

### Essay 3 - World Population and the Tragedy of the Commons

#### Introduction:

In the 1968 essay “The Tragedy of the Commons,” Garrett Hardin takes a careful look at the population problem. He begins by asserting that the population problem has no technical solution. Hardin then argues that the optimum population is less than the maximum population for the earth, and follows by addressing the question of how to reach the optimum population. Hardin asserts that freedom in the commons, particularly with respect to world population, will inevitably lead to environmental degradation, to tragedy for us all. He dismisses the effectiveness of appeals to conscience for the purpose of limiting population, and is wary of the dangers of trying to legislate temperance in the matter of reproduction. Nevertheless, Hardin concludes his argument by advocating “mutual coercion, mutually agreed upon” as a strategy to limit population. Hardin believes that we must recognize the necessity of relinquishing the freedom to breed; only by adopting that strategy can mankind avoid the tragedy of the commons.

In “Hostages to Hubris,” the introduction to his book *One with Nineveh*, Paul Ehrlich provides an updated look at the issues addressed by Hardin. Like Hardin, Ehrlich is concerned about environmental degradation. But he identifies additional pressures, beyond the exploding population growth that is Hardin’s focus, on the environment -- namely, overconsumption and a maldistribution of power. Ehrlich argues that mankind, for reasons of hubris and an inability (or refusal) to see the reality of what is happening to the world, is headed for catastrophe.

Hardin’s essay about overpopulation is notable for that fact that it contains no population data. For this paper, you will be given data about world population and asked to project the population into the future. You will then discuss possible solutions to the tragedy of the commons, based on your work with the data and your reading of the Hardin and other essays. The world population data below are from the United Nations.

year	world population (in billions)
1500	0.50
1750	0.79
1800	0.98
1850	1.26
1900	1.65
1910	1.75
1920	1.86
1930	2.07
1940	2.30
1950	2.52
1960	3.02
1970	3.70
1980	4.44
1990	5.27
2000	6.06

data source: <http://www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf>

## Initial Mathematical Work:

Before you write your essay, begin with a mathematical analysis. Some initial mathematical work will get you started.

- Although the UN population data go back to the year 1500, begin your analysis by working with the data from 1900 to 2000.
- Enter the data into a spreadsheet, and then use the spreadsheet to construct a graph of the data.
- Construct a mathematical model for the growth of world population. First, look at the graph of the data points, and decide whether a linear or exponential model would be more appropriate. Then define appropriate variables. Select two data points and use these to construct your model.
- Add your model to the spreadsheet, and then graph the data and model. Extend the table and the graph into the future to the year 2050. Compare the graph of the model to the data points. Is your model a good fit to the data? If not, select two different data points and construct another model. The mathematical details of this work should be presented in the appendix.
- Use your model to predict world population in the year 2020, and to predict the year in which the population will reach 10 billion. Mathematical details of these calculations should be shown in the appendix.
- Verify that your calculations are correct by using both the table and the graph to make the same predictions.

Be sure to incorporate the answers to the above questions in your discussion of the model in your paper. The mathematical details involved in deriving your model and in answering the final questions should be presented in an appendix to your paper.

## Writing Your Paper:

Your paper should focus on two central issues: when and how will your model break down if we do nothing (as we are now doing), and what should we do to prevent the tragedy of the commons? Of course, your argument should be informed by your work with the data and your projections into the future.

To address the question of model breakdown, you will need to carefully consider carrying capacity. Of course, we do not know the carrying capacity of the earth, but think about what we would need to know to decide on a reasonable carrying capacity. Certainly, the carrying capacity will depend upon both the population level and upon patterns of consumption. Finally, speculate about what you think the carrying capacity might be. As you think about carrying capacity, you might want to consider various resources: food, water, forests, the oceans, energy (fossil fuels), air, and others. What are the implications of your (considered) guess about carrying capacity for the tragedy of the commons?

As you consider a solution to the tragedy of the commons, you might want to examine strategies advocated by some of the essays you have read. Hardin suggests that private property is a solution for some of the problems of the commons. Aldo Leopold, in "The Land Ethic," advocates an ethical change in the way we see ourselves in the world. In "Foresters Without Diplomas" Wangari Maathai describes local action with larger (global?) consequences. Joy Williams writes about an entirely private response to the problems of environmental degradation in her neighborhood in the essay "One Acre." Do you think any of these strategies offer a realistic solution to the tragedy of the commons? Or do you have another strategy to suggest? Or perhaps you think that the tragedy is inevitable. Support your position with a carefully reasoned argument.

**Due Dates:** Completed rough draft due Wednesday, May 3  
Paper due on Friday, May 5