When ranking environmental projects

Mixing a little theory, logic and common sense leads to better outcomes

By David Pannell (University of Western Australia)

Around the world, thousands of different systems have been used to rank environmental projects for funding. Unfortunately, judging from the many examples I have examined, most of the systems in use are very poor. Indeed, the performance of many of them is not much better than choosing projects at random. If only people would be more logical and thorough in their approach to ranking environmental projects! The potential to reduce wastage and improve environmental outcomes is enormous. Attempting to get managers, researchers, policy people and decision makers to appreciate this has been a major driving force behind much of my work in environmental economics. It led to the creation of the INFER framework (Pannell et al, 2013) and it also has sparked many editorials on my blog, pannelldiscussions. Towards the beginning of this year I began a series of short and simple blogs on this theme of ranking environmental projects. My intention was go through the basic process, step by step, outlining the logic and warning about the common mistakes. The original aim was a half dozen articles, but the series took on a life of its own. There seemed to be a lot to say about each element. Some grew so much that they needed to be split into more than one episode. I also kept having ideas about additional topics to cover. Six instalments grew to become 20, and this series has now dominated by blog in 2013. If you have any involvement or interest in ranking environmental projects, I’d encourage you to read them. Below is a quick rundown of the main topic areas included.

Each topic is relatively straightforward. However, when put together there is a bit of detail to take in. One reaction I sometimes get is that it all looks too complicated and surely isn’t worth the bother. My response is to ask, if you could double your budget for projects by putting a bit more effort into your project ranking process, would you do so? Of course you would. Doubling the environmental benefits generated from your environmental investments is rather like doubling your budget. If your current ranking system is of the usual questionable quality (does it correctly answer the nine questions asked here?), doubling the benefits (or more) is readily achievable using the approaches advocated here.

Nine steps to a robust ranking

There are many ways that you can go wrong when putting together a formula to rank projects, and unfortunately the quality of the results is quite sensitive to some of the common errors. Common important mistakes include: weighting and adding variables that should be multiplied; messing up the comparison of outcomes with versus without the project; omitting key benefits variables; ignoring costs; and measuring activity instead of environmental outcomes. It’s relatively easy to avoid these problems. Apply bit of theory, some simple logic and a dose of common sense and it’s not hard to do a pretty good job of project ranking. Indeed, it’s simply a matter of being able to answer the following set of essential questions. The answers I have provided here are the basis of the blog series.

1. What is the core criterion?
The core criterion for ranking projects is value for money: a measure of project benefits divided by project-related costs. This is the criterion into which all the variables feed. It’s how you pull everything together to maximise environmental outcomes.

2. What is it that you’re ranking?
You should rank specific projects, rather than environmental assets.

“Doubling the environmental benefits generated from your environmental investments is rather like doubling your budget.”

You cannot specify numbers for some of the key variables in the ranking formula without having in mind the particular interventions that will be used. There are always many different ways of managing an environmental asset, and they can vary greatly in value for money. Therefore, it can be worth evaluating more than one project per asset, especially for large, important environmental assets.

3. What is the benefit?
Benefits of a project should be estimated as a difference: with versus without the project, not before versus after the project. Weak thinking about the ‘without’ scenario for environmental projects is a common failing, sometimes leading to exaggerated estimates of the benefits.

4. What factors should be taken into account in working out the benefits?
There are two parts to a project’s potential benefits: a change in the physical condition of the environment, and a resulting change in the values generated by the environment (in other words, the value of the change in environmental services). Those potential benefits usually need to be scaled down to reflect: (a) less than 100% cooperation or compliance by private citizens or other organisations; (b) a variety of project risks; and (c) the time lag between implementing the project and benefits being generated, combined with the cumulative cost of interest on up-front costs (ie, ‘discounting’ to bring future benefits back to the present).

5. How should these benefit values be combined?
If in doubt, multiply. That’s a way of saying that benefits tend to be proportional to the variables we’ve talked about (or to one minus risk), and the way to reflect this in the formula is to multiply by the variables, rather than weighting and adding them. Don’t take this too literally, however. You can mess up by multiplying inappropriately too. Weighting and adding is relevant only to the values part of the benefits equation (when there are multiple benefits from a project), not to any other part.

6. Should private costs and benefits be included?
Don’t include private benefits as a benefit or voluntary private costs as a cost, but do include involuntary private costs as a cost.

7. What other costs should be included?
Other costs to include are project cash costs, project in-kind costs, and maintenance costs (after the project is finished). Costs get added up, rather than multiplied.

8. How do you deal with uncertainty?
Uncertainty about project benefits is usually high and should not be ignored. The degree of uncertainty about each project should be considered, at least qualitatively, when projects are being...
ranked. Also, decisions about projects should not be set in stone, but modified over time as experience and better information is accumulated. Strategies to reduce uncertainty over time should be built into projects (eg, feasibility assessments, active adaptive management).

9. Should every project go through a rigorous analysis?

Where the cost of all projects that are in contention greatly exceeds the total budget, it is wise and cost-effective to run a simple initial filter over projects to select a smaller number for more detailed assessment. It’s OK to eliminate some projects from contention based on a simple analysis provided that projects are not accepted for funding without being subjected to a more detailed analysis.

There are a number of simplifications in the above advice. Simplifications are essential to make the system workable, but care is needed when selecting which simplifications to use.

More info: David Pannell david.pannell@uwa.edu.au

Reference

To download a compendium of David Pannell’s 20 blog posts on ranking environment projects, please visit http://purl.umn.edu/156482

Nine questions - one formula

The content and structure of the ranking formula matters (it matters a lot). Here’s a logical and practical formula that incorporates the answers to all nine questions discussed in this story. Where:

- BCR is the Benefit: Cost Ratio,
- \( V(P') \) is the value of the environmental asset at benchmark condition \( P' \),
- \( W \) is the difference in values between \( P1 \) (physical condition with the project) and \( P0 \) (physical condition without the project) as a proportion of \( V(P') \),
- \( A \) is the level of adoption/compliance as a proportion of the level needed to achieve the project’s goal,
- \( R_L, R_S, R_f \) and \( R_m \) are the probabilities of the project failing due to technical risk, socio-political risks, financial risks and management risks, respectively,
- \( L \) is the lag time in years until most benefits of the project are generated,
- \( r \) is the annual discount rate,
- \( C \) is the total project cash costs,
- \( K \) is the total project in-kind costs,
- \( E \) is total discounted compliance costs, and
- \( M \) is total discounted maintenance costs.
- \( V \) can be measured in dollars, or in some other unit that makes sense for the types of projects being ranked. The advantage of using dollars is that it allows you to (a) compare value for money for projects that address completely different types of environmental issues (eg, river water quality versus threatened species) and (b) assess whether a project’s overall expected benefits exceed its total costs.

For some projects, it works better to calculate potential benefits in a different way: \( (V(P') - V(P0)) \) rather than \( V(P') \times W \). They are equivalent but involve different thought processes.

A simplification that might appeal is to combine all four risks into equivalent but involve different thought processes.

This formula works were there is a single type of benefit from a project, or where the \( V \) scores for multiple benefits have already been converted into a common currency, such as dollars, and added up. If a project has multiple benefits and you want to account for them individually, replace \( V(P') \) by the weighted sum of the values for each benefit type. For example, if there are three types of benefits, use \( z_1 \times V_1(P') + z_2 \times V_2(P') + z_3 \times V_3(P') \), where the \( z's \) are the weights. I’m assuming here that the other benefit variables (\( W, A, R \) and \( L \)) are the same for each benefit type. If that’s not approximately true, you need to adjust the formula further.

INFFER team members assess proposed environmental projects with stakeholders in North Central Victoria. There’s never enough money to fund everything so decision makers need to rank, prioritise, the projects before them. Ranking projects is a relatively straightforward and logical process. Unfortunately, not many organisations or governments do it well. (Photo by Geoff Park)