
A Sustainable Approach to Structural Design

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3.1 Introduction

A contemporary definition of civil engineering given by the American Society of Civil Engineers (ASCE) in 1961 [1] states that “Civil Engineering is the profession in which a knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the progressive well-being of humanity in creating, improving, and protecting the environment, in providing facilities for community living, industry and transportation, and in providing structures for the use of humanity”. This definition implicitly embodies in the concept of civil engineering the concept of sustainability. Unlike other branches of civil engineering, however, where the concept of “sustainability” can boast a rather standardized and globally accepted meaning, for structural engineers, this concept can still lead to a certain degree of misunderstanding and interpretation. The concept of sustainable structural design can embody the canonical idea of “meeting present needs without compromising the ability of future generations to meet their needs” [2], but for this category it still represents a fancy idea rather than an operational and encoded approach to design.

Nonetheless, from the statement above [2], two meaningful concepts can be retrieved: (a) the concept of need, fundamental for the developing countries and for the poorer areas of the planet, where the care of the wealthier population should be addressed and (b) the idea of limit, associated to the available and finite resources, unable to meet the aspirations of the global population.

How can therefore structural engineers contribute to a sustainable and controlled decrease of the most developed areas of the world based on the idea that available resources have to be shared with the greater majority of the world’s population that rightfully claims for improved life conditions?

How can this goal be reached in the era of digital tools, where the claim is that every shape that can possibly be “implemented” and “solved” by a software, even if fantastically conceived and aesthetically stunning, is sustainably buildable in a continuous search for amazement (*Fig. 3.1*),