

# The Commons' Tragicomedy

*Self-Governance Doesn't Come Easily*

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In 1968 Garrett Hardin published an article in *Science* entitled “The Tragedy of the Commons” [1]. In the spirit of earlier articles on the irreversible exploitation of fishing grounds by Gordon [2] and Scott [3], he outlines the problem to sustain common goods or resources in an economically oriented society. The metaphor by Hardin invokes an open access grassland: Each herdsman can put as many cattle as he wants on the common and if he behaves rationally, so the argument goes, he will increase his herd by breeding more and more animals in order to maximize his gain. The problem is formulated in terms of game theory and, somewhat simplified, follows the following calculation: The utility of adding one more cattle to the herd has a positive and a negative component. The possibility to sell the additional animal results in a profit, say  $+P$ . The negative component is caused by the effect of overgrazing the cattle ground by one more animal. On the other hand, the reduction in profit following the increase in the number of animals on the pasture is shared by all farmers. Thus the expected negative utility for adding one animal is only a fraction of  $-P$  and the individual farmer who raises the number of his cattle obtains a positive overall payoff. Provided all farmers are rational agents they will all do the same and the outcome is evident. The pasture is heavily overgrazed and finally devastated. Garrett Hardin used his metaphor to illustrate a whole class of problems resulting from uncontrolled over usage of commons, for which no technical solution exists. Typical over-exploitable resources considered in such “no technical solution problems” are natural resources including no man’s land, the sea, and the atmosphere (forests, pastures, freshwater access, waste disposal, fisheries, atmospheric pollution), and related global issues like the growth of the human population, arms races—especially during the period of the Cold War—and global warming. Much attention was given to the tragedy of the commons and a large numbers of articles on related problems followed. The only solution to this class of problems on the national level seemed to be regulation by centrally imposed measures and/or taxation of profits resulting from exploitation of the commons. Governmental interference thus appeared to be inevitable. This has, in essence, the consequence that no appealing solutions whatsoever are possible for problems on a worldwide scale.

Further development of ideas to understand “no technical solution problems” and to find recipes for handling them showed that the situation is not as hopeless as originally expected (For a very detailed analysis of the commons problem by Elinor Ostrom and others see [4, 5]). Models based on the prisoners’ dilemma game [6] indicated that rationally behaving agents may eventually play cooperative strategies and benefit in the long run. Adaptive dynamics [7] also models cooperation and

provides insight into its evolution. In addition, economists became aware of the fact that common pool resources escape ruin through over-exploitation in less developed societies through sharing the profits by the community [8]. The usage of high altitude pastures in the Alps is another example from a fairly highly developed society: Some of the so-called "Almen" have a documented history of four thousand years usage and more without devastation through overgrazing [9, 10]. Another example in the same spirit and representative for thousands of similar cases comes from small-scale water resources management [11], which is self-governed in the sense that groups of users established their own rules without governmental interference and reference to formal legislation. Open access and free software on the internet are a recent high-tech example of common resources shared by a self-organized community. The LINUX community represents a particularly well-studied example. It has been addressed as "A bazaar at the edge of chaos" [12]. More recent works in economics based on Nash equilibrium analysis and simulations by multiagent systems [13, 14] are dealing with the nature and the emergence of self-governance structures on the commons, which are able to handle autonomously the sustainable uses of resources. A summary of the results obtained by Robert Axtell [13] in a nutshell says: The "tragedy of the commons" problem has a stable Nash equilibrium and Pareto levels of individual effort exist, which are superior to the Nash levels but not rational for the individual agent. In other words, to stabilize the commons individuals are required, which are willing to sacrifice part of their returns in order to compensate for the required increased efforts. If the agents are allowed to make mutually beneficial contracts, the efforts can be reduced and the community can escape the catastrophe of the "tragedy." The set of these contracts is interpreted as mutual monitoring and represent a simple form of self-governance avoiding the appropriation of undue shares. As in prisoners' dilemma cooperation, here

in the form of agreements, is the key to prevent ruin. The second act of the play ends quite optimistically: Not only is there a theory in economics that shows a way to find escape strategies for "no technical solution problems" through cooperation, there are also thousands of practical examples preventing the "tragedy of the commons" in reality, in ancient as well as in modern societies.

Returning to the dilemmas of global size addressed initially by Hardin the optimism coming up in the above paragraph is strongly damped or even converted into pessimism. Most of the cooperative real-world systems with self-governed administration are of small size. People cooperate more easily in groups, where they can know all or almost all players and unmasking of cheaters and other malefactors is much easier than in large societies. The most interesting case, but not necessarily a

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counterexample, in this context is the internet community, in particular the LINUX subgroup mentioned above. Access works largely anonymously and the numbers of people involved are apparently very large. Looking more closely, however, the situation becomes less clear, because only a few people are really active in determining how the LINUX system is developed further and where the community is going in the future. Among these people it is not difficult to imagine a hierarchy of decision makers. Moreover the vast majority of people in the community are users who just download stuff and who are causing very little excess costs (unlike supernumerary cows on the meadows). As nice as the successful examples of self-governance are we should also not forget the large numbers of cases where self-organization failed terribly. I men-

tion only the numerous efforts to remodel the decision system at the universities in Continental Europe, in particular in the German speaking countries. Finally, I feel there is little hope for a change in the attitude of the global players towards the large-scale problems: Growth of the human population, exploitation of global common pool resources, and environmental pollution, in particular carbon dioxide emission through energy production from fossil fuels. Wherever population growth has been reduced successfully, this was due to factors that are unrelated to self-governance. Country-wide social security systems in the developed countries made children dispensable for sufficient financial assets to survive at old age. It is an interesting detail that people in the United States have a less efficient social security system and more children than the citizens in continental Europe. Other countries, like China being the best example, introduced centralized legal control on birth rates. Conventions on fishery restriction were only partly successful, since the contracts are still broken regularly by a partner going for individual profit. The most recent example is a new attempt of Japan to circumvent the Whale catch agreement. Atmospheric pollution is almost an ideal case study for "the tragedy of the commons." After long negotiations the Kyoto protocol was laid down in a document. Three topmost countries among the CO<sub>2</sub> producers, the United States, China, and India did not sign the protocol and the majority of the other countries are now bargaining about allowed emissions and selling not consumed quota. As a matter of fact the present paragraph dealing with present day reality has restored the tragedy and ironically at the level that might be most harmful. Eventually, we are forced to conclude that, due to the tragicomedy of human foibles, self-governance—the only mechanism that might work for reasonable handling of global commons—does not seem to come about easily on a world-wide scale, and the evolution of self-governance is still not sufficiently well understood yet.

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