

# The dilemma of conflicting environmental outcomes

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Environmental issues arise from interactions between human and natural systems, both of which are characterized by considerable complexity and uncertainty. Attempts to achieve desirable outcomes through policy or management interventions in these systems are rarely simple tasks with clear cause-and-effect linkages or single impacts. Usually an intervention will produce more than one result, creating the need for assessment and prediction of outcomes, and for balancing or trading off these outcomes.

One category of conflicting outcomes is between environmental, social and economic outcomes and values, and integration of these is central to pursuing ecologically sustainable development (ESD) However, often there will be multiple *environmental* outcomes. This is to be expected, as "the environment" and environmental policy cover a wide range of interrelated natural processes and associated human values. Issues and values such as biodiversity, water quality and quantity, soil erosion, salinity, forest productivity and climate change are closely interdependent. Policy and management interventions aimed at one will invariably have implications for others.

## Examples

Four examples illustrate how conflicting environmental outcomes may arise from a management or policy intervention:

1. A chief strategy to control dryland salinity is revegetation of upper catchment areas using deep-rooted plants, to arrest the rise of saline groundwater and thus salinity. However,

- this may also impact on surface water flows in the upper reaches of streams. This may have economic impacts via the reduction in water availability for agriculture immediately downstream, but also an ecological impact on local streams and their biota.
2. Reducing carbon emissions from energy use may be sought through a shift from carbon-intensive fossil fuels. One alternative to coal-fired electricity is wind power, which although emitting little carbon involves development and scenic impacts on local environments. Another alternative is nuclear power, which again will lower carbon emissions but requires uranium mines in sensitive areas and creates problems of radioactive waste disposal.
  3. Different product packagings have different environmental impacts. Liquid food packaging choices include re-usable (refillable) glass, recyclable glass, plastic or paperboard, and various non-recyclable options. Glass is an energy intensive product which may be recycled, as is plastic and plastic coated paperboard. All use different resources, involving different extraction impacts, pollutants from manufacture, and transport and storage energy costs. If materials are not recycled, they have different impacts through land fill or incineration disposal processes. Glass is refillable, and although this minimizes material and energy use with sufficient cycles of re-use, significant amounts of water are used for washing and refilling. Therefore, environmentally optimal packaging depends on which particular extraction impacts, resources and pollutants are considered the most important, and on the detail and quality of the manufacturing, transport, use and disposal or recycling systems.
  4. The control of a vertebrate pest species may be considered necessary due to its environmental impact, such as soil and vegetation damage. However, native predators may have become reliant on the abundance of the pest species and rapid decimation through biological control, harvesting or poisoning will pose a threat, at least in the near term, to those predator populations. Similarly, a poisoning program may involve threats to other, native species.

Which outcome is the most important in such cases? It is clear from these examples that there is rarely a “right” answer, as such an answer would require close alignment of knowledge and priorities on the basis of perfect information. In practice, trade-offs and priorities must be established in the face of imperfect knowledge. A range of approaches and methods has been developed to assist communities and policy makers approach this task.

In considering such approaches, we can consider a continuum between more and less predictable conflicting outcomes. The examples above are easily predicted (although specifying outcomes with accuracy may be difficult). Given significant uncertainty in predicting the behavior of natural systems, and of the reaction of groups and individuals to policy interventions, unpredictable outcomes conflicting with desired or expected outcomes are likely. For example, soil erosion and productivity were successfully addressed in the middle decades of the twentieth century through the “sub and super” regime of improved pastures. It was not predicted then that this would contribute to later problems of soil acidification, now being addressed through other management techniques. It would be arrogant to believe that current management practices will not have their own unpredictable results.

**Unpredictable conflicting outcomes** can be addressed in two general ways. First, research, investigation and forethought in designing policy and management responses can seek to diminish the prospect of unexpected and possibly negative outcomes. Second, monitoring and evaluation of policy and management, and ongoing monitoring of environmental conditions, will enhance abilities to observe and react to changes in the environment.

With **more predictable conflicting outcomes** a range of options exist. The following groups these into general categories and gives examples of ways to either identify or deal with multiple outcomes:

- *Structures and processes within decision making systems* can serve to increase understanding of multiple outcomes. This may be done by encouraging prior assessment of likely impacts, through required steps in decision making in statutes, regulations and operating procedures. Alternatively it may be done by ensuring connections between different agencies and interests so that a wide range of relevant perspectives and skills are involved in informing and designing policies and management approaches. This can involve such mechanisms as inter-departmental committees, inter-agency and inter-government processes, multi-stakeholder processes, integrated regional natural resource planning, or strategic environmental assessment.
- *Research and monitoring* can inform policy and management – the more we know about complex human-natural system interactions, the more likely it is that outcomes will be identified and we will be better able to deal with these.
- More specific *assessment and analytical techniques* can assist in either identifying or dealing with multiple outcomes:

- the identification of outcomes can be addressed through qualitative approaches, such as conceptual modeling of systems involving multiple stakeholders, or scenario projections. Alternatively, quantitative approaches may be used, such as formal modeling (eg a hydrological-ecological model of a catchment), risk assessment, or life cycle assessment of products.
- when multiple outcomes have been identified, exploration of implications, trade-offs and priorities may be carried out through methods such as multi-criteria assessments or deliberative approaches like a citizens jury.

The above indicates only a few options for addressing multiple and potentially conflicting environmental outcomes. All are valid under different circumstances, and the choice in a given situation will depend on the information available, interests and issues at stake, and especially the time available before decisions and actions are required.

## **Conclusion**

Conflicting outcomes from policy and management responses are inevitable to some degree, due to complexity and uncertainty in human and natural systems, and the need for decisions and actions in the near term. As well as utilizing specific strategies and methods such as those above, an adaptive management approach involving close monitoring of the environment and the impact of policy and management is a more general requirement.

However, no matter how thorough our research and analysis, or how adaptive our management regimes are, there will inevitably be value or political decisions to be made, as conflicting outcomes carry with them conflicting or at least different social values as to what is most important. Rarely can multiple values be integrated to a single metric or measure that tells us a single, right answer. This indicates that transparency and inclusion of interested and affected parties is another general requirement, no matter what process or method is used, so that values, trade-offs and priorities are understood by all involved.

## **Sources**

Policy processes and instruments are discussed further in Dovers S 2005, *Environment and sustainability policy: creation, implementation, evaluation*, Federation Press, Sydney.

Details on a wide range of methods and approaches can be found in the *Citizen Science Toolbox*: [www.coastal.crc.org.au/toolbox/index.asp](http://www.coastal.crc.org.au/toolbox/index.asp)