Energy in the Ecopolis

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I. Introduction

Climate change, resource scarcity, and environmental degradation demand a paradigm shift in urban development. Currently, too many of our cities exacerbate these problems: they pollute, consume, and process resources in ways that negatively impact our natural world. Cities of the future must make nature their model, instituting circular metabolic processes that mimic, embrace, and enhance nature. In other words, a city must be a regenerative city or, as some say, an “ecopolis.”

Why focus on cities? Cities hold the greatest promise for leading change. They are more nimble, and more likely to experiment with innovation, than are state or federal government actors. Their approach toward land uses, transportation systems, trash collection, building design, and water management, among other areas, have great impact on nature and Driving Less Are the Keys to Sustainability 13 (2009) (arguing that cities’ explosive growth predicted for the next several decades will necessitate urban adaptation and response. By 2014, over one-half of the world’s population already lived in cities; the United Nations predicts that by 2050, two-thirds will. In real numbers, the urban population will increase by 2.5 billion people by 2050. Experts agree that we are experiencing the most rapid population growth in human history, which may yield potentially catastrophic impacts on both the environment and on human quality of life. Even with the population as it stands today, global cities are hardly sustainable, much less regenerative.

So, how to get there—to ecopolis—from here? In this Comment, I propose a partial answer by focusing on certain legal frameworks that must be reenvisioned to enable the ecopolis. Part II defines the ecopolis, drawing on accounts from leading thinkers. It then differentiates between regenerativity and the better-known concept of sustainability. That part also identifies the many facets of regenerativity, including food production, brownfield revitalization, integration with nature, waste management, water use, transportation, building considerations, and energy.

Part III then focuses on one of those facets: energy. The ecopolis must not only use less energy than our cities do today, it also must produce energy in a way that positively contributes to its surroundings. This means taking advantage of new generating technologies that harness renewable resources, such as biomass, sun, and wind, and that cleanly regenerate natural ecosystems. And cities’ explosive growth predicted for the next several decades will necessitate urban adaptation and response. By 2014, over one-half of the world’s population already lived in cities; the United Nations predicts that by 2050, two-thirds will. In real numbers, the urban population will increase by 2.5 billion people by 2050. Experts agree that we are experiencing the most rapid population growth in human history, which may yield potentially catastrophic impacts on both the environment and on human quality of life. Even with the population as it stands today, global cities are hardly sustainable, much less regenerative.

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convert trash to energy. In addition, it means embracing distributed generation, located near the end-user it is intended to serve. Distributed generation, whether for individual end-users or for community energy projects, is an essential element of energy in the ecopolis.

II. The Ecopolis

The concept of an ecopolis—a city that mimics, embraces, and enhances nature by instituting circular metabolic processes for all areas of urban consumption—is not original to this author. It appears, however, to be relatively new to the field of law. At the outset, we consider two basic concepts: metabolism and regeneration. What does it mean for a city to have a metabolism? The very question analogizes a city to a living thing that processes inputs and produces outputs. For living things, metabolism involves "[t]he chemical processes . . . that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized." In nature, the collective metabolism of individual living things produces no waste because the outputs of one living thing will be consumed by another. An ecosystem's metabolism thus is circular.

For cities, however, metabolism is linear, "with resources flowing through the urban system without much concern about their origin, and about the destination of wastes." A linear metabolism means that cities do not themselves consume the toxic outputs, such as greenhouse gases and sewage, that they emit; rather, they impose the costs of such outputs on the ecosystem beyond. A linear metabolism also means that cities consume more resources, such as water and food, than they are able to produce themselves, potentially depleting resources of non-urban lands. An ecopolis requires a circular metabolism. Measuring and mapping urban metabolisms can identify situations where leaders may close the metabolic loop.

And what about the term "regeneration"? Here, again, we look to biology. To regenerate means "[t]o replace (a lost or damaged organ or part) by the formation of new tissue" or "[t]o give new life or energy to; revitalize." Think about a starfish regrowing a lost arm, or a new tree limb resprouting from the place on the trunk where a branch recently fell. For cities, the concept of regeneration has been described by one international organization as follows: "Creating regenerative cities . . . primarily means one thing: Initiating comprehensive political, financial and technological strategies for an environmentally enhancing, restorative relationship between cities and the ecosystems from which they draw resources for their sustenance." This description reinforces the notion that cities are like living creatures, which should function within an ecosystem like the other living creatures contained within it. But the description also underscores how far current realities are from the regenerative ideal. No one could plausibly claim that cities have a restorative effect on their surroundings. Radical changes must occur in order to realize that goal.

Two key concepts now covered, we turn to a brief intellectual history of the regenerative city. The ecopolis has been imagined and reimagined by architects, planners, and engineers for decades. Starting in the 1960s, architects and engineers designed eco-friendly cities of the future, with utopian visions that both drew from and contributed to the environment. At least one of these imagined cities was built, but only partially. In the 1980s and 1990s,


10. WORLD FUTURE COUNCIL & HAFENCITY UNIV. HAMBURG COMM'N ON CITIES & CLIMATE CHANGE, REGENERATIVE CITIES (2010) [hereinafter REGENERATIVE CITIES].

11. The first lengthy treatment of the topic or urban metabolism was ABEL WOMAN, THE METABOLISM OF CITIES (1965). For more recent, accessible work, see PAULO FERREIRA & JOHN E. FERNÁNDEZ, SUSTAINABLE URBAN METABOLISM (2013). Other researchers have taken up this issue; and universities are supporting their work. For a recent, thorough literature review, see TISHA HOLMES & STEPHANIE PICCETI, UCLA INST. OF THE ENV'T, URBAN METABOLISM LITERATURE REVIEW (2012). UCLA's California Center for Sustainable Communities, for example, has focused on this topic. See STEPHANIE PICCETI ET AL., ENABLING FUTURE SUSTAINABILITY TRANSITIONS: AN URBAN METABOLISM APPROACH TO LOS ANGELES (2014) (identifying materials and energy flows in Los Angeles). In addition, the Massachusetts Institute of Technology (MIT) has a multidisciplinary urban metabolism group. See MIT, Urban Metabolism, www.urbanmetabolism.org (describing among other things projects in Africa, China, and Singapore).

12. DICTIONARY, supra note 9, at 1479.

13. REGENERATIVE CITIES, supra note 10 (emphasis added).

14. For example, in 1967, engineer Buckminster Fuller, in partnership with the U.S. Department of Housing and Urban Development, developed the concept for Triton, a prototype for a floating offshore city. Triton was anticipated to serve as a low-cost utopia, complete with full desalination facilities, for several thousand residents. See TRITON FOUNDATION & R. BUCKMINSTER FULLER, A STUDY OF A PROTOTYPE FLOATING COMMUNITY (2005) (publishing the original report to the government). This project has never been mentioned in a law review article.

15. Paolo Soleri's Arcosanti was built in the Arizona desert beginning in 1970, as the built expression of his philosophy of arcology (the combination of architecture and ecology). See PAOLO SOLERI, ARCROLOGY: THE CITY IN THE
landscape architects began to use regenerativity as a guiding principle in their work. For example, one leading landscape architect, John T. Lyle, described the ideal community as “a developed landscape serving human purposes, but...also an ecological system with life-support processes functioning as natural systems do.” Over the last 20 years, academic discourse has expanded beyond cityscapes to include a life-cycle approach for materials and technologies, which can be deployed in a regenerative city. Meanwhile, urban ecologists and planners have published many books with catchy-sounding titles, calling for more integration of nature with cities.

While these recent publications may gesture toward the ecopolis, few embrace it explicitly. Most recent work is focused on creating sustainable cities, rather than regenerative ones. The distinction is important. Sustainability has been defined in a number of ways, but the classic definition is from the United Nations: “meeting the needs and aspirations of the present without compromising the ability to meet those of the future.”

Regenerative cities, however, do not merely meet present needs; rather, they are designed and planned to nourish, and even restore, the ecosystem around them, in real time. Regenerative cities are meant to renew themselves, while adapting to change.

A comparison among strategies underscores the difference. Sustainability strategies might include encouraging the planting of local plants (xeriscaping), developing public transportation systems to reduce residents’ carbon footprint, or instituting recycling systems. Regenerativity strategies would take things a step further: the wholesale planting of urban forests, renewable-energy-run public transportation that returns energy back to the grid, and “zero waste” policies. While the call to create sustainable cities has reached a wide audience, the push to create regenerative cities has only just begun in earnest.

Despite the attractiveness of regenerative cities, many laws currently obstruct their development. For example, local zoning laws prohibit farming or large-scale gardening in urban cores; allowing such activities would help urban dwellers meet their own food needs and thus reduce dependence on rural farms. State public utility laws prohibit small-scale energy production, which would allow people to work in small groups or within neighborhoods to create economies of scale that would make renewable energy projects more feasible. And federal laws complicate reuse of brownfield sites, which when properly remediated can catalyze economic growth and improve environmental health.

Cities must begin looking for opportunities to change such limiting rules. If they do, vacant lots may be transformed into gardens and farms, providing food to urban “food deserts.” Widely recognized deficiencies in our transmission and distribution infrastructure may be partly remedied by the establishment of neighborhood microgrids that locate energy infrastructure on vacant land and produce enough energy to feed the wider grid. Meanwhile, redevelopment of brownfield sites can have a ripple effect on the region, while providing a real environmental benefit.

One obvious strategy is simply ensuring that more nature is located within the city itself. To that end, a city should protect and restore forests, wetlands, and prairies, while planting more native trees and shrubs. Waste

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management is also critical. Recovering and processing recyclables, composting organic waste on a large scale, processing sewage, and using household or community animals to consume waste are all ideas worth pursuing. Similarly, prudent management of water—the collection of stormwater, deployment of green infrastructure, preservation of wetlands, recycling of household greywater, and the like—will determine whether a city thrives in a future of constrained resources. From a transportation perspective, the primary goal must be to discourage the use of the private automobile, which has a significant negative impact on the environment. Bicycling, walking, sharing cars, and using energy-efficient or renewable-energy-powered public transportation would all help in that regard. For buildings, considerations about natural light and ventilation, solar orientation, use of sustainable materials, and energy efficiency should all come into play.

Localities all over the world have begun to consider, or even adopt, some of these strategies, as well as others not mentioned here. However, many legal and practical constraints thwart regenerativity. If our laws constrain the achievement of this goal, now is the time to change them.

III. The Energy Dimension

This Comment focuses on one critical aspect of the ecopolis: energy. Modern cities consume energy in tremendous amounts for heating, cooling, lighting, and even transportation. Ninety percent of this consumption is fueled by either fossil fuels (coal, natural gas, and petroleum) or nuclear electric power. None of these sources of energy is renewable. All have tremendous negative environmental effects, usually borne by the non-urban communities whence they come. The lion’s share of our energy consumption therefore demonstrates a metabolism that is profoundly linear. Energy flows through our cities at great costs imposed on the ecosystem beyond. In the future, in order for our cities to be more regenerative, we must close the metabolic loop. Our cities must both use less energy and produce energy in a more thoughtful way. In this part, I consider demand and supply through the lens of regenerativity, and identify several areas where law and policy must be reconsidered, offering a broad roadmap for further discussion.

A. Demand

Demand for energy in our current, conventional environment continues to rise. An ecopolis would reduce to a bare minimum the amount of energy required by its inhabitants. Designing to minimize energy requirements is relatively easy when a city is designed from scratch. But for an existing city, significantly reducing demand may be a daunting task. Whether new or existing, there are three key components essential to designing for the ecopolis: urban design; energy efficiency; and conservation. Only by deploying these methods to radically depart from the current baseline of per capita energy consumption will we realize regenerativity.

I. Urban Design

First, we turn to urban design. Designing compact, walkable cities that take advantage of nature’s rhythms and assets can reduce per capita energy demand. As a general matter, city dwellers use far less energy than suburban or rural dwellers. As economist Edward Glaeser notes:

Cities are . . . greener than suburbs because urbanites use less electricity . . . . Bigger, denser cities where people own smaller homes, use less electricity. The average single-family detached home consumes 88 percent more electricity than the average apartment in a five-or-more-unit building. The average suburban household consumes 27 percent more electricity than the average urban household.

Moreover, in cities where destinations are clustered closer together, people walk, bike, or use public transit instead of using energy by driving individual automobiles. Indeed, New York City residents, who can take advantage of a robust public transit system, use less energy per capita than residents of any other city. Redesigning all of our cities to emulate Manhattan would be unrealistic. But attention to urban design details, including enhancing the benefits of proximity, better incorporation of public transit, the planting of trees and greening of roofs to reduce the heat-island effect, and increasing density should all come into play.

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28 Note that I am not including in this discussion industrial or manufacturing processes, or the important strategy of demand response, which discourages large commercial end-users from consuming energy during peak hours. See Kevin B. Jones & David Zoppo, A Smarter, Greener Grid: Forging Environmental Progress Through Smart Energy Policies and Technologies 61-82 (2014).

29 Glaeser, supra note 2, at 208-09.


25 Localities that are often cited for their efforts include Hamburg, Germany; Adelaide, Australia; Copenhagen, Denmark; the city of Oakland and Sonoma County in California; and Seville, Spain.

effect, and the encouragement of transit-oriented development, among other strategies, can reduce energy usage in any city.\(^\text{32}\)

### 2. Energy Efficiency

Second, our cities should promote heightened standards for energy efficiency, defined by the International Energy Agency as “deliver[ing] more services for the same energy input, or the same services for less energy input.”\(^\text{33}\) Comprehensive demand management that dramatically changes consumption patterns is critical toward achieving the regenerative city of the future.\(^\text{34}\)

Two primary foci for energy-efficiency measures have been buildings and technology.\(^\text{35}\) Buildings use a large portion of the energy and electricity consumed in this country.\(^\text{36}\) Cities should modify their building codes to require that new construction and renovations be far more energy-efficient than they are today. Currently, many building codes do not incorporate best practices in energy efficiency. As just one example, the U.S. Green Building Council’s Leadership in Energy and Environmental Design program, a certification program that includes stringent performance-based energy design principles, has only been required for private construction in a handful of jurisdictions.\(^\text{37}\) In addition, some highly energy-efficient construction materials, including natural, renewable materials such as hay bales, are outlawed or not expressly authorized by current building codes. Wholesale changes to the way we think about building construction must be considered, with care paid of course to ensuring life safety.\(^\text{38}\) In addition, the innovative financing methods that promote energy efficiency must be rapidly expanded to support private developments. For example, property assessed clean energy (PACE) programs allow property owners to effectively capitalize energy-efficiency improvements through a special assessment district structure.\(^\text{39}\)

As for building-related technology, the primary mechanism for promoting energy efficiency is through voluntary compliance with standards. The federal Energy Star program, for example, sets standards for kitchen appliances and heating and cooling systems, and offers an Energy Star designation to those projects that meet the standards.\(^\text{40}\) Policymakers should reexamine these standards, strengthen them, and phase them in as mandatory. Public entities should also lead the way by deploying on a large scale energy-efficient technologies—think, for example, of replacing conventional street lights citywide with solar-powered lamps powering LED bulbs.

Some commentators have expressed skepticism about the value and effectiveness of energy-efficiency measures. Such commentators primarily draw from “Jevons’ paradox”: the more energy-efficient a building or technology is, the more energy end-users will ultimately consume.\(^\text{41}\) Even a major proponent of the ecopolis, Richard Register, has written:

> The better the mileage, the more the suburbs sprawl out over vast landscapes, the more demand there is for cars and freeways, the more cars are needed to service expanding suburbia, and, ultimately and ironically, the more gasoline is needed. Thus the energy-efficient car creates the energy-inefficient city, the “better” [the] car, the worse the city. The car is a part of a whole system of complex, necessarily interconnecting parts existing in an interdependent relationship with the total environment it helps create.\(^\text{42}\)

Register and others are probably correct to worry about the effectiveness of some energy-efficiency measures. Indeed, despite some strides in requiring energy efficiency in buildings and encouraging it in technologies, energy demand is on the rise. But it could be that our energy-efficiency rules now are just not strict enough to make real change. In any event, we have to start somewhere. Energy

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32. These and many other relevant strategies are identified in a handy document called The Smart Growth Manual. ANDRES DUANY ET AL., THE SMART GROWTH MANUAL (2010).


34. The World Future Council, a key proponent of regenerative cities, espouses this view. See REGENERATIVE CITIES, supra note 10 (stating that “none of these [supply-side] efforts will be sufficient without simultaneously introducing comprehensive energy demand management systems for our cities”).

35. A third energy-efficiency strategy, district energy, will be discussed in the next section.


37. Troy, supra note 19, at 163-66 (praising the PACE program and its effect on energy efficiency). Troy warns, however, that “[d]espite all these promising mechanisms, the relatively slow pace of upgrading building efficiency in the United States suggests that there are limits to voluntary programs.” Id. at 167.


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42. Register, supra note 1, at 8-9.
Planning, zoning, subdivision, and environmental regulations to ensure that we can develop dense cities that are integrated with nature and not dependent on automobiles. We must update building codes and technology standards to strengthen and modernize energy-efficiency requirements. We must establish and expand financing mechanisms for energy-efficiency improvements. And we must structure programs and incentives to encourage individuals to choose to conserve energy. If all of these strategies are deployed together, energy demand over time may drop. And if we significantly reduce our energy appetite, we may have a shot at realizing the ecopolis.

### B. Supply

While reducing energy demand is important, rethinking energy supply may be even more critical. Where energy comes from and how it is deployed will determine whether a city is truly regenerative. Regenerative energy sources fall into one of three categories: renewable energy; energy from waste; and district energy (for heating and cooling needs). A true ecopolis utilizes only these sources of energy. From whatever the source, regenerative energy must be deployed as distributed generation. It may not come from outside the ecopolis, because an external location would take the generating facility out of the urban metabolism.

### 1. Sources

First, renewable energy is an essential element of the ecopolis. Currently, renewables—hydropower, wind, biomass, geothermal, and solar—account for just 10% of energy used in the United States. In absolute terms, the total amount of annual renewable energy production has increased just threefold since 1950. A significant increase in the deployment of renewable energy, both as a percentage of energy used in the United States and as an absolute amount, must be facilitated.

How to go about doing so? No doubt we should expand existing programs that encourage renewable energy, whether they be financing mechanisms, financial incentives (such as tax credits), or policy mandates. But to realize that goal, we must change a wide variety of laws. Among other changes, we must update planning codes to require that new and existing buildings be designed to use energy efficiently. We must establish and expand financing mechanisms for energy-efficiency improvements. And we must structure programs and incentives to encourage individuals to choose to conserve energy. If all of these strategies are deployed together, energy demand over time may drop. And if we significantly reduce our energy appetite, we may have a shot at realizing the ecopolis.

### 3. Conservation

Third, there are conservation strategies, meaning encouraging people to reduce their own consumption through education, incentives, or some combination of both. These strategies could have great value, since household decisions directly affect about one-third of energy consumption. Behavioral psychologists and social scientists have already identified a few triggers that inspire people to change their behavior. For example, telling people how much energy they use compared to neighbors seems to work. Those who learn they use more energy than their neighbors tend to slightly modify their behavior to conserve more energy.

As another example, feedback to customers about their behavior identified a few triggers that inspire people to change their behavior. As another example, feedback to customers about their energy usage (including doorhangers on their own usage) was found to increase energy consumption by 2%. Similarly, households received doorhangers notifying them of neighbors’ energy usage, which increased energy consumption by 2%. And if we significantly reduce our energy appetite, we may have a shot at realizing the ecopolis.

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tax credits and grants), or fast-track permitting. We must especially promote measures that will facilitate the operation of renewable energy. Such measures include appropriate feed-in tariffs, net metering, and submetering. We must invest in technologies that will make biomass—from manure to agricultural crops to algae to cellulose—easier to convert into energy. And we must ensure that utility companies not only improve their response to renewable energy projects, but also rethink their own business models to enable a more flexible market.

A second source of regenerative energy is waste. Over the years, waste-to-energy schemes have sometimes been controversial. The traditional method of incinerating trash to generate energy has obvious downsides in terms of negative environmental effects. But new technology has allowed for cleaner combustion. And technology has enabled production to occur without direct combustion—through the use of anaerobic digesters, for example. One advantage of using waste products to generate energy is that energy production itself can actually metabolize the negative outputs, like solid waste and sewage, of other urban processes.

A third source of regenerative energy is district energy: the capture of excess energy resulting from power generation to heat water through pipes, which in turn may be used for heating and cooling. There is no reason that heat produced during energy generation should not be captured by end-users located near the generating facility. The strategy is already widely used around the world.

Whatever the source of the energy, a regenerative city must deploy that energy to ensure a circular metabolism. Location is key. Energy must be generated near the end-user or users that it serves: in other words, it must be “distributed generation.”

Prioritizing distributed generation would be a radical departure from our current system, which is overwhelmingly served by utility-scale infrastructure. Utility-scale infrastructure tends to be located in large facilities that are far from end-users. The distance ensures inefficiency: At least 6% of the energy generated gets lost in transmission lines during transit. Far-flung infrastructure also contributes to energy sprawl, which I have defined elsewhere as “the phenomenon of ever-increasing consumption of land, particularly in rural areas, required to site energy generating facilities.”

Energy sprawl can be problematic because it can fragment landscapes and destroy wildlife habitats and ecosystems. Even the benefits of large renewable energy facilities, like the wind farms that increasingly dot our plains and prairies, may be outweighed by such costs.

So, we turn back to the alternative to utility-scale infrastructure: distributed generation. Distributed generation can take several different forms, with the variables being the number of owners, the number of end-users, and the number of parcels involved. The simplest setup involves a single owner-operator and a single end-user on a single lot. Think about a solar panel on someone’s home.

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In Helsinki and Copenhagen, for example, nearly 90% of all buildings benefit from District Energy, accounting for 49% and 60% of their heat supply respectively. In Sweden, 270 municipalities currently use the system, representing 50 TWh/year of energy consumption. Further afield, in Moscow, District Energy installations account for 66,000 GWh/year of energy use.


According to the U.S. EIA, Glossary (last visited Mar. 24, 2015) (defining a distributed generator as, “[a] generator that is located close to the particular load that it is intended to serve. General, but non-exclusive, characteristics of these generators include: an operating strategy that supports the served load; and interconnection to a distribution or subtransmission system (138 kV or less”).

As just one illustration of the saturation of utility-scale infrastructure, note that only 1% of the U.S. retail electricity market involves distributed solar customers. See Kind, supra note 55, at 4 (estimating approximately 200,000 customers overall).


63. Note that any of these arrangements could operate as a microgrid, namely, small-scale, low-voltage distributed generation that may be islanded from the main grid and typically provides some form of energy storage. Microgrids can serve either one user or multiple users, and may have either one owner-operator or multiple owners/operators. See Jones & Zoppo, supra note 28, at 130-35 (describing the microgrid as having “a great deal of consumer appeal,” but still being in its nascent stages as a concept); Bronin, supra note 62 (providing the first comprehensive treatment of microgrids in legal academic literature).

64. By “single” here, I mean a single person or entity, including, for example, a household unit.
individual distributed generation is inefficient in terms of resources used to design and install it, it is certainly regenerative, provided that it uses one of the source types described in the preceding section.

Other setups involve multiple end-users. A single owner-operator or multiple owner-operators could serve multiple end-users, on a single lot or multiple lots. Any arrangement involving multiple end-users fewer than the number typically served by the utility could be identified as community energy. A co-author and I have defined this term elsewhere as “mid-sized energy sources supported by resources pooled from several private parties in close geographic proximity.” Community energy offers economies of scale beyond those enjoyed by an individual end-user, while avoiding the phenomenon of “energy sprawl” inherent in large, rural projects. Unfortunately, with few exceptions (including Connecticut's microgrid program and Colorado’s community solar program), community energy projects are prohibited.

Reversing this approach to community energy is important to facilitating regenerativity, but many legal issues must be clarified first. At the outset, our laws must identify the business enterprises most suitable for the installation, ownership, and operation of a community generating facility.65 In some states, a traditional business enterprise such as a corporation, a nonprofit organization, or a limited liability company may be the only option. Other states, such as Connecticut, may offer an energy improvement district, a special district allowed to own energy infrastructure and recoup costs through an incremental property tax. Still others may allow for electric cooperatives: democratically owned entities with limited profit and patronage refunds, initially envisioned to bring energy to rural areas. And increasingly, homeowners’ associations—private organizations that collect fees, maintain property, and enforce covenants within a subdivision—are being considered in this context.71

Then, there is the question of how a community energy facility operates. Utility companies may require certain interconnection agreements, or argue with owners or operators of distributed generation about applicable rates and tariffs. Power purchase agreements with third parties, and financing documents, may complicate matters. Finally, land use restrictions and siting rules may prevent distributed generation in particular neighborhoods. Questions such as whether the generating facility is a structure pursuant to the zoning ordinance, or whether it is consistent with a comprehensive plan for development, may all be asked during a siting process where the rules are not clear.

These and many other legal issues must be clarified before distributed generation, beyond merely the individual scale, may occur. But there is hope for change. Even the utility-funded Edison Electric Institute recently identified a “confluence of factors,” namely “technological innovation, public policy support for sustainability and efficiency, declining trends in electricity demand growth, rising price pressures to maintain and upgrade the U.S. distribution grid, and enhancement of the generation fleet), the threat of disruptive forces (i.e., new products/markets that replace existing products/markets),” that are requiring utility companies to rethink their business models.72 Through this brief overview of relevant legal issues for energy in the ecopolis, I encourage utility companies to continue to do so.

IV. Conclusion

In this Comment, I began by identifying the related threats of climate change, resource scarcity, and environmental degradation as prime normative motivators for urban regenerativity. These threats give urgency to the search for the ecopolis, especially when viewed in light of rapid urbanization worldwide.

65. See also Sara C. Bronin & Paul McCary, Peaceful Coexistence: Independent Microgrids Are Coming! Will Franchised Utilities Fight Them or Foster Them?, PUB. UTILS. FORTNIGHTLY, Mar. 2013, at 39-40. In that paper, we identified five categories of microgrids as follows:

Category 1: A single end-user with multiple facilities on one parcel of real estate owned by that end-user. Example: A college campus with no intervening public streets.

Category 2: Multiple tenant end-users on a single parcel owned by one entity. Example: A shopping mall owned by a corporation with many retail tenants.

Category 3: Multiple property-owning end-users on multiple contiguous parcels, with no intervening streets. Example: An industrial park with multiple buildings, where individual buildings are owned by different parties, but with a common overall campus or environment.

Category 4: A single end-user with facilities on multiple parcels, with intervening public streets. Example: An urban college campus with buildings on different blocks.

Category 5: Multiple end-users on multiple parcels with intervening public streets. Example: A municipal cluster of a school, a firehouse, and a police station on both sides of a street; or public and private users in a central business district.


68. See Colo. Rev. Stat. §40-2-127 (defining “community solar garden” to include at least 10 subscribers and setting out minimum generating capacity and other limitations).

69. A generating facility can include a wide range of tangible assets: distribution wires; generating equipment; thermal energy related equipment; energy storage; meters; controls; and communications systems. Each of these can be owned by different entities. Intangible assets, including energy credits and intellectual property, must also be allocated among parties in the team.

70. CONN. GEN. STAT. §32-80a.

71. See Wiseman & Bronin, supra note 66, at 170-82 (describing business enterprise types appropriate for community-scale renewable energy).

72. Kind, supra note 55, at 3.
But there is one even more practical motivator that may drive some American cities toward regenerativity: the continuing effects of the Great Recession. The situation of a growing number of American cities is dire: municipal bankruptcies; disinvestment; suspension of crucial city services; vacancies and abandonment; homeowners’ financial tragedies. But these challenges, however, provide opportunities for reimagining urban life. Indeed, those cities hit hardest by the Great Recession are the ones most eagerly experimenting with new legal frameworks—eliminating outdated restrictions, being proactive about energy, and turning urban planning upside down.

If we believe American urbanist Jane Jacobs, then these cities’ innovations may well help them compete against other cities, which in turn will create wealth they do not have access to now. More importantly, though, if cities begin now to explore legal strategies for regenerativity, ultimately we will have cities that are not only attractive places to live, but also places that positively contribute to the larger ecosystem of which they are a part.
