

## ECN 371 - Environmental Economics 09:00-12:00 - May 21, 2014

**A1:** No books except English dictionary, no other aiding tools.  
This exam consists of 4 questions, for a total score of 100 points.  
All questions are to be answered. You may answer in English or Norwegian.

### Question 1 (20 points)

The basic equation of monitoring and enforcement is  $p = \frac{U_n - U_c}{S}$ .

- (a) Explain the terms in the above expression, and relate your explanation to the “hang the prisoner with probability zero” proposition. **(5 points)**
- (b) State the main objectives of monitoring and enforcement, and relate the above expression to these objectives. **(5 points)**
- (c) Show how to arrive (derive) the above expression from a fundamental behavioral model of compliance and non-compliance of regulations. **(10 points)**

### Question 2 (20 points)

Resource allocation mechanisms (RAMs) are important tools for designing environmental policy. The RAM framework is a development from principal-agent (PA) models.

- (a) State the three necessary conditions for a RAM to yield predictable outcomes, and briefly explain why each of these criteria are important. **(10 points)**
- (b) Explain the linkages between *adverse selection* and *moral hazard* in PA-models and the conditions in RAMs. **(10 points)**

### Question 3 (20 points)

Auctions are increasingly used for assigning environmental management contracts to potential least cost providers.

- (a) Explain what is meant by *truthful revelation*, and show how *uniform price auctions* yield *truthful revelation*. **(10 points)**
- (b) *Discriminatory price auctions* have been found to deliver lower costs of meeting conservation targets than *uniform price auctions*. Explain why this outcome is more when potential providers have limited experience with conservation auctions compared to repeated uses (for example when auctions are repeated at another geographical location). **(10 points)**

#### Question 4 (40 points)

New environmental issues tend to emerge in the sense that activities or products that initially were believed to be harmless prove to have quite adverse effects on the environment or on human health. Examples include the use of DDT, asbestos and PCBs. A recent concern is micro particles from plastics (MPP), that end up hurting aquatic organisms by accumulating in their digestive systems and serving as attractors for various toxic substances. MPPs are not toxic themselves, and perceived damages from MPPs are related to emissions to water.

The use of plastics in the economy is wide spread, ranging from household to industrial use in nearly all sectors of the economy. Particular concerns relate to plastic used to wrap all sorts of products.

Consider a small, open and affluent economy (not unlike that of Norway), where environmental regulators propose the following policy to reduce plastic usage, and hence also emissions of MPPs:

1. A subsidy on other types of packaging materials to reduce the relative profitability of using plastics in packaging.
  2. A voluntary agreement with domestic industries to reduce the use of plastics by 5 % annually for the next ten years, against a promise that if this target is met, taxes on the use of plastics will not be introduced.
  3. At the international level, the country works for getting an international agreement in place to reduce the use of plastics, in particular for packaging purposes.
- (a) Discuss the expected advantages and disadvantages of the domestic proposals (1) and (2). **(10 points)**
- (b) Propose a package of alternate domestic regulations to (1) and (2). Briefly discuss the expected environmental and economic performance of your proposed package. **(10 points)**
- (c) Getting international agreements (3) in place is time consuming. Propose temporary import regulations for reducing the domestic risks of MPPs from imported goods while waiting for an international agreement to be implemented. Discuss how these extra import regulations may help speed up the process of getting an international agreement in place. **(10 points)**
- (d) Export industries are concerned about all measures that are likely to increase their costs and hence reduce their competitiveness. They therefore ask to be exempt from any regulations that increase their costs. Briefly discuss the merits of such an exemption for the export industries. **(10 points)**

Eric Nævdal (sign.)  
(external controller)



Eirik Romstad  
(course responsible)