.g., Haniyeh Sanaieian & Martin Tenpierik, et al., Review of the Impact of Urban Block Form on Thermal Performance, Solar Access and Ventilation, 38 RENEWABLE & SUSTAINABLE ENERGY REV. 551-560 (2014) (concluding that since form and position of urban blocks not only influence micro-climate but also the energy performance of each such block, considering a building in isolation without studying the effect upon its surroundings is senseless). Architects tend to study energy and comfort mostly on the building scale, see id. at 552. Urban blocks impact the energy performance of each building occupying a portion of the block.

315 Grossi, supra note 73, at 4.

their own terms, with sensible bureaucratic verification. Goal-orientation is more likely to result in real environmental benefits than prescriptive standards can achieve.317

Will the development industry circumvent or ignore the intent behind explicit community goals in performance zoning ordinances? Some degree of cheating is inherent in human nature.318 Consider three responses. First, it makes good economic sense for developers to invest in higher building performance standard compliance. They are aware that increasing numbers of their occupants view sustainability as reflecting the mission and values of their businesses and that such occupants want to provide a healthful workplace for their employees.319 Even were these buildings largely vacant, however, savings on energy and water usage are realizable through implementing relatively inexpensive sustainability initiatives, the costs of which may quickly be recaptured. Second, verification methods are applicable to new development, and sanctions are available for defectors (cheats), either through forfeiture of developer-posted cash collateral or by suspending certificates of occupancy pending compliance with the goals that the developer claims have been met. Indeed, verification methods will become sophisticated enough in short order that questions arise whether concealment of facts remains a viable long-term option for commercial building operators.320

317 See Schindler, supra note 220, at 334.
320 New technology amplifies the capacity of its users to glean building performance metrics without hacking into the property manager’s cloud-based datasets. The invention by New Bounce Imaging of “tactical spheres” that, equipped with multiple cameras, enter unwelcoming spaces to gather pictorial evidence of conditions from disparate images knitted together to make full panoramic portraits transmitted to a smartphone. See Rob Matheson, Alumnus’s throwable tactical camera gets commercial release, MIT NEWS Jun. 26, 2015, available at newsoffice.mit.edu. Available initially to first responders in dangerous environments, these Explorers and similar “spying devices” will soon be affordable to consumers who will use these “indoor drones” to investigate interiors’ temperatures and air-flows. Self-appointed “watchdogs” stealth, supported among the workforce, will stymie all but the most sophisticated methods of cheating.
Third, the developers’ temptation to defect is reduced when the opportunity exists to exchange stakeholder rights in respect to project performance standards. If the developer cannot meet certain goals despite good faith endeavors, performance zoning’s quantification of value enables “swapping” performance standards by the most geographically-affected neighborhoods and a developer in those instances where particular standards are not achievable.\(^{321}\) If neighbors are undisturbed by a compliance failure with a performance standard perceived to be less consequential, then a trade for something of greater perceived neighborhood value may be appropriate – within certain constraints.\(^{322}\) Trading away a performance standard potentially gives local authorities “cover” (it is their citizens’ choice so to do) while satisfying the neighborhood and saving the developer a difficult election whether to retrofit a new project or postpone operation of the project until compliance is achieved (if ever).

Since Chicago has demonstrated that cities can monitor the sustainable outcomes of development, it behooves competitive communities to structure performance zoning codes enabling verification of sustainability achievement by readings of sensors and meters (through examination of utility bills\(^ {323}\) or otherwise). To the extent cities lack first-hand information, some will enlist the cooperation of citizens by providing smartphone apps that measure internal building temperature, air flow (“breeze”), humidity and light intensity, among other metrics of building performance. Cities also can stream building performance data on their websites to display publicly how companies and building managers attain sustainability goals through creative initiatives. Community managements can sanction uncooperative persons by, among other approaches, causing developer performance bonds’ forfeiture; indeed, they can convert the forfeited sums into collateral supporting issuing “green bonds.”\(^ {324}\) A compelling means for

\(^{321}\) See Ottensmann, \textit{supra} note 256, at 41-42.

\(^{322}\) See \textit{id.} Ottensmann acknowledges that negotiating standards compliance between neighbors may result in outcomes harmful to more distant property owners in the broader community or to passers-by. \textit{Id.} at 41. These are, after all, public goods subject to trading by private parties; accordingly, Ottensmann concedes that there may be maximum limits on rights to be acquired through exchange for any specific development location. \textit{Id.}

\(^{323}\) Many municipalities own their water and sewer companies and electric utilities, \textit{see e.g.},

punishing defectors, effectively those falling short would subsidize the energy efficiency of later-arriving community commercial buildings, including some developed by the defectors’ direct competitors for tenants or investors. These sanctions should be publicly displayed, further promoting the concepts of transparency and open government, emphasizing citizen “ownership” of energy efficiency.

Given its wider menu of options to institutionalize sustainability in commercial project development, should performance zoning supplant altogether Euclidean ordinances in commercial districts? Perhaps an incremental approach more appealing to all stakeholders in the land use regulation realm is to make performance zoning in all non-residential zoning districts be the applicant developer’s election, like a Planned Unit Development alternative. If


See AMERICAN PLANNING ASSOCIATION, UNDERSTANDING PLANNED UNIT DEVELOPMENT, PAS QuickNotes No. 22, available at https://www.planning.org/pas/quicknotes/pdf/QN22.pdf. This approach is being taken by the City of College Station, Texas under its Unified Development Ordinance (UDO). After adopting its Comprehensive Plan in 2009, the city identified 15 zoning districts for creation and conversion (from old standards), including seven non-residential zoning districts adopted by Ordinance in 2012: Natural Areas Preserved, Suburban Commercial, Business Park, Business Park Industrial, Office, General Commercial and Commercial Industrial. See CITY OF COLLEGE STATION, NEW ZONING DISTRICTS, available at http://cstx.gov/index.aspx?page=3800. These zoning districts are fundamentally use-based, but contain new performance standards for storm-water retention, among other things, see id. In 2014, the city added a Mixed Use district to the UDO, see id. In so-called Growth Areas, where future development is deemed to have little initial impact on neighborhoods, greater market flexibility and expanded development options have led to developers proceeding via “Planned Development District” applications for new project implementation consistent with the Comprehensive Plan, see id. The city intends to adopt future districts specific to individual Growth Areas to maintain flexibility and “to reduce the number of steps in the zoning process,” see id. One such district is the BioCorridor Planned Development District created in 2012, see COLLEGE STATION ORD. No. 2012-3449, which forms a multi-jurisdictional zoning district involving College Station, the City of Bryan and Texas A&M University. See COLLEGE STATION UNIFIED DEVELOPMENT ORD. §§12-2.7 (B), 12-2.11. Augusta, Maine’s zoning ordinance gives commercial developers the option to proceed via either “conventional zoning” or “performance zoning” routes, particularly under the city’s Planned Development Districts (two in number), see AUGUSTA, ME. CODE Chapter A (3), § 3.6.1.5 and § 3.6.1.9. This incremental approach to district development allows more community inputs en route, likely increasing stakeholders’ credibility with the full regulatory process.
a developer seeks to elevate the community’s emphasis on sustainability, then greater
development latitude in siting, design and intensity should attend compliance with express
standards of project performance in metrics like traffic generation, parking availability ratios,
stormwater retention and energy use efficiency. In this manner, communities further encourage
innovations at the design phase of development by lowering the extent of municipal
micromanagement. “Controls” will still be available to land use administrations through the
vehicles of frequent, open communication (through social media and community Web pages)
with the public about a new project’s intended siting and design parameters and via requiring
performance bonds from developers to ensure they keep their word, in consideration of the
latter’s unshackling from myriad less flexible code requirements under Euclidean ordinances.

Millennials quickly are to be, in the shrinking number municipalities where they already
are not, at the helm of zoning and long range planning administrations. Millennials have already
embraced, as they will continue embracing, technology alien to their preceding generations’
cultural norms merely while adapting to their changed economic circumstances. Since new
economic conditions and future financial uncertainty are institutional as well as personal, land
use officials must seek out and familiarize themselves and their colleagues and governance
partners with ground-breaking technologies enhancing sustainability innovation and energy
efficiency in the built environment. In this manner, the community increasingly trusts
management of infrastructure and ongoing monitoring of development’s negative effects, while

327 Administrations always will need to build public support for commercial projects of substantial
scale. Neighbors are not going to abandon the “defense” of their territory simply because of new
zoning regimes. It will not serve to merely announce one’s development plans and “see what
happens.” Involving the public early and affording numerous opportunities for inputs is not just the
job of public officials; it further lessens public suspicion and weakens inelastic initial opposition to
anything unknown. See, e.g., Steven Hale, Dean, Undone: Once again, the mayor stumbles when he
needs to build public support for projects, 34 NASHVILLE SCENE 10 (Jun. 4, 2015), available at
www.nashvillescene.com (describing Mayor Karl Dean of Metro Nashville, facing public resistance
to projects he supports, in part due to his administration’s frequent “minimalist public campaigns”
leading to public misunderstanding and mistrust of his office’s plans, see id.).
328 Christopher Mims, How Aging Millennials Will Affect Technology Consumption, WALL ST. J.
TECH May 17, 2015, 8:07 P.M. EST, http://www.wsj.com/articles/how-aging-millennials-will-affect-
technology-consumption-1431907666.
“those who own their own property will not have the heavy hand of local government deprive them”\(^{329}\) of development options.

The urban form endgame is democratic access to light, air, public space, and related dimensions undergirding citizen “quality of life”.\(^{330}\) For the most part, however, our urban fabric remains governed by prescriptive regulations predetermining building mass, siting and form in ways detrimental to neighboring parcels and open spaces, while not addressing energy consumption.\(^{331}\) In the U.S., the most prevalent way of imposing urban form and program on new development is through Euclidean zoning, which makes little sense, given its inflexibility (one size fits all district circumstances) in regulation.\(^{332}\) In order for zoning to bring about egalitarian relationships, computation ought to play a major role in urban design.\(^{333}\) Employing performance-based zoning standards instead of prescriptive rules, planners implementing software tools and microprocessor-enabled sensors eliminate the assumed inverse relationship between project density and the quality of our urban spaces informing Euclidean zoning principles. Daylight access, building cores siting, proximity to parks and other open spaces, and myriad additional factors can be simultaneously evaluated in a short window to afford immediate feedback to designers, planners, and other land planning stakeholders – including everyday citizens in the digital open government era.\(^{334}\)


\(^{331}\) See id. To be clear, prescriptive standards tell a developer what to do and how to do it; performance-based standards describe the end goal but grant the developer latitude to decide the means to reach the stated goal, see Schindler, *supra* note 220, at 308 n.93, 333-4. Giving the developer discretion to innovate, having obtained neighborhood inputs and perhaps even having exchanged neighbor rights inhering under the standards, seems more likely to achieve a timely and successful project with reduced friction than forcing a project to toe the line under prescriptive standards or to obtaining variance relief.


\(^{333}\) See id.

\(^{334}\) See id.; Retzlaff, *supra* note 319, at 10.
Performance zoning criteria are community goal-oriented rather than specific. Despite its potential to add a high level of accountability to environmental principles,\textsuperscript{335} performance zoning has not achieved much momentum because it requires community administrations to vet proposals under a step-by-step review to determine whether complex criteria have been met. Moreover, some definitions of many performance standards, perhaps clearer at the architectural scale, remain elusive at the level of urban design.\textsuperscript{336} Today, however, these standards can be analyzed and implemented simultaneously through a set of parametric urban design tools and the data these tools generate.\textsuperscript{337} In short, when software platforms are designed to examine numerous urban form conditions simultaneously, producing constant feedback among concurrently relevant design criteria, then, with the aid of computation, non-linear, inductive thinking will prevail over deductive methods, stripping away biased and visceral reactions to design proposals.\textsuperscript{338} Instead of resorting to design rhetoric describing non-specific development


\textsuperscript{336} See id.

\textsuperscript{337} See id. Today’s parametric technology is more than merely a drafting tool. Not only can it model a building and many of its attributes in three dimensions, it can revise a model instantly. Thus, if an architect wants to alter the pitch of a roof, for example, the walls then follow the revised roofline automatically. The designer sets the rules and parameters, with the computer doing the iterations, affording designers more flexibility to explore designs and their impacts on all the parameters dictated by the owner. See Allison Arieff, \textit{New Forms that Function Better}, MIT TECH. REV. Jul. 31, 2015, \textit{available at} http://m.technologyreview.com/review/517596/new-forms-that-function-better/#.VYF76JphJCg.mailto. This illustrates parametric application to energy efficiency in commercial buildings: software called Ecotect Analysis models everything from thermal performance to daylighting (the practice of placing windows or other openings in such a way that natural light can reliably illuminate the interior). As architects address design in a computer, it calculates and analyzes such properties as the building’s floor area, its volume, and the required quantities of materials, simulating the thermal performance of different wall, roof, and window assemblies and evaluating the performance against its costs. \textit{Id.} They could study how different types of glazing would perform—not just in general but on its northeast wall at the building’s exact geographic location, under conditions suggested by long-term weather data. \textit{Id.} Parametric modeling can take human proportions and movement into account. A company called AnyBody Technology, for example, does full-body physical simulations for the design of cockpits or workspaces, collaborating on R&D with architects so that a parametric model can simulate a body walking through a given space, allowing optimization of walking distances or ergonomics. \textit{See id.}

\textsuperscript{338} See id.; Ziwei Li, \textit{et al.}, Optimizing the Building Form by Simulation – a Parametric Design Methodology Study with Integrated Simulation at Schematic Phase, PROC. 13\textsuperscript{TH} CONF. OF INTERN’L BUILDING PERFORMANCE SIMULATION ASS’N CHAMBERY, FRANCE Aug. 26-28 2013, 877, 877,
ambitions (raising suspicion among land use stakeholders), employing a parametric platform providing immediate, specific spatial feedback to outcomes of design decisions vastly advances the public negotiation process.\(^{339}\) These design tools combine early stage architectural design with energy efficiency engineering. If energy consumption is one selected objective function of design parameters, building energy performance is improved by controlling other design parameters or the function relationship itself.\(^{340}\) This leads to substituting performance – driven design for the customary performance – based architectural form focus.\(^{341}\)

VII. Conclusion

Sustainability in property development and operation depends mightily on private institutions committing to improving the commercial indoor workplace and global environments – yet these institutions are traditionally propelled by profitability concerns that question the financial value of commercial project sustainability.\(^{342}\) Communities must engage companies to offer

\(^{339}\) See Hong, supra note 222.

\(^{340}\) See Li, supra note 229, at 877.

\(^{341}\) See id. In the realm of HVAC systems especially, this leads to the approach known today as Commissioning, where building system performance requirements set by the owner are expressed clearly and the design consultants audit different judgments and designs to realize the performance criteria before the building is built. See J.C. Visier, ed., COMMISSIONING OF BUILDING HVAC SYSTEMS FOR IMPROVED ENERGY PERFORMANCE, RESULTS OF THE IEAEXBCS ANNEX 40, 9, available at www.ecbcs.org/.

their best possible evidence to investors of how corporate sustainability strategy materially contributes to data and results already critical to investment decisions. Not all sustainability strategies impact key financial objectives. But through a sharper focus on sustainability’s value proposition, investors and market analysts will in time recognize elements of financial and competitive advantages that many companies currently deliver by embracing sustainability. As municipalities know, the development community has the deepest experience in scalability of capitalizing infrastructure; and that experience should be leveraged into green infrastructure implementation in new urban development projects, fostered by community support both at the top administrative levels and at the grassroots base. In recent years, developers have learned the American office market, for one, is highly dependent on the strength of the host local economy, and that leaders in occupancy and rent growth are regions driven by those technology sector – businesses populated by Millennial knowledge workers. Sufficient financial incentive exists today to incorporate Internet and communications technologies into the workspace and maintenance environments of new projects, enhancing building performance.

One means for green buildings to capture the proper attention of communities, because of its basis in performance assessment, is through implementing standards under performance zoning platforms. It hardly is revolutionary to include requirements for meeting green building standards in such regulations; some cities already require certain types of buildings to

344 See id. at 19-20; Retzlaff, supra note 319, at 4.
345 See Clark, supra note 275, quoting Prof. Dodd Galbreath of the Institute for Sustainable Practice at Lipscomb University.
346 See, e.g., Abigail Hauslohner, D.C. will use roof gardens — among other things — to clean city waterways, WASH. POST D.C. POLITICS, May 20, 2015, http://www.washingtonpost.com/local/dc-politics/dc-will-use-roof-gardens--among-other-things--to-clean-city-waterways/2015/05/20/0dcbf9f4-ff1b-11e4-805c-c3f407e5a9e9_story.html (“Green infrastructure” means publicly-financed project elements like porous pavement, cisterns, rain gardens and roof gardens meant to capture and clean rainwater while also cooling temperatures and sometimes improving aesthetics).
incorporate a building assessment system.\textsuperscript{349} Since siting and infrastructure in some circumstances can more greatly impact communities than the performance of a building itself, integrating planning into green building conventions is instrumental.\textsuperscript{350}

Not only will ICT-rich cities\textsuperscript{351} using performance zoning schemes profile the competitiveness and sustainability of their communities; these smart cities will advance the social paradigm of open government.\textsuperscript{352} Their citizens will dialog and interact in innovative and real-time debates (using droves of current information accessible by all stakeholders) with their representatives, directly creating and evaluating municipal policies, including those on sustainable real property development.\textsuperscript{353} Citizens will provide inputs for sustainability targets and establishing project values through participation and knowledge exchange with fellow stakeholders.\textsuperscript{354} Open government interpolates elements of the big-data realm, leveraging all


\textsuperscript{350}See Retzlaff, supra note 319, at 5.

\textsuperscript{351}See, e.g., Hans Wiklund, A Habermasian analysis of the deliberative democratic potential of ICT-enabled services in Swedish Municipalities, 7 NEW MEDIA & SOC. 701, 702 (2005) (noting that information and communications technologies have improved the deliberative qualities of democratic governance).

\textsuperscript{352}See Marc Garriga-Portola and Julia Lopez Ventura, The Role of Open Government in Smart Cities, in 4 PUB. ADMIN. & INFO. TECH. 205, 205-6 (Mila Gasco-Hernandez, ed. 2014). Open government is an extension of the open source (access to software source code) culture, a collaborative model for sharing data and narrative information, see OPENSOURCE.COM, ABOUT OPENSOURCE.COM, available at https://opensource.com/about; the Sunlight Foundation, a type of NGO promoting open government, exists “to use technology to enable more complete, equitable and effective democratic participation. Our overarching goal is to achieve changes in the law to require real-time, online transparency for all government information,” including at the state and local levels. See SUNLIGHT FOUNDATION, OUR MISSION, http://sunlightfoundation.com/about/.

\textsuperscript{353}See, e.g., Jeffrey D. Sachs, The Age of Sustainable Development, 4, 503-04 (2015) (noting that good governance principles include transparency and direct citizen input in decision-making). Nat’l Acad. Pub. ADMIN., supra note 249, at 19 (noting that local officials must “ensure that state agencies adequately assess and address localized adverse impacts and that the state agencies solicit perspectives of community residents and address their concerns before approving permits.”) Id. at 19, Recommendation 9. A further Academy recommendation is that local governments ensure that citizens “affected by environmental decisions receive fair treatment and are involved in a meaningful way,” see id. at 20, Recommendation 10.

\textsuperscript{354}See Retzlaff, supra note 319, at 10.
aspects of the community’s competence (whether bureaucratic-, business- or citizen-derived) to attain holistic and collaborative urban planning.\textsuperscript{355} Aided by technology, in time open government will neutralize suspicion and mistrust of flexible regulations like performance zoning standards and will reduce fear of the development community’s design intentions, as politics evolves from a traditional “aggregation of private interests into policy” mode to an environment within which issues of common interest are publicly debated, considering the views of all stakeholders, to reach consensus about their optimal resolutions.

\textsuperscript{355} See Mike Weston, ‘Smart Cities’ Will Know Everything about You, WALL ST. J. Jul. 13, 2015, at A15, available at http://www.wsj.com/articles/smart-cities-will-know-everything-about-you-1436740596. If doubt about transparency’s inevitability persists, it is dispelled by inserting private enterprise into the mix of data-sets generation, analysis and distribution. See id. IBM and Cisco Systems are not the lone players integrated into the Smart Cities movement, see, e.g., ANTHONY TOWNSEND, SMART CITIES: BIG DATA, CIVIC HACKERS AND THE QUEST FOR A NEW UTOPIA 24-32, 44-9, 62-69 (2014); Katie Fehrenbacher, Google’s New Startup Needs to Go Far Beyond Tech, FORTUNE TECH, Jun. 11, 2015, http://fortune.com/2015/06/11/google-city-sidewalk-startup/(Cisco, IBM and GE are developing sensors, wireless networks and algorithms to make city infrastructure operate more efficiently). In June, 2015, Google’s Larry Page announced the establishment of Google’s Sidewalk Labs, purposed to incubate urban technologies at the sub-multinational corporate level to address issues like efficient transportation and energy usage, see LARRY PAGE GOOGLE+ POST, Jun. 10, 2015, available at plus.google.com (herein, “Page post”). CEO of Sidewalk Labs Dan Doctoroff said that “when the concerns about urban equity, costs, health and the environment are intensifying, unprecedented technological change is going to enable cities to be more efficient, responsive, flexible and resilient.” See Steve Lohr, Sidewalk Labs, a Start-Up Created by Google, Has Bold Aims to Improve City Living, N.Y. TIMES, Jun. 11, 2015, at B1, available at nytimes.com. Page added that once the big picture view of city life is described, communities can develop the “partnerships you need to make a difference.” See Page post, supra. Naturally, private enterprise intends to exploit such partnerships by leveraging their existing technology platforms; for instance, Waze (a Google application) undoubtedly will morph to adapt its maps service to address broader city transportation issues, as will Urban Engines, a 2014 startup. Startups like FirstFuel, WegoWise and Retroficiency will tackle building energy efficiency performance through data rich software technologies. See Fehrenbacher, supra. Capitalism functions optimally when private enterprises adapt their resources to address the public’s perceived needs as articulated by governments, in the process generating revenue. The fact that the private sector benefits by such “crucial partnerships” in applying system dynamics and cybernetics to analyzing and improving urban life cannot justify municipal shunning such partnering opportunities. And business will increasingly adopt open-source approaches to engage other businesses and local government, see David A. Lubin and Daniel C. Esty, The Sustainability Imperative, HARV. BUS. REV. May 2010, available at https://hbr.org/2010/05/the-sustainability-imperative (last visited Jul. 15, 2015).