**Sustainability Policy Statement**

Approved by the Engineers Forum on Sustainability (EFS) Committee 4/6/17
Approved by American Association of Engineering Societies 4/25/17

AAES and its Member Societies acknowledge the importance of sustainability and sustainable engineering to the present and future well-being of humanity, and the central role of the engineering profession in supporting human well-being, including protecting the natural environment. AAES is committed to encouraging and supporting its Member Societies to develop and promote practices and principles that incorporate sustainability into designs and practices at all scales, both common and large.

Sustainability is about maintaining long term social, economic, and environmental conditions on the Earth that are favorable to the existence of society. The role of engineering is to use technology and engineering practice to make it possible to meet the many challenges facing society considering effectiveness, efficiency, and sustainability.

The projected growth of the human population and increase in consumption creates the need to provide water, energy, food, and consumer products ranging from clothing to electronics as well as infrastructure for a growing urban population, including transportation.

Engineers need to continue to sustainably: develop technology to meet basic human needs and the legitimate needs of society; develop infrastructure to support society; and address adaptation to and mitigation of changing conditions.

*Note: See EFS' white paper entitled Sustainable Engineering for more background on sustainability, including related documents from Member Societies that provide a foundation for this policy statement.*

**Sustainable Engineering**

AAES Engineers Forum on Sustainability (EFS) Committee

## 1. Sustainability

Sustainability is about maintaining long term social, economic, and environmental conditions on the Earth which are favorable to the existence of society. If humanity is going to continue to thrive, "sustainability" is a concept that must be incorporated into design practices at all scales, both common and large. There is often an element of change inherent in sustainability because societies are living and dynamic entities, which in the modern world are no longer self-sufficient or environmentally benign. In addition, societies must not compromise the options of future societies to be sustainable. This is an idea that was most succinctly captured by the World Commission on Development and Environment[1], also known as the Bruntland Commission in reference to its chair, Gro Harlem Bruntland. The Commission report forms the core principle of sustainable development.

The social aspect of sustainability addresses the need to create and maintain conditions which provide safe and adequate living conditions for people, orderly and appropriate conditions for business to operate, and an overall level of well-being for society. The economic aspect of sustainability addresses the need to create and maintain opportunities for individuals to obtain suitable employment, for private enterprise to conduct business profitably, and for government to maintain law, order, and stability. The environmental aspect of sustainability addresses the fact that the earth is neither an infinite source of raw material and energy, nor an infinite sink for waste. Rather, the legitimate material and energy needs, and services needs of society have to be met within the capacities of the earth.

## 2. Some Current Challenges

Current challenges in engineering sustainability are driven by a growing human population which is increasingly prosperous across the globe. However, prosperity and development are important as well, because repeated studies have shown that in many regions of the world, environmental conservation and other sustainability objectives are not effective until economies have reached a level of development where basic human needs are being met.[2] Whether an increasing human population and increasing prosperity are or are not desirable is not in the realm of engineering and will not be addressed here any further. On the other hand, what is in the realm of engineering is to provide the means to manage the resulting challenges. Engineers must, therefore, consider increasing population, which drives increasing consumption of water, energy, food, many consumer products from automobiles to electronics, transportation for an increasingly urban population, and many other challenges. The increase in all of these challenges is straining the technological systems tasked with meeting them, but then engineers are the professionals who are most capable of using technology to solve problems. Furthermore, these changes are occurring in

[1] World Commission on Environment and Development (WCED). Our Common Future. Oxford University Press, Oxford. 1987.

[2] Frank, E. G., & Schlenker, W. (2016). Balancing economic and ecological goals. Science, 353(6300), 651-652.

the context of a planet where the climate appears to be changing rapidly, and where providing for resources from water to metals to fuels in the needed quantities is a challenge as well. Lastly, adaptation to changing conditions is also an area in which engineered solutions must play an important part.

## 3. Engineers and Sustainability

In the modern world, governments have taken on the role of overseeing day to day life for their citizens, and industry has taken on the role of providing options to their customers. From the perspective of engineering, sustainability usually adds at most a modest design cost in the present for large costs avoided in the future. Implementation, however, must either be mandated by government or incorporated into the ethics of industry, and of those who design its processes, engineers. Engineering is the art by which the means of meeting the needs of society are created, and sustainable engineering is the art of meeting these needs sustainably. The role of engineering is, therefore, to use technology and engineering practice to make it possible to meet the many challenges facing society effectively, efficiently, economically, and sustainably. Closely related to these issues are the United Nations Sustainable Development Goals[3], many of which are in the realm of engineering. For these aforementioned reasons, a number of the Member Societies of AAES have sustainability policies[4, 5, 6], guidance in their Codes of Ethics[7, 8], statements in a position paper[9], and/or sustainability definitions[10, 11] all with the goal of establishing the importance of sustainability within engineering. Here we cite a representative sample of these statements which, along with other documents from the AAES Member Societies, form a basis for this Sustainable Engineering White Paper. Finally, the involvement of engineers is critical because, to some extent, they can use ingenuity to provide for sustainability without government or corporate mandates.

## 4. Professional Policy Guidelines for Engineers

Given the importance of sustainability and sustainable engineering to the present and future prosperity of humanity, and the central role of the engineering profession in supporting human well-being, it is crucial that:

a. A high priority shall be given to the development of economically and socially viable technology for meeting basic human needs sustainably that include:

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[3] www.un.org/sustainabledevelopment/sustainable-development-goals/, accessed 09/26/2016.
[4] www.asce.org/issues-and-advocacy/public-policy/policy-statement-418---the-role-of-the-civil-engineer-in-sustainable-development
[5] www.asee.org/about-us/the-organization/our-board-of-directors/asee-board-of-directors-statements/sustainable-development-education
[6] www.smenet.org/about-sme/government-affairs/advocacy/technical-briefing-papers/the-mining-industry-and-sustainable-development
[7] www.nspe.org/resources/ethics/code-ethics
[8] www.asce.org/code-of-ethics
[9] www.asme.org/getmedia/21e6a103-d922-42e6-bdb0-06989024b8fe/ps14-24-securing-america-s-energy
[10] https://southmauisustainability.wordpress.com/2009/01/14/defining-sustainability-institute-for-sustainability-grassroots-project/
[11] http://connect.spe.org/sdts/home

i. Making usable water available, conserving water resources, and meeting needs at the lowest level of consumption.
ii. Generating adequate energy to meet needs, conserving energy to greatest extent possible so that energy used serves a useful purpose, and meeting needs at the lowest level of energy consumption feasible.
iii. Producing enough food to meet human consumption, while minimizing the loss of food already in existence. This will involve improving the means for food distribution and storage.

b. A high priority shall be given to the development of economically and socially viable technology for meeting the legitimate needs of society sustainably that include:
   i. Manufacturing, using, and disposing of consumer products in a manner that results in minimal environmental impacts.
   ii. Producing chemicals, metals, and other intermediate materials with lowest impact on the environment feasible.
   iii. Acquiring the raw materials needed by society efficiently with minimal waste and minimal impact on the environment.

c. A high priority shall be given to the development of economically and socially viable infrastructure to support society sustainably that include:
   i. Transportation, communication, and electrical power distribution systems.
   ii. Water distribution which provides safe and usable water access to all human populations while minimizing waste and impact on the environment.
   iii. Waste water treatment and disposal which removes hazards to human health and ecosystems from waters discharged into the environment.
   iv. Food distribution systems which provide adequate sustenance to the human population while minimizing waste and conducting food production and distribution with minimal impact on the environment.
   v. Solid waste management systems that minimize the mass of waste that has to be stored long term and renders the waste harmless to human health ecosystems.
   vi. Reducing waste and utilizing waste as a resource to create closed-loop systems to harness waste as input to other products or as energy and fertilizer.

d. A high priority shall be given to adaptation to and mitigation of changing conditions, particularly climate change, urban growth management, water scarcity, and food scarcity in manners that are economically and socially viable.

Finally, reaching back to the dawn of history the engineering profession has spearheaded much of the progress of society, and it is now being called again to the front ranks of those working on the solution of the important challenges of the present age. However, in the context of the 21st Century, one has to realize that engineering solutions are affected by economic policies and governmental incentives. This is a realm that interacts with engineering but is not driven by engineering, and it has goals that can sometimes compete with sustainability.