

1. Current GDP in your country is 100 trillion (or 100,000 billion). Your economy is expected to grow at an annual rate of 3% over the next 10 years. Scientific experts predict that a policy designed to reduce greenhouse gases in your country to 2000 levels over the next 10 years will cause a reduction in the annual rate of growth to 2%.

- a. Compute the loss of GDP for each of the next 10 years from this policy.
- b. If the discount rate is 5%, what is the present value of the loss of GDP from this policy?
- c. Suppose your current population is 5 billion, and it is expected to grow at a rate of 2% over the next 10 years.
  - (1) Compute the loss of GDP per capita for each of the next 10 years from this policy.
  - (2) If the discount rate is 5%, what is the present value of the loss of GDP per capita from this policy?

2. Consider an isolated community in which electricity is provided by a firm that uses a coal-fired generator. The total community demand (in dollars) for megawatt hours  $M$  of electricity is given by the marginal private benefit of electricity,

$$MPB_e = 1000 - 20M.$$

The marginal private cost of electricity  $MPC_e$  is a constant \$5 per megawatt hour.

Downwind from the power plant is the agricultural region that provides food for the community. Emissions from the plant affect the PH level of the soil and reduce the crop yield. The total community demand (in dollars) for tons of food  $F$  is given by the marginal private benefit of food,

$$MPB_f = 3000 - 5F.$$

The marginal private cost of food  $MPC_f$  is a constant \$50 per ton.

- a. What are the total net social benefits in this situation?
- b. Suppose the agricultural community suggests legislation that would force the power plant to install a scrubber that would increase the MPC of producing electricity to a constant of \$10 per megawatt hour. However, it would also reduce acid deposition and the acidic content of the soil, thereby increasing crop yield and thus reducing the cost of producing food to \$40 per pound.
  - (1) What would installation of this scrubber do to net social benefits?
  - (2) Would you expect the citizens of this community to support this legislation? Explain.