NTNU
Det skapende universitet

Institutt for samfunnsøkonomi

Eksamensoppgave i SØK3524/8624 – Miljø- og ressursøkonomi

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Eksamensdato:	6. juni 2013
Eksamenstid:	6 timer
Sensurdato:	27. juni 2013
Tillatte hjelpemidler:	Flg formelsamling: Knut Sydsæter, Arne Strøm og Peter Berck (2006): Matematisk formelsamling for økonomer, 4utg. Gyldendal akademiske. Knut Sydsæter, Arne Strøm, og Peter Berck (2005): Economists' mathematical manual, Berlin. Enkel kalkulator Citizen SR-270x, HP 30S eller SR-270X College
Annen informasjon:	-

Målform/språk:	Engelsk
Antall sider:	3 (inkl. forside)
Antall sider vedlegg:	0

Question 1

a) Discuss some main conceptual differences between 'global' and 'local' pollution problems. Discuss also the relevance of the socalled Environmental Kuznets Curve related to these two types of pollutions.

b) What is the main difference between a stock and flow pollution problem? Formulate and analyze a stock pollution problem when the flow of emission is constant over time.

Question 2

Assume that the growth of a fish stock is governed by $dX_t / dt = F(X_t) - h_t$, where h_t is the harvest and $F(X_t)$ is the natural growth function. The fish stock is exploited through an artisan fishery where only the catch and food count. The net instantaneous benefit is thus given by the utility function $U_t = U(h_t)$ with $U' > 0$ and $U'' < 0$. Suppose that these fishermen optimize the benefit of the fishery over an infinite time horizon with discount rent $\delta > 0$.

a) Formulate the Hamiltonian of this problem and find the control and portfolio conditions.

b) Construct a phase-plane diagram and analyze the dynamics and find the steady state.

c) Find an explicit expression for the steady state stock and harvest when the natural growth function is specified as the standard logistic one.

Question 3

a) Consider a hydropower project. I is the investment cost and $D_t = D > 0$ is the operating profit (electricity sale minus operating costs), assumed to be fixed through time. With δ as the discount rate and when investment takes place instantaneously, the present-value of the project is defined by $PV = -I + \int_0^T D_t e^{-\delta t} dt$ when. Calculate PV .

Next, calculate PV when the operating time of the project is infinite such that $T = \infty$. Will the company carry out the project?

Study the same problem when also including environmental costs ('destroying pristine land') given by $P_t > 0$. Analyze first the situation when these costs are fixed through time, $P_t = P$. Next, discuss some extensions of the analysis when these costs increase over time ('Krutilla assumption').

b) Consider an even aged stand of trees planted at a piece of land at $t = 0$. The biomass at time $t \geq 0$ is given as V_t. How may the time profile of V_t look like?

The planting cost is c_0 and the net sale price (net of logging costs) of the biomass is given by p_t. Characterize and interprete the optimal logging time when the land has no opportunity value after logging. What is the effect of the discount rate?

Assume now instead that the land after logging has an opportunity value Q_t at every point of time. Characterize the optimal logging time when this opportunity value is included. Compare with what you found without this value.