

Queen's University
Introduction to Ecological Economics
ENSC 290*
Fall Term 2007

ASSIGNMENT # 1

This assignment is due by 4:00 pm, Wednesday, October 17.

Late submissions will not be graded.

Students are encouraged to work together on the assignment, but each student must submit an original copy of their own responses.

Electronic submissions will not be accepted.

All questions must be answered.

Please show your work.

There are a total of 60 marks on this assignment.

Assume that all of the functions described in this assignment are only defined within the positive quadrant.

GOOD LUCK!

Question # 1

Using a standard SMB – SMC diagram in which all social values and costs have been accurately measured, separately analyze the effects of the following events on the socially optimal quantity (E^{**}) and value (P^{**}) of an environmental asset E.

For each event be sure to note the direction of any changes in the socially optimal quantity or value, and provide a short explanation for why you feel (E^{**} , P^{**}) may have changed.

(a) [6 marks]

As part of a new campaign to educate the public about the “breath-taking beauty” of environmental asset E the Federal Government has allocated over \$10 million on new television and radio commercials promoting E’s virtues.

(b) [6 marks]

Environmental asset E is located in central Alberta. Over the past 10 years the population of Alberta has risen by approximately 3% per year, while average income levels have risen by nearly 5% per year. However, this rapid growth has lead congestion and longer travel times on the route to E. To make matters worse, in search of additional revenue the Alberta government has begun to charge \$10 per person per visit to experience E.

(c) [6 marks]

Most visitors to both Disney World and environmental asset E travel long distances to enjoy the experience at each destination. Like Disney World, environmental asset E is a very popular vacation destination for young families. Disney World has recently raised its ticket prices by 15%.

- (i) Environmental asset E is located right next to Disney World.
- (ii) Environmental asset E is located far from Disney World in upstate New York.

(d) [6 marks]

- (i) A highly publicized research report released by the School of Environmental Studies shows that there are no health benefits associated with environmental asset E for the current generation, but for future generations the health benefits may be considerable.
- (ii) This report has been revised. It turns out that the considerable health benefits of E actually are enjoyed by the current generation, not future generations.

(e) [6 marks]

The only way to experience environmental asset E is to travel by car. The view of E improves dramatically the fewer people there are at the lookout and the fewer cars there are in the parking lot. In the past year gasoline prices have risen nearly 20%.

Question # 2

(a) [5 marks]

There are two buyers on a market for the environmental asset E. Their Private Marginal Benefit functions are:

$$PMB_1 = 20 - E$$

$$PMB_2 = 20 - 2E$$

If we use an unweighted utilitarian social welfare function, what is the aggregate private marginal benefit function?

If we use a weighted utilitarian social welfare function, in which person 1 receives a weight of 0.25 and person 2 receives a weight of 1.75, what is the aggregate private marginal benefit function?

On a fully labeled diagram illustrate the two individuals' private marginal benefit functions, the unweighted utilitarian private marginal benefit function, and the weighted utilitarian private marginal benefit function.

(b) [10 marks]

The private marginal cost function for the environmental asset E is:

$$PMC = 1/3 E$$

Calculate the private market equilibrium (E^* , P^*) if we use the unweighted utilitarian social welfare function described in part (a).

How much consumer surplus is generated at this private market equilibrium?

How much producer surplus is generated at this private market equilibrium?

How much social welfare is generated at this private market equilibrium (assuming no external costs or benefits)?

On a fully labeled diagram illustrate the private market equilibrium described above, and the consumer surplus and producer surplus generated.

(c) [15 marks]

Now let us assume that there are individuals who do not participate in the private market exchange who derive benefits from E and are burdened with costs from E.

The external marginal benefit function for the environmental asset E is:

$$EMB = 8$$

The external marginal cost function for the environmental asset E is:

$$EMC = 1/6 E$$

If the private marginal benefit functions are aggregated using an unweighted utilitarian social welfare function, what is the social marginal benefit function?

What is the social marginal cost function?

What is the socially optimal quantity of the environmental asset (E^{**})?

What is the socially optimal value of the environmental asset (P^{**})?

What is the value of social welfare at the market equilibrium described in part (b) if we include the external costs and benefits?

What is the value of social welfare at the socially optimal exchange (E^{**} , P^{**}) if we include the external costs and benefits?

On a fully labeled diagram illustrate the gain in social welfare when we move from the private market equilibrium to the social optimum.