

Dynamic Games Modeling “The Tragedy of the Commons”

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The tragedy of the commons means that, in the absence of regulation, each individual will have a tendency to exploit the commons to his/her own advantage, typically without limit. Under this state of affairs, the commons is depleted and eventually ruined.

The general *objective* of the research project is in depth study of *the tragedy of the commons* in dynamic context of *exploitation of common renewable resources*, also with taking into account various approaches to information.

Aim of proposed research project is four-fold:

1. Cognitive. We want to study the nature of the problem in more realistic models than considered before.
2. Producing additional tools which will help other scientists working in dynamic games.
3. Studying *the tragedy of the commons* and proposing solution of this problem in specific models.
4. Verification and completing or amending results of others in order to increase the base of the results which are for sure mathematically correct.

The tragedy of the commons, especially in the context of marine resources, is a very important problem of contemporaneity. There are many papers in this field but the results are quite partial. The reason is that dynamic games are much more difficult to cope with than dynamic optimization problems.

So, introducing additional, interacting participants into a dynamic optimization problems whose solutions can be calculated or computed, makes it extremely compound. Therefore, only a limited number of models of *exploitation of common renewable resources* was studied, even only by numerical methods.

Therefore, in this research project, we are going to construct tools to solve *the tragedy of the commons* problem.

We are going to enlarge the set of solved models of this problem and complete those which are incomplete by now. It is worth emphasizing that this class of incompletely solved models contains such classics of the field as Levhari and Mirman seminal paper. So, being sure that results contained therein are correct seems crucial for the field of applications of dynamic games in environmental economics.

Moreover, if followed by further practical implementation, they can substantially improve well being of societies taking into account scientist's indications, by solving *the tragedy of the commons*.

We also work on tools of numerical methods which is more general class of decision making problem, which will be useful also for other scientists working in dynamic games.