

ECN 275/375 Environmental and natural resource economics

Exercise set 14 – stock pollutants

Exercise 14.1 – Climate emissions as a stock pollutant

Natural scientists often view climate gas emissions as an accumulation of CO₂ equivalents in the atmosphere. Denote climate gas emissions in CO₂ equivalents in time period t as Mt , and maximum allowed accumulated emissions as \bar{M} to avoid a certain severe climate damage scenario.

- (a) What is the “resource constraint” given this perspective on climate gas emissions? Briefly explain your answer.
- (b) $\lim_{t \rightarrow \infty} \frac{\bar{M}}{t} = 0$ of the resource constraint implies a zero emission policy. Why is this partly irrelevant?
- (c) The “arrival time” of *backstop technologies* is uncertain. How could uncertain “arrival time” for backstop technologies be incorporated in the resource constraint?

Exercise 14.2 – Graphical analysis of the stock pollutant problem

4-quadrant graphs like the one presented in lecture 13 (see graph to the right), can be quite useful in terms of characterizing changes in management of non-renewable resources.

- (a) What changes are needed in our explanation of the key elements in such graphs to make such a graph usable analyzing stock pollutants like emissions of CO₂-equivalents?
- (b) What are the impacts of technologies that reduce the demand for carbon emissions on the “resource” allowable carbon emissions to avoid an undesirable climate scenario? Use a 4-quadrant graph to illustrate your findings.
- (c) Explain why the reduced demand for carbon emissions may not lead to full use of the carbon budget, i.e., that carbon emissions continue until the new and higher time indicated by the red lines in quadrants 2 and 3.

