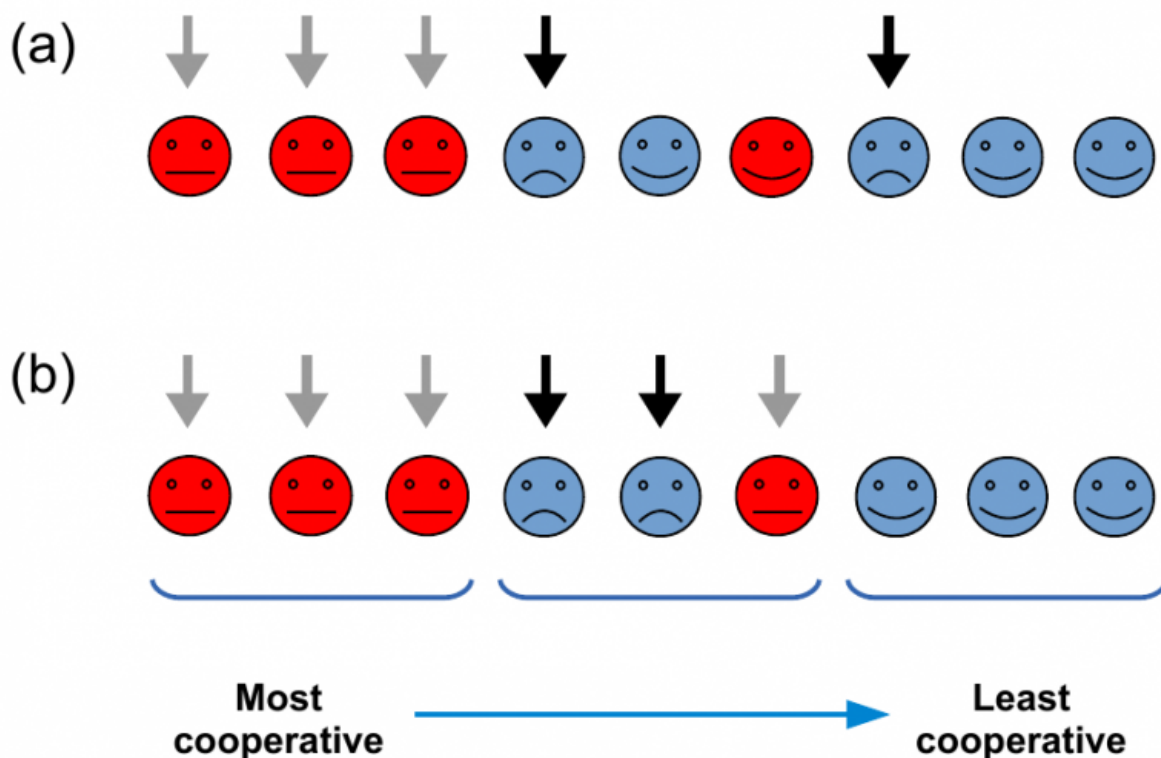


'Targeted punishments' against countries could tackle climate change

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A diagram of two possible strategies of targeted punishment studied in the paper.
Credit: *Royal Society Open Science*

Targeted punishments could provide a path to international climate change cooperation, new research in game theory has found.

Conducted at the University of Warwick, the research suggests that in situations such as climate change, where everyone would be better off if everyone cooperated but it may not be individually advantageous to do so, the use of a strategy called 'targeted [punishment](#)' could help shift society towards global cooperation.

Despite the name, the 'targeted punishment' mechanism can apply to positive or negative incentives. The research argues that the key factor is that these incentives are not necessarily applied to everyone who may seem to deserve them. Rather, rules should be devised according to which only a small number of players are considered responsible at any one time.

The study's author Dr Samuel Johnson, from the University of Warwick's Mathematics Institute, explains:

"It is well known that some form of punishment, or positive incentives, can help maintain cooperation in situations where almost everyone is already cooperating, such as in a country with very little crime. But when there are only a few people cooperating and many more not doing so punishment can be too dilute to have any effect. In this regard, the international community is a bit like a failed state."

The paper, published in *Royal Society Open Science* and freely accessible online, shows that in situations of entrenched defection (non-cooperation), there exist strategies of 'targeted punishment' available to would-be punishers which can allow them to move a community towards [global cooperation](#).

"The idea", said Dr Johnson, "is not to punish everyone who is defecting, but rather to devise a rule whereby only a small number of defectors are considered at fault at any one time. For example, if you want to get a group of people to cooperate on something, you might arrange them on

an imaginary line and declare that a person is liable to be punished if and only if the person to their left is cooperating while they are not. This way, those people considered at fault will find themselves under a lot more pressure than if responsibility were distributed, and cooperation can build up gradually as each person decides to fall in line when the spotlight reaches them."

For the case of [climate change](#), the paper suggests that countries should be divided into groups, and these groups placed in some order - ideally, according roughly to their natural tendencies to cooperate. Governments would make commitments (to reduce emissions or leave fossil fuels in the ground, for instance) conditional on the performance of the group before them. This way, any combination of sanctions and positive incentives that other countries might be willing to impose would have a much greater effect.

"In the mathematical model", said Dr Johnson, "the mechanism works best if the players are somewhat irrational. It seems a reasonable assumption that this might apply to the international community."

More information: S Johnson, "Escaping the tragedy of the commons through targeted punishment", *Royal Society Open Science* (2015).
[rsos.royalsocietypublishing.org ... /10.1098/rsos.150223](https://royalsocietypublishing.org/.../10.1098/rsos.150223)

Provided by University of Warwick

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