# ECON4910 Environmental economics, Spring 2014

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**Lecture 6: Stock pollution**

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Please bring lecture notes to lecture.

*Reading:*

Perman et al. (2011). Chapter 16, in particular sections 16.4 and 16.1

It is useful but not strictly necessary that you have some knowledge of optimal control theory. See lecture note 6B for a brief sketch.

**Summary of main theory in Perman section 16.4**

1. Notation:
   * *M*  is a flow
   * *A* is a stock
   *  is rate of depreciation (Perman uses ). Two cases:
     1. 
     2. 
2. Stocks and flows; benefit of flow *B*(*M*) and cost/damage of stock *D*(*A*). Three case:
   1.  and  for all *A.*
   2.  and  for all *A.* I.e.  where *h* is a positive constant
   3.  for all *t* and  for , where .
3. The social optimum. Box 16.2 in Perman sec. 16.4
4. The optimal emission tax from equation (16.12) in Perman sec. 16.4 (which has a misprint ; should be = not +). Define . It follows from (16.12) that



1. The steady-state equilibrium (for ). Perman Sec. 16.4.1.
2. More on the three possibilities of the *D*-function.

**Derivation of (\*) using optimal control theory (sketch):**

Max 

s.t.



Current value Hamiltonian



Optimal solution satisfies





Defining  this gives

 and the development of *q* is given by

 which implies that



where *K* is some constant. However, the transversality conditions imply that K=0, giving (\*)