UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4910 – Environmental Economics**

Date of exam: Wednesday, June 15, 2011

Time for exam: 09:00 a.m. – 12:00 noon

The problem set covers 2 pages (incl. cover sheet)

Resources allowed:
- No resources allowed

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Exam ECON4910

Both problems must be answered, and count equally in the evaluation.

Problem 1

A single firm produces a good in quantity x with costs $C(x)$, assumed increasing and strictly convex. The good is sold in an international market at an exogenous price p. Producing the good gives emissions e equal to $a(z)x$, where z is R&D expenditure of the firm. The function $a(z)$ has the following properties: $a(0) = a_0$, $a' < 0$, $a'' > 0$, $a(z) > 0$ for all z. Environmental damages are given by an environmental cost function $D(e)$, assumed increasing and strictly convex.

1. Derive the first-best social optimum.

2. Derive the optimal emission tax, assuming that the tax is set prior to the producer's choice of x and z.

3. Assume that the only policy instrument is a tax/subsidy on the production of the good (i.e. on x), set prior to the producer's choice of x and z. What is the optimal tax/subsidy? Compare the outcome with the outcome under an emission tax.

4. Would your answers to questions 2 and 3 be changed if you instead had assumed that a tax/subsidy was set after z and $a(z)$ was observed by the regulator, but before the producer's choice of x?

Problem 2

A river starts in country A and also runs through country B before reaching the ocean. Without any environmental regulation, there are polluting emissions from both countries into the river.

1. What is the outcome if the regulator in each country regulates pollution from its own country, but regards pollution from the other country as given? Is this outcome Pareto efficient if transfers between the countries are ruled out?

2. Derive the socially optimal cooperative outcome if countries can cooperate both on emissions and transfers between themselves. Discuss the difference between this outcome and the outcome derived in question 1.