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Global warming game shows importance of public pressure

jason i. BRown
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THERE ARE detractors who disbelieve our world is experiencing global warming, but there is an ever-growing body of empirical evidence of a worldwide warming trend.

So why can't governments get their acts together and do something about it? The problem is harder than you think.

From a mathematical point of view, imagine that all countries play a game called Who Will Fix Global Warming? Every country decides whether to reduce greenhouse gas emissions. There are mutual benefits to be had, but also some individual costs.

To simplify things, let's just imagine there are only two countries, Country A and Country B, which need to decide on gas reductions (the extension to multi-country involvement is not so different).

The big question is: should each government legislate its individuals and corporations to reduce emissions?

When considering costs and benefits, it's often better to assign some sort of number indicating the relative worth of each choice.

Mathematicians call these numbers utilities; positive numbers indicate something that is deemed worthwhile, while choices with negative values are to be avoided, if possible.

The graphic shows what I see as some reasonable values for each country's choice:

It would be good for both countries, and indeed the world, if they jointly reduced emissions.

But here is the problem: if a country realizes this, then there is an incentive to change its mind (provided the other country doesn't change its mind) and not reduce emissions, as it will benefit economically by not having to invest in reducing greenhouse gas emissions (and hence having a higher value).

The country that remains determined to reduce emissions will actually pay a steep price by doing so, as it will pay higher costs while the other country continues to emit.

So what inevitably happens? Both countries continue to emit greenhouse gases, a choice that hurts everyone (the value of doing so for each country is far lower than if they both reduce emissions).

We are stuck in what is known mathematically as the prisoner's dilemma. Negotiations make no difference, as long as each country acts in its own self-interest. Although there may be long-term agreements to cut greenhouse gas emissions, if the contracts are not enforceable, both countries will cheat.

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Recognizing the inherent issues is one thing, but does this help us find a way out of our global-warming problem?

One answer may lie in changing the values of the choices.

Government leaders love one thing even more than money — staying in power. Imagine if the public could be organized so that reducing emissions were a make-or-break issue for a government.

We would have to let our leaders know that we highly value reducing greenhouse gas emissions, no matter what, even in the face of other countries that continue to pollute.

If governments sense the values of their choices have changed, then what can result is a stable solution, namely for both countries to reduce emissions.

Neither country would have any incentive to switch to cheat.

Defeating global warming would not only be the right decision, but the rational one as well.

Jason I. Brown is a mathematics professor at Dalhousie University in Halifax. His research that used mathematics to uncover how the Beatles played the opening chord of A Hard Day's Night has garnered worldwide attention. He is also the author of Our Days Are Numbered: How Mathematics Orders Our Lives. (jbrown@herald.ca)

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