EPA Growing DASEES (Decision Analysis for a Sustainable Environment, Economy & Society) – to Aid in Making Decisions on Complex Environmental Issues

Research Value:

A family's decision to buy a car involves the needs of a number of people (mom, dad, children), and multiple concerns (cost, safety, maybe even climate change). In making decisions that involve ecosystems, both the number of people involved and the number of concerns/ factors increases greatly over personal decisions. Environmental issues often affect multiple groups of people (often referred to as *stakeholders*) in a community or society. Environmental issues also involve many physical, chemical, and biological factors. Local issues, such as a eutrophic lake, to global ones such as climate change, all involve many people interacting with complex ecosystems. All these factors raise these decisions to a higher level of difficulty than decisions in our daily lives, such as family making a decision about buying a car. Just as a calculator is useful for complex calculations, can tools be developed to handle all the factors in these complex decisions?

Having a framework and tools to help sort through complicated environmental issues in an objective way would be useful to communities and risk managers, and all the stakeholders affected by these issues. This is one need that **DASEES** (Decision Analysis for a Sustainable Environment, Economy, & Society) can help fill.

The environment provides us with many ecosystem *services*, which sustain us and provide us with quality of life. These include the air we breathe, the water we drink, plants and animals that sustain us and add to our quality of life, and provide the raw materials on which all of our economy is based. The vast majority of environmental decisions are made without consideration of the roles that ecosystem services play and how long they can be sustained into the future. DASEES can also help those tasked with making decisions about complex environmental problems to incorporate ecosystem services into their decision making processes. These tools in DASEES more fully account for tradeoffs, both positive and negative, in these services and how they affect economic and social decisions.

The DASEES project can be looked at as "formalized common sense for big issues". It creates a formal framework so the same common sense decision-making principles that we use in our daily lives, can be applied to more complex environmental issues.


Research Details:

DASEES is an open-source, web-based decision analysis framework, being developed by an integrated trans- disciplinary research team of EPA, university, and private company researchers. It focuses on sustainable systems and communities. It is flexible but rigorous, transparent and auditable, and adapts to new information.

The last part of the DASEES acronym, 'EES' acknowledges that this approach takes into account the *environmental*, *economic*, and *societal* aspects of what have traditionally been defined as just environmental issues. This formalized common

sense is referred to in technical circles as "multi-attribute decision analysis". These attributes include the many stakeholders that are affected by decisions on environmental issues. Other attributes include the many physical, chemical, and biological aspects of ecosystems. A major strength of this approach is that it is inclusive and incorporates input from many stakeholders. This framework consists of 5 steps:
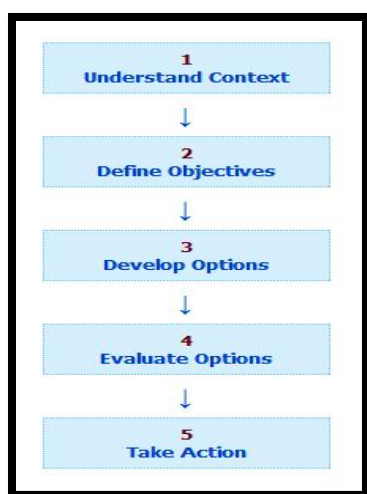
Let's take a look at just the first step in this process. First, we must define and understand the 'context' or the boundaries of the issue. This will include both the physical boundaries, as well as defining the groups and individuals involved. Let's say that the issue is algal blooms that are robbing a lake ecosystem of oxygen. Do you draw your physical boundary at the lake's edge, at the outskirts of the community next to the lake, at the boundary of the watershed that the lake is in? You would also need to define boundaries in terms of which groups and persons to include, and to

characterize relationships among decision makers, management options (responses), stakeholders, and scientific information

DASEES uses tools like Social Network Analysis and a DPSIR analysis to define the physical and social context or boundaries of the issue. DPSIR is named after its components: Drivers, Pressures, States, Impacts, and Responses. It is a key tool that can be used to help decision-makers understand the systems context of issues. Using consistent tools and processes, DASEES can take an objective look at complex environmental issues. This process can then generate several options for potential solutions, involving such things as policies, land-use strategies, and behaviors. It can evaluate the options in terms of costs and benefits.
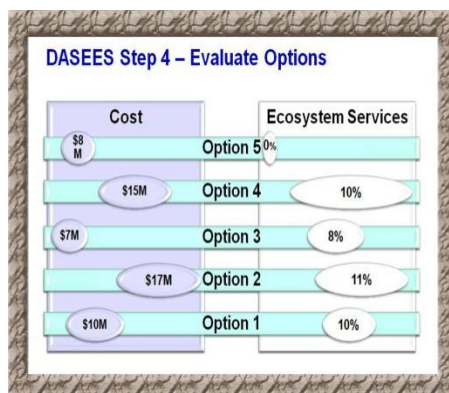
Finally it can make projections of alternative futures for the various options.

Outcomes and Impacts:

The DASEES framework is currently being used as part of cooperative efforts to address

real-world ecological problems

such as nutrient loads in the Albemarle-Pamlico Watershed and Florida Keys and sediment runoff into Guánica Bay, Puerto Rico.

REFERENCES

U.S. Environmental Protection Agency. (2009). "Decision Support Framework (DSF) Team Research Implementation Plan." EPA/600/R-09/104. Office of Research and Development.

U.S. Environmental Protection Agency. (2009). "Ecosystem Services Decision Support: A Living Database of Existing Tools, Approaches and Techniques for Supporting Decisions Related to Ecosystem Services." EPA/600/R-09/102. Office of Research and Development.