Resource & Environmental Economics Field Examination

May 24, 2007

Instructions:

You have 4 hours to complete the exam. This time commences at the end of the 15-minute reading period during which no writing is allowed.

Please use your assigned "alpha letter" on every page to identify your exam and number each page. Do not use your name or social security number. Write on only one side of the page leaving at least one inch margins. When you submit the exam, make sure the pages are in order.

You have four questions to answer.

Answer four of following five questions.

1. Revisions to the Endangered Species Act now call for an assessment of economic impacts, so suppose that you have been asked to provide economic analysis regarding protection of an endangered species. The specific question is: what are the benefits of protecting a particular species? You face two problems.

   • First, whether the species will go extinct or not involves risk or uncertainty.

   • Second, scientists argue extensively about the manner in which habitat provision influences species stock.

   There is so much uncertainty that scientists cannot agree about the effects of habitat characteristics on stock sizes. They are unable to provide probabilistic risk information linking habitat characteristics to the stock of this species.

   Explain how you would proceed with an ex ante analysis of the benefits of protecting the stock or, alternatively, explain why it is impractical to empirically estimate these benefits.

   If you recommend proceeding, you may use any modeling framework you like, but the model has to be justified on the basis of consistency with the problem, as well as being able to generate policy relevant results.

2. The Inter Governmental Panel on Climate Change has made it clear that human-caused climate change is occurring and will continue. However, many governments around the world are not fully addressing the question of mitigation (net emissions reduction).

   Develop a framework that addresses the issue of what is the economic cost (if any) of delaying action on emissions reduction. Discuss how uncertainty might affect the cost of delaying mitigation. Using the framework, show how you could study how adaptation options might alter the cost of delaying action today. Throughout your discussion, be very clear what you mean by cost.

3. Increased fossil fuel use with population growth and warmer conditions originating through climate change are expected to increase ozone concentrations. Many say increases in such concentrations will

   - decrease agricultural yields, and

   - damage health of individuals shortening lives, work times while raising health related costs.

   How could you analytically develop an approach to appraise the damages from increased ozone as an input to the decisions as to whether to increase car fuel standards and power plant emissions?

   If you were to find significant damages suggest some policy approaches directed toward fossil fuel use that might address the problem.

4. Given the human roots of all resource and environmental problems, perhaps economists should focus more on modeling humans as the planet's primary pollutant. If this could be accomplished, better policies might be identified. It is clear that net production of this pollutant (i.e. population growth) contributes importantly to all notable environmental and resource problems – depletion, environmental quality degradation, extinctions, etc. – by the two-pronged effects of

   - increasing resource use, and

   - adding more people to be affected by environmental degradation and resource scarcity.

   Discuss how human reproduction constitutes a true market failure by applying accepted economic definitions. Formulate a parsimonious mathematical model in which an arbitrary household makes childbearing decisions in the presence of own-benefits, own-costs, and external costs, where the latter are an increasing function of only N, the world population. Discuss your model and its more immediate implications.

   Suppose your model indicates that the world's current population (N) is inefficiently large. Assuming that a global cap-and-trade policy to attain N* (<<N) is a good policy choice, what economically founded ideas can you offer regarding the following important considerations:

   a) the optimal initial division of population rights across countries,

   b) immigration policy for single countries, and

   c) the optimal adjustment time from N to N*.

5. Ever-tightening water quality standards are challenging urban wastewater treatment utilities with rapidly rising costs, since utilities must comply with these standards. These publicly owned utilities process the sewage discharged by thousands of widely differing homes, apartments, businesses, and small manufacturing enterprises.

Current policy is that these many effluent dischargers are unregulated and pay their urban wastewater utility on the basis of the amount of water they consume. Yet, water consumption is loosely linked to the amount of sewage discharges and poorly related to the amount of various contaminants that may be present in these discharges, especially for manufacturers. Also, due to the small amount of discharges emitted by households and most firms, it is too costly to constantly meter or analyze emissions from each discharger.

It has been argued that from a single utility's point of view, its diffuse sewage collection network is not unlike the situation of nonpoint pollution externalities.

Discuss your opinions on the accuracy of this argument. What are the implications of your discussion for redesigning or replacing the pricing policy noted above?