New Metrics for a Sustainable Planet

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Great architecture and urbanism have never truly been defined by quantitative requirements and standards. They are about the atmosphere of places, their look, feel, and taste. Yet, as design professionals, we are required to work with standards to regulate design. Although these standards can never create vision themselves, they are metrics that inform a wide variety of decisions. Architecture and planning codes, product documentation, development standards, and client *pro formas* are examples of the metrics that bring built-in assumptions about "proper" design. These metrics in many cases dictate resource uses, through parking ratios, open space and roadways standards, and building codes. Complex and detailed metrics have been carefully devised and applied by architects and urbanists for decades, with much care and effort.

Along the way, we discovered something very disturbing. Not only are we living unsustainably, our metrics contain fundamental flaws in the treatment of natural resources. We believed that natural resources would be available in nearly unlimited quantities; that "good" road designs offer high capacity and free flowing traffic volume for cars, regardless of the number of passengers, and always include generous parking capacity; that expansive but inefficient utility and infrastructure systems should offer rapid delivery of nearly unlimited supplies of resources; that we needed big houses with large yards and plenty of grass. Our permit and planning process are a significant part of the Achilles heel: they rely on local administration and are mainly sensitive to local needs. They are often blind to both sustainability and the need for global coordination.

We now face a serious environmental crisis, and the design metrics we have applied to urbanism, architecture, landscape, and transportation systems are implicated as primary contributors to it. We should have been calculating greenhouse gas emissions and changes to the atmosphere, rather than parking stalls. Our default system of metrics provides the blueprint for our future course to environmental devastation.

Given this situation, quick and decisive action is needed. New design metrics, founded on aggressively sustainable principles, would acknowledge that the consequences of our actions are measurable.

above: Sacramento, Ca: Urban Setting, 14.7 Units Per Acre; image credit, The Lincoln Institute of Land Policy. www.Lincolninst.Edu/Resources, Under "Visualizing Density."

What Metrics Must Accomplish

Although the magnitude of the task is substantial, the list of objectives is remarkably succinct.

left: Tyson's Corner, Va: Suburban Setting, 0.9 Units Per Acre. right: Davis, Ca: Suburban Setting, 4.3 Units Per Acre; image credit, The Lincoln Institute of Land Policy. www.Lincolninst.Edu/Resources, Under "Visualizing Density."

Metrics reflect value judgments and quantitative targets and encourage desired behaviors. What behaviors should our metrics encourage? Six points can summarize the primary issues.

First, and most critically, new metrics must be *performance oriented,* addressing global emissions targets. Second, strategies must be applied to reflect coherent, locally appropriate *community visions*. Third, metrics must successfully *link strategies* for buildings, infrastructure, land use, landscape and open space, economics, transportation, and so on. Fourth, metrics must *focus on public transit* and pedestrian alternatives as primary means of movement, minimizing use of the automobile. Fifth, *implementation strategies* must be included, offering incentives for desirable development, energy reduction, preservation of buildings and resources, and efficient infrastructure. Sixth, to be truly effective, metrics must serve as *integrated tools for design professionals,* rather than after-the-fact justification instruments.

First Generation New Metrics

A brief look at what has been accomplished over the past two decades is encouraging, although not fully resolved. For instance, the *Charter of the New Urbanism,* as a first generation tool, set out a highly compelling vision of sustainable architecture and urbanism, focusing on compact development, infill, transit and transportation, pedestrian-oriented districts, sustainable building, density, economics, codes, and other topics. More recently the *Canons of Sustainable Architecture and Urbanism* (recently adopted by the CNU) extended that principle-based approach. Although the CNU itself has avoided turning the *Charter* or the *Canons* into quantitative metrics, others have considered the issue. These types of efforts generally fall into one of three categories, which, in sequential order, progress from qualitative to quantitative, as follows.

a) Subjective point systems, focused on smart growth principles (reflected in various examples of smart growth scorecards, such as *The New Urban Development Project Appraisal System,* by Nathan Norris, Allison Ude, 2003, http://home.comcast.net/~nuappraisal/).

b) Baseline resource calculations (for water, electricity, etc.) to establish targeted energy reductions (reflected in the US Green Building Council's *LEED for Buildings* and the evolving *LEED for Neighborhood Design*).

c) Carbon calculators, which yield sophisticated emissions measurements, but do not recommend particular sustainable strategies (reflected by the *Clean Air and Climate Protection Software* by the Local Governments for Sustainability USA [ICLEI], which is available for purchase only by member cities, www.icleiusa.org/action-center/tools/cacp-software).

In the space available here, one can only summarize the differences among these approaches, neglecting their intricacies. The first applies smart growth strategies, with no specific emissions benchmarks. The second, arguably the most developed in terms of applied smart growth strategy, seeks resource reductions relative to conventional development practices. The third focuses on calculating actual greenhouse gas emissions targets but does not advocate smart growth strategies. None truly connects the dots from global emissions measurement to local strategy, and, except in rare cases, all are voluntary.

Second Generation New Metrics

In California, the next step will be the implementation of Assembly Bill 32 (2006) and Senate Bill 375 (2008), which call for local jurisdictions to update General Plans to calculate greenhouse gas emissions, even in advance of the issuance of regulations. They thus link the critical issues of land use, transportation, and emissions, long-time challenges for sustainable strategies, reflecting an unusually ambitious approach that many have advocated. A principal means of implementation

left: San Francisco, Ca: Urban Setting, 222 Units Per Acre; image credit, The Lincoln Institute of Land Policy. www.Lincolninst.Edu/Resources, Under "Visualizing Density."

is to allow projects which meet specific performance standards to bypass CEQA requirements. As visionary as these laws are, however, they fall short of creating comprehensive tools that unify emissions calculations with coherent, community-making design outcomes. At worst, they risk repeating the shortcomings of CEQA, which have often been characterized as an after-the-fact, highly litigious process. Furthermore, as architects and designers, we will need real tools which allow an understanding of environmental performance *during* the design, and well before the approval process begins. Whether such design-engaged tools can be delivered through LEED or other means is yet to be seen.

How might we expand the best qualities of the newest initiatives into true, design-integrated practices? The six objectives noted above can be useful in focusing the effort to create comprehensive metrics that sensibly bridge such issues.

I. Establish Performance Targets

Matching local actions with global climate needs has been one of the most vexing challenges for sustainability efforts. We must recognize that urban-scale design must focus on energy performance, and that urban configuration will be a defining issue for sustainable design over the next generation. California's leadership in requiring local jurisdictions to calculate emissions is the first step. To effectively apply this approach to pending development projects for roads, buildings and operations, two key issues need to be resolved: consensus on proper emissions targets and an administrative process that links local development permits to those targets.

II. Apply Metrics through Community Visioning

We must use metrics strategically, applied to an overall vision, rather than piecemeal. Community visioning is the best impetus for the making of healthy, sustainable towns and cities. Among the design shortcomings that contributed to global warming are practices that value automobiles over people, disabling the public realm. Communities must be allowed to develop designs which reflect their own needs, but they also must reprioritize. Community visioning must integrate quantitative metrics to encourage higher densities and discouraging far-flung development, while setting aside more public open space and creating streetscapes that encourage pedestrians.

III. Link Strategies

The primary elements of urbanism—buildings, infrastructure, land use, landscape and open space, economics, and transportation—are interrelated. Sustainability demands that they be linked in numerous practical ways, and tested quantitatively. For example, effective transit must be paired with a reduction of parking ratios, because an oversupply of parking can undermine the incentive to use public transit. Similarly, growth boundaries must be paired with compact, dense development, and there must be a balance between jobs and housing to minimize commuting.

IV. Enable Public Transit as a First Choice

The distorted ways that traffic strategies are related to human behavior has been called a "principle of triple convergence": transportation congestion adjusts to changes in routes, times, and modes. Anthony Downs, in *Traffic: Why It's Getting Worse, What Government Can Do* (Brookings Policy Brief Series # 128, January 2004), explains that, in dense areas, where new capacity is provided to address congestion, capacity is almost automatically filled by a combination of new, more distant commuters, those who previously avoided the congested route, etc. Congestion becomes a permanent malady. We must prioritize transit and design cities with a compactness that encourages walking, bicycling, and only rare use of the automobile—density targets of perhaps 3,000 to 4,000 people per square mile.

V. Include Implementation Strategies

Economic incentives must establish community-wide goals for compact development and community integration, including walkable neighborhoods; minimum building life spans of perhaps as much as 100 years; preservation of existing buildings; and sustainable infrastructure, such as pervious pavement for low storm water run-off. These are only a few of the many implementation strategies that must be part of a comprehensive strategy that can be locally accomplished to reach sustainable goals.

VI. Apply with Practical Design Tools

Finally, metrics must serve as fully integrated design tools, rather than bit players in an "after the fact" project justification process. Such an approach responds directly to the dilemmas of the CEQA process, whose highly complex, time-consuming, and costly system of review and documentation has never truly been integrated with architecture and urban design practice. The kind of interactive approach suggested here must allow designers to lead the process rather than follow it, allowing for real-time simulation of design strategies. The results of a design proposal should be fully understood and tested immediately. Carbon calculators abound on the Internet; a simple example is the Construction Carbon Calculator at www.buildcarbonneutral.org. Although it addresses only buildings, and its makers qualify it as a simple prototype, it is suggestive of the kind of design-interactive metrics tool that would be useful for estimating greenhouse gas emissions for proposed designs. The ultimate goal would be a design protocol and related metrics that help guide the integration of architecture and urbanism—rather than buildings, infrastructure, and cars as unrelated emissions sources.

Conclusion

Metrics offer no silver bullet for sustainable design. Rather, they can serve as a desperately needed way of rapidly testing designs and adhering to real emissions targets while developing coherent, community visions. The six objectives suggested here provide the basis for new metrics that require substantial further development. Among the key issues to address are the serious disconnection between global measurements and local action, and the tendency to apply metrics independent of each other. Substantial cultural disconnections between the global scientific and regulatory communities and local agencies complicate the quest for such metrics. Ultimately, the end-game issue of human survival requires much more than mere tracking of environmental degradation or the use of plausible estimates; it must give way immediately to healthy, sustainable development that precisely targets emissions growth. We have no other choice. ◉