Sustainable Construction
Sustainable Construction
Green Building Design and Delivery
Third Edition

Charles J. Kibert
For Charles, Nicole, and Alina,
and in memory of two friends and sustainability stalwarts,
Ray Anderson and Gisela Bosch
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The Roman architect, Vitruvius, once defined the purposes of architecture as creating commodity, firmness, and delight—roughly translated as usefulness, stability, and beauty. To that list, we now must add a fourth purpose, harmony, by which I mean the fit between buildings and the built environment broadly with the ecologies of particular places. In contrast to architecture as utilitarian or as form making, place making poses unique challenges. The first rule of place making is to ruin no other place. This requires considerable care, competence, and foresight in managing the upstream and the downstream effects of buildings from materials selection and construction to long-term operations and maintenance.

The challenge of creating commodity, firmness, delight, and harmony will be tougher in a world of 7 billion people predicted to grow to 10 billion by 2100 and facing worsening climate destabilization and its collateral economic, social, and political effects. In other words, ecological and economic constraints in the years ahead will limit what can be built, where, and how. Higher temperatures, larger storms, stronger winds, longer droughts, and rising sea levels will require more planning, better design, and more stringent engineering standards. Financial and climatic constraints could interact to diminish the role that architecture has played historically as a source of delight at a time when we will need a great deal of it. Vitruvius emphasized the importance of careful site selection for buildings and cities in order to maximize the salubrious effects of sun, wind, water, and shade. Those factors will become more important but less predictable in an age of rapid climate change. Moreover, designers can no longer assume that energy will be cheap and reliable. Military planners have said repeatedly that the US electric grid is highly vulnerable to terrorism, operator error, technological accident, and larger storms. Much the same could be said of the systems that provision us with water and food.

We have entered the rapids of human history and will need to respond with a new era of design. How architects, engineers, builders, and building managers respond to the new realities will have a larger impact on the human prospect than we thought even a few years ago. Building construction and operations are responsible for roughly 40 percent of global carbon emissions. If we are to make the necessary transition to climate stability, that number will have to decline dramatically as the number of buildings increases to accommodate a projected 40 percent rise in population. At the same time, the capacity of governments to respond to the climate emergency is being challenged both by those who want less government and by increasingly difficult economic circumstances. The upshot is that a great deal rides on the design and building professions and the private sector.

Against this background, the green building movement and the remarkable rise of the US Green Building Council and its counterparts elsewhere is a great success story, in no small measure due to the work of Charles Kibert and the Powell Center at the University of Florida in Gainesville. From modest beginnings in the 1990s to the present, the art and science of high-performance building is becoming the default for renovation and construction worldwide. It is now well documented that high-performance buildings have lower operating,