European Commission

Science for Environment Policy

Choosing between established and innovative policy measures: controlling invasive species

Assessing the potential of new environmental management tools often brings an 'innovation dilemma': is it better to stick with what is known to work, or to implement new measures that are potentially more effective, but also more uncertain? Researchers have proposed an approach to deal with these dilemmas, and applied it to the case study of an invasive species programme in the US.

25 April 2013
Issue 325
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Source: Ben-Haim, Y., Osteen, C.D. & Moffitt, L.J. (2013) Policy dilemma of innovation: and info-gap approach. *Ecological Economics.* 85:130-138. Doi: 10.1016/j.ecolecon.2012.08.011.

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Policy decisions often have to choose between a new option that could bring high potential improvements, but more uncertain results, and another option that is less promising, but has better known results. Pest control and eradication programmes present such innovation dilemmas. For example, these programmes may be very promising in their ability to reduce or control pests, but they may not be as effective at achieving these goals as expected, or the pests may not be as damaging as initially thought.

The study proposes using 'info-gap theory' to inform policy decisions where these dilemmas exist. An info-gap is a disparity between what is known, and what needs to be known, and an info-gap model of uncertainty identifies and quantifies this disparity. The info-gap robustness is the highest acceptable amount of uncertainty. What is deemed to be 'acceptable' is defined by the decision maker, and the robustness answers the question of how wrong can we be in our data, models and understanding for an action to still lead to an acceptable outcome.

The study demonstrated the info-gap management of an innovation dilemma brought by an eradication programme for an invasive alien species, the light brown apple moth, in California. The economic impact of a new invasive species is highly uncertain and expert opinions may differ.

While some experts believe the moth species is harmless and needs no intervention, others argue that it is damaging, but can be eradicated or contained by actions that cost less than the potential loss caused by the moth. Furthermore, there are those who agree the species is harmful, but believe that intervention can have no useful impact.

All these claims are uncertain, but the most uncertain is the eradication view, as it could cause unpredicted damage. The non-intervention views are relatively predictable. The annual economic loss from the spread of the moth is estimated, with relative certainty, to be $1.1 (€0.85) billion. An eradication program costing $0.09 (€ 0.06) billion will limit the annual loss to no more than $0.55 (€0.42) billion, which is a relatively uncertain figure. The study modelled the robustness of a decision for various amounts of 'acceptable' financial losses.

The results indicated that the robustness of a decision depends on what is deemed to be an acceptable level of loss. Where the policymaker requires the loss to not exceed $1.4 (€1.08) billion annually, then the preference is for eradication. If the policymaker is willing to accept a loss in excess of $1.4 (€1.08) billionannually, then non-intervention is preferred.

The researchers highlight that, although based on real data, the study offers an illustration of the info-gap method rather than a precise policy recommendation. Info-gap analysis of this dilemma does not avoid the need to make policy judgments as a decision still has to made as to what is considered to be an acceptable loss. However, it helps prioritise policies (investments, in this example) to reliably achieve acceptable outcomes. Acceptable outcomes may change and, as such, the study provides a flexible framework to evaluate options based on a desired policy outcome.