

ECN 371: Exercise set 5

Exercise sets are not to be handed in. At the same time as exercises are put on the WEB page, so are the associated suggestions for answers.

Go to the page <http://www.mare.su.se/next/>, and start the model Nest (most modern PCs comes with JAVA installed, so just try to start the model - if it does not start, follow the link "Installation").

Nest is scientifically based model for improving environmental quality in the Baltic Sea **at least cost**. The environmental improvement is measured as an increase in Secci depths (a white circular disk with a diameter of 30 cm is lowered into the water, where the disk no longer is visible is the Secci depth). Secci depths measure the clearness of the water, and is a frequently used indicator for the nutrient state, and hence the degree of water pollution.

The Baltic is divided into seven sub-water basins, the Bothnian Bay (all the way up north between Finland and Sweden), the Bothnian Sea (the second northernmost sub basin between Finland and Sweden), the Baltic Proper (the large central water basin just south of the Bothnian Sea), the Gulf of Finland (the bay between Finland and Estonia reaching to St.Petersburg), the Gulf of Riga (the bay on the border of Estonia and Latvia), the Danish Straits and Kattegat. Note that water flows between the various sub-basins to a varying degree.

What to do:

1. Show that the total abatement cost amount to 83.7 mill Euro per year for a Secci depth improvements shown in the table below.

Sub-water basin	Bothnian Bay	Bothnian Sea	Baltic Proper	Gulf of Finland	Gulf of Riga	Danish straits	Kattegat
Targets	0.7	0.5	0.5	0.3	0.3	0.3	0.2

(Once Nest has started, go to the Input Data window in the upper right half of the screen, click on the sub basin and use the ruler on the right to get the desired improvement (target) for that sub-basin. Click the "Calculate" button. Total costs are shown in the lower right half screen. Round pie charts in each country indicates the magnitudes of needed measures in each country. By clicking on the chart, you see the distribution in % of that country's abatement across sectors.

2. Increase Secci depth improvements to the Baltic Proper by 0.1 meters, i.e., to 0.6 meters. What happens to total costs and why?
3. Exclude the following measures: *Land use*, *Livestock reduction*, and *Fertilizer use* from the allowed sectors for all countries (Click on the Measures tab in the upper right window, and remove tick marks from those sectors, apply to all sectors). What happens to total costs, and why?
4. Increase Secci depths by 0.2 meters in all sub-basins from 2. What happens, and why?
5. Go back and allow abatement to take place in all sectors. What happens now, and why?
6. Go back to the initial improvement targets in the table in 1. Let all countries except Latvia abate. What happens? Suppose Latvia is in such a poor economic situation that it cannot afford to undertake measures. How would you achieve the solution in 1?