UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4910 – Environmental Economics**

Date of exam: Thursday, June 19, 2014

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.

Note that both problems count equally, but you need to pass both in order to pass the exam

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Problem 1

Consider a situation where there is one town and N firms. The firms' production causes emissions that are damaging to the environment. Denote the aggregate emissions by $M = \sum_{i=1}^{N} m_i$, where m_i are the emissions from firm i. Each firm has its own production technology and profits and emissions are related by a function $f_i(m_i)$ where $f_i(m_i) \geq 0, f_i'(m_i) \geq 0, f_i''(m_i) \leq 0$ and $f_i(0) = 0, f_i'(\hat{m}_i) = 0$.
Suppose emissions are "uniformly-mixing" and the damages from aggregate emissions are known to be $D(M)$ with $D'(M) > 0$. Denote the optimal total amount of emission by M^*.

a.) Suppose there is a regulator setting a total emission cap $\bar{M} = M^*$ and giving each firm a non-tradable quota of $\bar{m} = \frac{\bar{M}}{N}$. Is this policy efficient? Why, or why not?

b.) Suppose the regulator wants to use a tax instead. At which level should the tax be set?

Consider a slightly different situation where there are two towns and two polluting firms, one in each town. There is one regulating body that seeks to regulate the damage from emissions. Emissions are no longer "uniformly-mixing": Ambient pollution in town 1 stems from firm 1 (located in town 1) and firm 2 (located in town 2) according to the following formula: $A_1 = t_{1,1}m_1 + t_{1,2}m_2$, where $t_{i,j}$ is the "transfer coefficient" telling how much emission from source j ends up in location i. Equivalently, ambient pollution in town 2 is given by $A_2 = t_{2,1}m_1 + t_{2,2}m_2$.
The damage function $D(A_i)$ is the same in each town (but A_i might of course differ).

c.) What does the optimal tax schedule look like?

Now consider the location-specific pollution situation, but suppose that there are two regulators, one in each town. Each regulator cares only about his own town and can only set a tax for his own town.

d.) Find the tax that each regulator would set. Discuss the consequences for total emissions.

Problem 2

Suppose the government of a country wants to reduce the exhaust gas pollution from cars. There are two proposals at the table: Either to introduce a tax per liter of purchased fuel, or to introduce a tax on the purchase of cars with low fuel efficiency (the more fuel a given car need to drive one km, the higher the tax). *As an advisor to the government, which policy proposal do you favour, and why?*