

**Comments on EPA's proposed
Carbon Pollution Standard,
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Good evening. I'm Henry Hamburger, member of the Union of Concerned Scientists, emeritus professor of computer science, at George Mason University, and formerly a tenured mathematical social scientist at the University of California, Irvine, where I worked in a field of crucial relevance to the issue now before EPA, the study of the multi-person Prisoner's Dilemma game, originated by three people independently in 1973, according to "Elsevier's Dictionary of Psychological Theories." One got a Nobel prize in economics, another the William James award in psychology, and the third one is me.

I will state the lessons learned from this field and relate them to the need for regulation, specifically with regard to carbon pollution.

Game theory is about interacting decisions. Prisoner's Dilemma was originally a game with just two people: For example, two strangers sit in separate rooms without the ability to communicate. Each gets an initial stake of \$10 - to keep, or maybe not. Each is offered an additional \$10. If one of them takes it, that costs the other one \$15. And vice versa. So each has two options: Take it - or leave it. No matter what you think the other person will choose, you do best by taking the offered extra amount. But if both of you take say yes, you're both worse off (20 minus 15) than if each just took the initial stake (10). So individual rational choice defeats the common good.

Here are 10 lessons learned from the game called Multi-Person Prisoners' Dilemma:

1. Many real-life situations have this decision structure.
2. Most notably situations involving pollution.
3. Results may involve money, health, and other good things.
4. The numbers matter, the amount of money, the degree of lost health.
5. Communication matters.
6. Voluntary uncritical cooperation is for suckers.
7. With increasing numbers of players, cooperation gets harder and harder to achieve.
8. Governments can restructure a situation to induce better outcomes.
9. A nation sets up the game that businesses play.
10. Nations are also players - in a global game, where the rules are treaties.

Here are 3 real, known, solutions to real problems structured like Prisoner's Dilemma:

1. Congestion charging in urban centers.
2. Enforced nonproliferation of nuclear weapons.
3. Government regulation of carbon.
(so you're not only legal, you're right!)

Yes, EPA is right to have a Carbon Pollution Standard but you can do more! 5 things worry me.

1. Fracking is carbon pollution that's huge, upstream and apparently ignored here.
2. Sequestration is a long-term risk, huge, downstream and apparently ignored here
3. Old utilities: Where is the pressure to replace them?
4. Non-utilities and small utilities: Exemption promotes subdividing and decentralizing.
5. "Averaging" - We need accountability before year 11.