*Environment: Science, Issues, Solutions* by Manuel Molles and Brendan Borrell

Critical Analysis Questions Sample Answers: Chapter 1

1. **Scientists once thought they were on a quest to discover the absolute unchanging rules governing natural phenomena. Increasingly, scientists in every discipline have had to come to terms with the concept of uncertainty, a concept that even Albert Einstein had difficulty accepting. What are some of the implications of the inability of science to eliminate uncertainty entirely, particularly in regard to environmental issues, such as ozone thinning, involving great risks to harm human populations and with significant potential economic consequences following regulation??**

As a result of the inability to remove uncertainty entirely, the public and policy makers may find it difficult to justify taking actions to manage, deter, or eliminate a potential threat to the environment or to a particular species or group of species. There may be a continual demand for more information prior to initiating a change; however, despite the skepticism surrounding the issue and/or the scientific data that is produced, it is important to consider the precautionary principle and to take action if a threat of harm exists, pursuing the idea of “better safe than sorry.”

1. **Exploring nature and solving complex problems are often important motivations for scientists choosing a career path. For those successful in obtaining a position in scientific research, what responsibilities come with the privilege of working in this highly competitive field?**

Scientists must hold themselves ethically accountable for the honesty and accuracy of the research methodologies they apply, the results they gather and analyze, and the claims that they make. They must avoid at all times not just sloppy data collection, but fabrication, falsification, plagiarism, and purposeful deception. Regardless of who is funding the research, an ethical scientist will present the results as they are and avoid conflicts of interest and/or pleasing a potential funder by altering results. Scientists must also avoid introducing any personal bias into their research and let the results speak for themselves.

1. **While awareness of human environmental impact began in ancient China and Greece, that awareness has only increased over time, with the environment in the news nearly every day. What factors have contributed to the apparent increase in human impact on the environment? Do these contributory factors suggest potential ways to reduce environmental harm?**

Increasing levels of environmental impact can be attributed to a rapidly growing human population. Even in meeting our basic human needs of food, water, and shelter, the environment has been negatively impacted. We are now the most populous vertebrate species on the planet, and too often our resource demands go beyond what Earth can sustain. Additionally, awareness of environmental issues and a rise in environmental literacy have resulted in expanded study of the environment, giving rise to the apparent increase in environmental impact. These studies continually incorporate more advanced technologies which allow us to more accurately explore impacts, both increasing our detection sensitivities on the micro scale, as well as increasing our global understandings through analyses on a macro scale. To reduce future environmental harm, it will be necessary to curb population growth and to adopt ways of living that do not exceed Earth’s supply capacity.

1. **Figure 1.24 summarizes the components of the ecological footprint. If you were to propose an alternative measure of ecological footprint, what components would you choose? If you conclude that the existing ecological footprint index is the best one, without modification, justify its focus.**

The current components included in the World Wide Fund for Nature’s ecological footprint are carbon, cropland, grazing land, forest, built-up land, and fishing grounds; however, you may want to consider other components such as freshwater supply, mined resources, technology, greenhouse gases (besides just carbon), etc. (Numerous components could be included.) The World Wide Fund for Nature’s components are very practical and help individuals and national populations look at everyday-type impacts that have been well-documented. These components provide a relatively clear picture of where and how resources are used so that individuals and nations can compare themselves with one another, and these component contributions can be lessened to reduce the footprint size.

1. **Why does environmental science include so many areas of thought and expertise in its domain? What are the relative roles played by the natural and applied sciences versus the social sciences and humanities in addressing environmental issues? Can we ignore the humanities and social sciences and just move forward with solving environmental problems with the tools of the natural and applied sciences?**

Environmental science is a multidisciplinary field of study, drawing from many areas of knowledge such as the natural sciences, applied sciences, social sciences, and humanities. The interaction of so many fields under the environmental science umbrella is a result of the complexities of environmental science issues. Although the natural and applied sciences often analyze directly the practical components of environmental problems, the social sciences and humanities provide an understanding of how to communicate the issues to the general public and how to prompt and sustain change. It is imperative that environmental science continue to involve all these areas of study, to further the mission of identifying sources of environmental impact and working toward eliminating those impacts, managing them, or reaching a goal of sustainability.