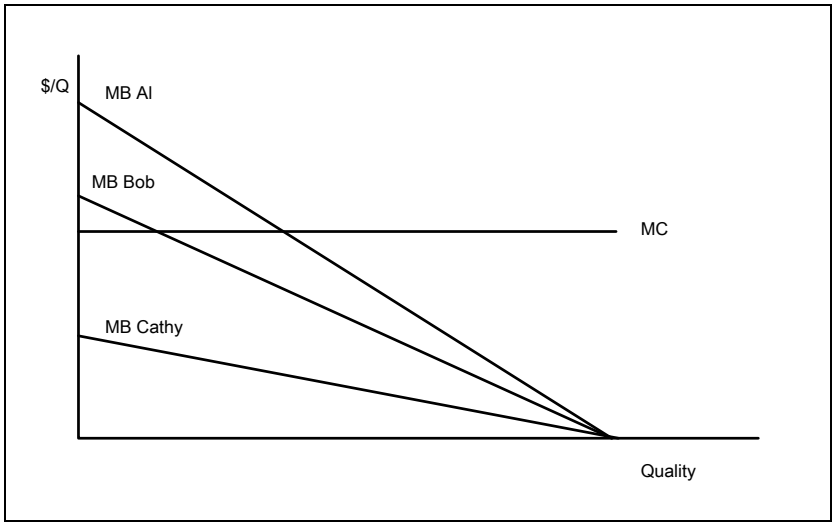
Econ 493w **Environmental Economics** Fall 2012

WVU **Review Sheet 2** R. Congleton

1. Identify and/or Define:

a. Marginal Benefit
b. Marginal External Cost
c. Pigovian Tax
d. Expected Value
e. Present Value
f. Median Voter Model
g. the Regulatory Dilemma
h. NIMBY
r. race to the bottom
j. Federalism
k. Cap and Trade
l. Niskanan Model
m. Carbon Sink
n. Carbon Tax
o. Acid Rain
p. CFC agreements
q. Greenhouse Effect
r. Kyoto Protocol
s. life cycle calculation
t. sustainable development

2. Consider the following series of voter demands for municipal water quality.



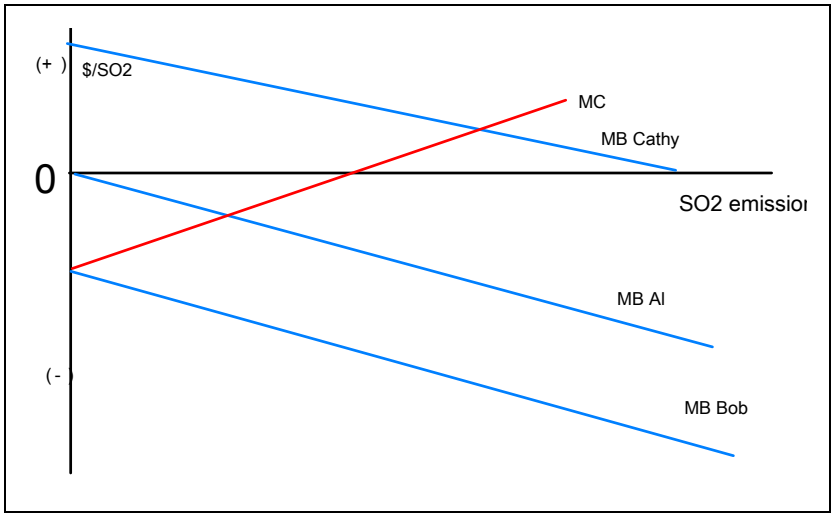
a. Find the Pareto Efficient level of water quality when the municipal water plant can provide only a single quality level for all three voters simultaneously.

b. Find the level that would be preferred by the median voter in the case in which the cost of the water purification plant is shared equally.

- (Hint, in this case each voter pays MC/3 in taxes.)

c. Find the level that the median voter prefers if only Al and Bob share the tax burden.

3. Consider the following series of demands for SO_2 emissions.



a. Suppose that MC represents the cost of production associated with SO_2 emissions.

- What level will Cathy select if she controls the production process.
- What level is Pareto Efficient?
- Discuss how a Coasian contract might (hypothetically) be used to solve the problem.
- What level of emissions will be preferred by the median voter given the existing distribution of costs (0 for Bob and Al).

b. Explain why SO_2 emissions levels > 0 can be Pareto efficient even if SO_2 emissions are disliked by most persons. Note supporting areas in your diagram.

4. Now redraw the SO_2 problem in the electricity production domain with market supply and consumer demands for electricity. Include a marginal external cost curve.

   a. Determine the Pareto efficient output of electricity.

   - How high would an electricity tax have to be to reduce emissions to the efficient level? (Show this on your diagram and discuss briefly.)
   - How much revenue is generated by the tax?
   - What is the deadweight loss of this tax, if any?

   b. How would an SO_2 emissions market affect the cost of meeting emissions targets?

   - Use a marginal damage reduction curve together with a marginal cost of reducing emissions curve to characterize the Pareto efficient level of aggregate emissions, Q**.
   - Show the market clearing price for a permit in a cap and trade system that allows Q** of total emissions.
   - Note the difference in firm costs for a grandfathered and an auction-based cap and trade system.
   - Note that your Cap and Trade diagram indirectly shows that the marginal cost of an emission's permit tends to be the same as the Pigovian emissions tax, if aggregate emissions are set at Pareto efficient (social net benefit - maximizing) levels.
   - Explain this reasoning. (Hint: recall that marginal damage reductions is based on the marginal external damage curve.)

   c. Are there any cases where subsidizing emission reducing technology is a better solution than? Discuss.

   - Are there cases in which the median voter might prefer an emissions tax to direct regulation?
   - Are there cases in which the median voter might prefer direct regulation to an emissions tax and to a cap and trade system.

5. In separate diagrams show that the median voter model can generate CFC regulatory policies that are (i) too lax, (ii) Pareto optimal (maximize social net benefits) and (iii) too stringent.

   a. Describe briefly the characteristics of the distribution of voter ideal points that account for these three possibilities.

   b. Are some environmental problems more amenable to solution by majority voting than others? Discuss.

   c. How do international aspects of a thinning Ozone layer affect your analysis?

   - International aspects can be analyzed with a separate diagram or game matrix.
   - Do so and note the existence of a regulatory externality problem.

6. Many current international environmental problems tend to be very long run problems. For example, noticeable effects caused by increased CO_2 densities on global temperatures occur between 50 and 200 years in the future under mainstream forcasts.

   a. Construct a simple cost benefit analysis of long run costs and benefits associated with global warming.

   - Assume an infinite time horizon, a 3 percent real discount rate, that there are benefits associated with stablising the earth's average temperature, and that the costs of implementing your regulations are significant--perhaps equal to 60% of the damages avoided.
   - List consequences that generate costs and benefits and (arbitrarily) assign values for time streams of benefits and costs.
   - How serious is the problem according to your calculations? (That is, what social net benefits are at risk?)

   b. Now suppose that there is a fifty percent chance that there will be no change in global temperatures because of negative feedbacks (increases in clouds and vertical air flows).

   - How does this change your analysis and conclusions from part a?

7. Use a diagram and/or game matrix to illustrate why carbon taxes may be set too low by even an environmentally concerned national median voter, because of regulatory externalities.

   a. Explain why international treaties might be necessary to address such political problems.

b. Discuss how an interest group might try to influence policies on global warming even in democratic governments dominated by the median voter.

c. List reasons why a median voter might choose to address intergenerational environmental externalities.

- Would the age of the median voter matter?
- Would it matter whether or not the median voter had children or not?
- Would the ideology of the median voter matter?

8. Can there be international NIMBY or Race to the Top problems?
   - Create a 3x3 game to illustrate such a case.
   - Show how a treaty might be used to solve the problem.
   - Can you think of a way to make treaties "self enforcing"?

9. International environmental externality and commons problems can only be addressed via Coasian contracts (treaties) between the governments of the parties affected by the externalities.

   a. Explain why Coasian contracts are the only policy device for addressing international environmental problems.

   b. Construct a 3x3 diagram that illustrates the "regulatory externality" generated by one country's efforts to regulate an effluent that is eventually carried across the border by the wind or water.

   c. Explain why (or whether) Coasian contracts between nations are more problematic than those between individuals within a single nation.

   d. To be effective, treaties have to be "self enforcing" in the sense that no signatory has an incentive to default on his treaty obligations.
      - (i) Use a 3x3 game matrix to illustrate the free-riding problem associated with implementing an international agreement. Discuss how such problems might be addressed via a treaty.
      - (ii) Use your game to demonstrate that each party has an incentive to cheat on the original agreement.
      - (iii) Is there a way to solve this problem? If so describe, if not criticize treaties as method of solving international environmental problems.
      - (iv) Does the *repeated* nature of the game help solve this problem?

   e. Discuss briefly how you would attempt to assess the costs and benefits of unregulated global warming.
      - Discuss uncertainties involved in trying to estimate the damages associated with future fossil fuel use.
      - Discuss how increasing scarcity of fossil fuels may affect future CO2 densities.

   f. Discuss some of the core scientific issues involved in estimating the effects of increased CO2 emissions on the average temperature of the earth.
      - (Optional) Write down an algebraic expression for the present value of adhering to the Kyoto accords for the case in which all scientific questions have been completely solved.
      - (Optional) Now write down an algebraic expression for the expected present value of implementing Kyoto given scientific uncertainties.

10. Niskanen's model of bureaucracy models bureaucrats as budget maximizers. Explore some implications of the Niskanen model for environmental policy making.

    a. Illustrate the Niskanen bureaucrat's "ideal" regulatory stringency for direct regulations under the assumption that budgets increase as the stringency of environmental controls increases.

    b. Would budgetary concerns ever affect the agency's allocation of research grants to scholars interested in environmental science?

    c. According to the Niskanen model, the EPA will prefer one kind of regulation over another because of anticipated increases in its budget. Consider how different solutions (direct regulation, Pigovian taxes and subsidies, cap and trade systems, etc.) would affect EPA budgets.

11. In a democracy, an ideal bureaucracy might adopt policies that the median voter would have preferred had she/he sufficient information to assess her/his own benefits and costs on the policy matters of interest. Voters may lack relevant information because of information problems faced by the median voter.

    a. Given this, can be argued that an ideal bureaucracy would not always try to advance the current policy "goals" of the median voter? What are the limits of this line of argument?

    b. Is there a method to distinguish the environmental policies of an ideal bureaucracy from that of a Niskanen budget maximizer? Discuss.

    c. Contrast the policies of an ideal environmental bureaucracy with one that maximizes social net benefits.

12. [Remember to check through Study Guide 1 and the mid term exam(s) to make sure that you still can apply the tools and ideas from the first half of the semester. The **exam is cumulative** in the sense that all the tools developed in the first half of the course are needed to address the issues explored in the second half.]