Playing pollution games

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Abstract

The paper presents a small set of environment pollution problems and describes them from the point of view of both Non Cooperative Game Theory ($NCGT$) and Cooperative Game Theory (CGT) with Transferable Utility (TU). Of each problem we give the general formulation and then we translate it in two forms:

1. a static game of complete information in $NCGT$,

2. a game with TU in CGT.

For each of the two forms we give the solutions of each game.
For NCGs this means that we give at least the classical or modified Nash Equilibria for each game whereas for CGs we give at least their core or the Shapley value (if the core is empty) and analyse the stability of the coalitions that possibly form.
The problems we describe and solve are derived mainly from Osborne and Rubinstein (1994), from Bialas (March 2005), from Ray (January 2000) or represent an original contribution.
Within this framework, the games we deal with involve a set of n players that emit a pollutant in some common area, i.e. an unbounded space (such as the atmosphere), or in a more or less common pool such as a lake or a river or a set of private spaces such as neighbouring gardens.
Obviously we are not concerned with the nature of the pollutant nor with the technology that is necessary for its treatment. We are only concerned with either the strategies that players can carry out or the coalitions they can

form for the reduction of such damages that this pollutant causes to either all or some of the players and the costs that the involved players must bear to abate the pollution level.

References

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