

Science for Environment Policy

When can science help conflicting stakeholders reach agreement?

Does scientific evidence always help conflicting stakeholders to reach agreement on how to deal with environmental risks? Scientists have now developed a mathematical framework to help answer this question. They show that stakeholder perceptions of the costs and benefits of regulations, as well as their perceptions of the quality of new research, will determine whether they change their standpoint.

Controversial environmental issues, such as shale gas or genetic modification, can provoke strong opinions. In these cases, scientific studies are often presented to opposing stakeholders to help them reach consensus. However, the science itself can become part of the debate, with stakeholders expressing doubt over the credibility of the research.

For this study, researchers used a mathematical framework to explore how scientific studies might be able to promote a consensus, and the probability that this will occur. To illustrate how it works, they applied it to a hypothetical case study of exposure to electromagnetic fields from high-voltage power lines. No consensus has been reached on whether power lines pose a health risk. The researchers also chose two hypothetical opposing parties: an industrial stakeholder against stricter regulations for building new power lines, and an environmental stakeholder who supported such regulations.

The researchers assumed that the industrial stakeholder would strongly believe that no health effects existed (95% chance of no health effects, odds of 5:95, or 0.053) and that the environmental stakeholder would be much less sure: 50% chance, odds of 50:50, or 1. Both stakeholders are assumed to accept the same cost estimate for the stricter regulations, \$282 million (€209 million). However, they differ in their assessments of the effectiveness and potential health benefits of the stricter regulation, if a health effect is proven. The industrial stakeholder values the regulatory benefits at \$458 million (€339 million), while the environmental stakeholder anticipates benefits that are 60% higher: \$735 million (€544 million).

In this study, these perceptions were assigned by the researchers purely to show how the framework works. In real-world situations actual data could be gathered from surveys or interviews.

Overall support for regulation was calculated by dividing the perceived benefits by the costs and then multiplying that by the perceived odds of health impacts. This created a 'prior preference index' score. The stakeholder favours increased regulation if the index is above 1. In this case, the industrial stakeholder had a preference of 0.09 and the environmental stakeholder of 2.61.

The framework then considers whether the stakeholders feel that a new study will resolve the issue's uncertainty. This can be done by asking them what they feel the likelihood is of a study providing either a 'false positive' i.e. finding a link with health impacts where none exist, or a 'false negative' i.e. finding no link when there is one. The researchers assumed that the industrial stakeholder would believe that false positives were quite likely (40%) and false negatives less so (10%). Conversely, the environmental stakeholder would feel that false positives were unlikely (5%), but false negatives were fairly likely (30%).

Once the stakeholders receive information about the results of the study they then re-adjust their preference index based on perceived likelihood of false positives and false negatives. Depending on these values, there may come a point when the stakeholder will change their standpoint, and this can be shown mathematically. In this example, had the proposed study found no link to health impacts, the environmental stakeholder would have changed their standpoint. The industrial stakeholder, however, would not have changed their opinion even if the study had shown a link. The industrial stakeholder would only change their opposition to stricter regulation if there was significant improvement in their perceived quality of the study.



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