

Chapter 15

Sustainability: The New 21st Century General Education Requirement for Engineers

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ABSTRACT

The relation of sustainability to science and engineering will be delved into so as to validate the need for its inclusion in current engineering curricula. The chapter will highlight key elements of sustainability that need to be incorporated into a General Education requirement (i.e. lower level undergraduate) course as well as some options for elective (i.e. upper level undergraduate) or postgraduate courses. The chapter will act as a “how to” curriculum development guide to give ideas for the quick development of sustainability courses. It also highlights how engineering students can become engaged in service learning (something that is at the fore of importance for most engineering departments in the US) through their student organizations and associated academic staff advisors with sustainability at the core.

INTRODUCTION AND BACKGROUND

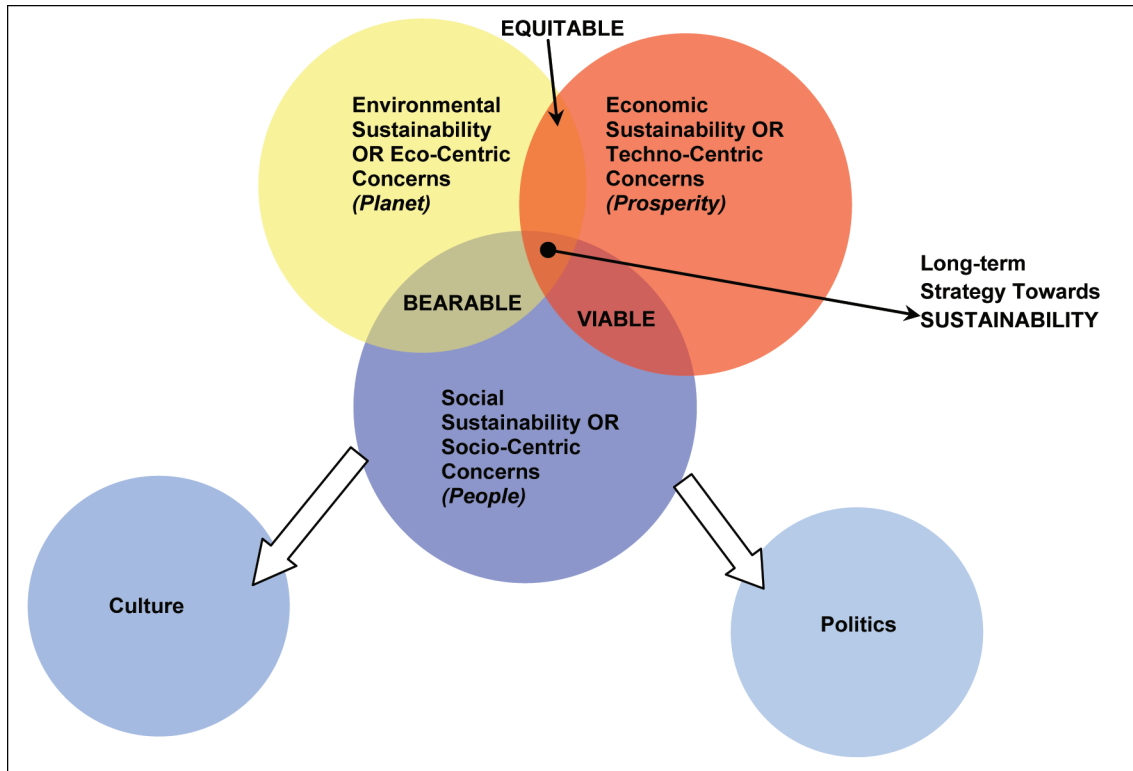
The objective of this chapter is to show why sustainability needs to be part of the undergraduate curriculum throughout all engineering programs as well as to suggest a route of core (and elective) courses by which this could be done for

both the distance and traditional student. Since sustainability is a relatively new notion, there is a need to get our communities aware of it via informal engineering education lead by the arteries of engineering departments—academic staff and students.

The term “sustainability” has different meanings to different people. One of the definitions of sustainability is that it is “development that meets

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Figure 1. The three interconnected pillars of sustainability consist primarily of the environmental (planet), economic (prosperity), and social (people) dimensions with emerging dimensions of culture and politics



the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). Sustainability is a multi-disciplinary and evolving discipline of study, research, and practice that has become a strong component in practice of professional and engineering ethics. At the business level, sustainability is defined as, “meeting the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well” (Dyllick & Hockerts, 2002). While there are varying definitions of sustainability from different sectors of industry, what is important is that it strives for protection of the environment, prudent use of natural resources, equitable social progress, and maintenance of economic well-being without compromising the environment and society. Fig-

ure 1 shows the key dimensions of sustainability. Long-term strategies towards achieving sustainability should consider all three aspects (i.e. the whole or complex system), either at the decision stage or during the operational stage.

The three core pillars of sustainability (i.e. Environment, Society and Economics) or the ‘triple bottom-line’ (i.e. People, Planet, and Prosperity or 3P’s) are inter-connected and hence may influence each other in multiple ways. Understanding the interconnectedness and employing strategies that consider all three dimensions is critical to achieving sustainability. Strategies that concentrate on short-term gains often focus on one aspect of the triple bottom line. Ongoing research and development in the field of sustainability science has expanded those 3 core pillars to 5 pillars of sustainability: environment, culture, politics, society and economy (McConville &

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