AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative Masters Programme in Economics for Anglophone Africa (Except Nigeria)

JOINT FACILITY FOR ELECTIVES (JFE) 2011

JUNE – SEPTEMBER

ENVIRONMENTAL ECONOMICS I

First Semester: Final Examination

Duration: 3 Hours **Date: Wednesday, August 3, 2011**

INSTRUCTIONS:

1. You are required to answer **ANY THREE** questions.
2. All questions carry equal weight.
3. Answers must be clear, well structured and concise.

Question 1 [20 marks]

(a) Explain the Environmental Kuznets Curve hypothesis. Discuss what may drive this relationship, its empirical validity, its policy implication and limitation. **(10 marks)**

(b) Explain why the idea of substitutability is important in the sustainability debate. **(5 marks)**

(c) Explain the so-called "Hartwick rule". Discuss its policy implications in reference to resource rich countries in Africa. **(5 marks)**

Question 2 [20 marks]

Reflecting on the management of fisheries in Senegal:

(a) Discuss how government policy and insufficient resources together with the quasi-open access nature of Senegalese fisheries have led to a dangerous depletion of fish stocks (in particular the demersals) **(10 marks)**

(b) Discuss the rationale and the substance of the new incentive-based approaches (both in artisanal fisheries and industrial fisheries) to address the fisheries crisis. **(10 marks)**

Question 3 [20 marks]

Based on evidence in Kenya and/or Nigeria, discuss the importance of extraction of products from forests for poverty and inequality reduction. **(20 marks)**

Question 4 [20 marks]

Suppose a mine operates in a competitive industry. The mine owner is a profit maximiser and faces a linear demand curve for the exhaustible resource: $q(t) = a - bp(t)$. Suppose further that the costs of extraction are zero, that initial reserves are $R(0) = S$ and that the discount rate is r. In addition in period extract is given by the following equation $\dot{R}(t) = -q(t)$.

(a) Write the mine owner's problem when the time horizon is T_c. Identify the control and state variables. **(3 marks)**

(b) Derive the necessary conditions and the transversality condition using the maximum principle. **(5 marks)**

(c) Provide an economic intuition for the co-state variable and its dynamics. **(2 marks)**

(d) Solve the dynamic optimization: Find the time-path of extraction, price and the final time of extraction T_c for this competitive firm. **(6 marks)**

(e) Under the assumptions of this problem, a monopolistic mining firm would choose a time horizon T_m that solves the following equation: $T_m - \frac{1-e^{-rT_m}}{r} = \frac{25}{a}$.

Show that $T_m > T_c$ and provide an economic intuition for this result. **(4 marks)**