

Keith R. Cooper

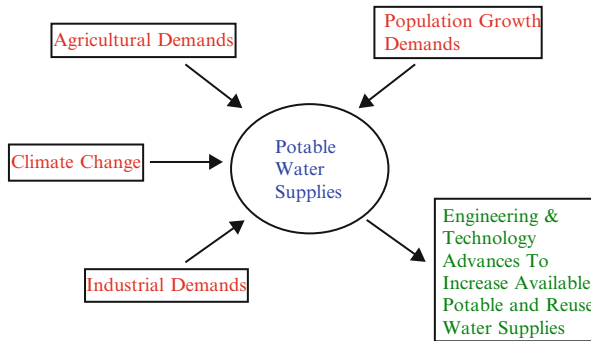
A systems engineering approach must be applied to solving the sustainability issues dealing with the world's water, food, and energy demands (see Fig. 8.1). The earth must be looked at as a total system, which integrates these resources through physical, biological, and social networks, which are constantly in flux. The other key component is the economic factor, which unfortunately favors the rich and punishes the poor when it comes to distribution of adequate safe water, food, and energy resources. The public health issues and toxicological effects become critical when water resources are impacted by environmental and/or anthropogenic activities.

Engineering and scientific innovations have made major advances in producing potable water from seawater and gray water, but the demand and costs have limited the adoption of these methods. In poorer communities, engineering solutions for water treatment and power production must reflect the regional resources available and the abilities of the local workforce to construct and maintain facilities.

The world's water reserves must be managed as a total system which incorporates sound policy decisions on a world-wide and regional basis. The current global warming trend is placing additional stress on areas already precipitation poor, as well as causing excessive flooding in other regions. Individual countries, sustainability efforts have proven to be somewhat effective in local regions, but are ineffective in protecting regional and shared world-wide resources. In order to solve such complex issues and avoid the tragedy of the commons, international cooperation on protecting environmental resources is essential. The world population growth continues on a logarithmic rate and is disproportionately concentrated in countries and regions where the demand will soon outstrip their water resources impacting their food supply and creating public health concerns. Therefore, sustainable engineering solutions must be appropriate for the society for which they are to be used and maintained.

---

K.R. Cooper  
Department of Biochemistry & Microbiology, Rutgers, The State University of NJ,  
New Brunswick, New Jersey, USA  
e-mail: [cooper@aesop.rutgers.edu](mailto:cooper@aesop.rutgers.edu)



**Fig. 8.1** Impacting factors (red) that decrease freshwater supplies and engineering remedies (green)

---

## 1 Cross-References

- ▶ [Fundamental Toxicology Methods and Resources for Assessing Water-related Contamination](#)
- ▶ [Groundwater Contamination: Role of Health Sciences in Tackling](#)
- ▶ [Impact of New Technologies: How to Assess the Intended and Unintended Effects of New Technologies?](#)
- ▶ [Sustainable Water Management in Response to Global Changes](#)