Assessing and Improving Sustainability Outcomes

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I. INTRODUCTION

Sustainability outcome[1] metrics typically describe the impacts companies have on the environment in terms of air quality, water quality, or waste management. There is an enormous suite of tools and approaches for calculating and reporting these metrics, including the Global Reporting Initiative and the recently released Carbon Disclosure Standards Board framework for reporting environmental information and natural capital impacts.

One challenge with the existing suite of tools is that sustainability outcome metrics are often descriptive and may not be actionable because they do not provide information to drive corporate decision making. The practical value of such metrics, especially at the project level, is unclear to companies.

This paper describes a framework that helps companies determine which sustainability outcome metrics can improve their internal decision-making, and how the value of sustainability metrics can be quantified. In particular, we focus on the important role that project context has in making good sustainability decisions. These project level decisions may sometimes be at odds with the high level priorities that drive corporate sustainability reporting.

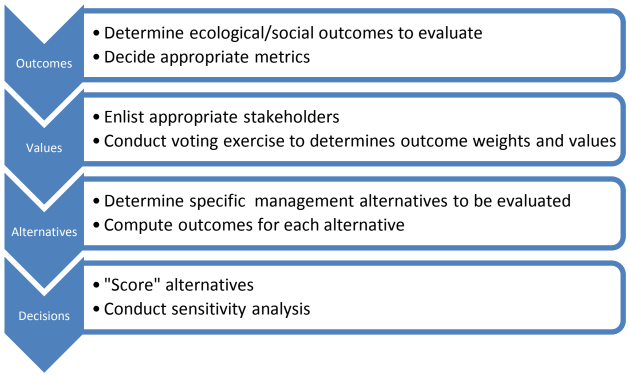
The framework should be of interest to companies, consultants and academics because it demonstrates a practical approach for evaluating sustainability metrics and determining which ones are most valuable.

II. DECISION FRAMEWORK

The framework for this paper integrates two decision support tools. First, the Ecosystem Services Identification and Inventory (ESII) tool, which is being developed collaboratively by The Dow Chemical Company, The Nature Conservancy, and EcoMetrix Solutions Group. ESII enables corporations to understand the delivery of ecosystem services in quantifiable units, and therefore helps them to understand the relative benefits produced by different management alternatives at a site.

The Natural Capital Decision Analytics (NCDA) tool, built by ERM, provides a robust framework for corporations to systematically evaluate project or program decision alternatives based on the environmental and social metrics that are most important to decision-makers.

The broad steps for using the combined framework are:



III. DECISION CONTEXT - ILLUSTRATIVE PROJECT LOCATION DECISION

We illustrate the framework using a simplified, illustrative project.

Background

IMC is a global manufacturer of specialty equipment for manufacturing supply companies. Because of increased demand for its specialty products, IMC is planning to build a new manufacturing plant in Eurasia. It has already received preliminary government approval to build the facility; the major remaining issue is whether to build the facility near a wetland (Site W) or a forested area (Site F). The facility will be located in an area that is currently undeveloped, about 100 kilometers from a mid-sized city. The general area is rich in the types of mineral resources that are needed by the facility and the project will represent a significant commitment of capital. Both locations will have impacts on the local environment and on local communities that depend on the ecosystems. There has been controversy and conflict about development in the area and associated impacts on the local population.

IMC needs to determine where to build the facility and secure final government approval. IMC recognizes that securing approval will require a well-documented analysis of the environmental and social impacts of the choice of location. It also wants to assure that the choice is consistent with its sustainability goals, and the need to operate a financially sustainable facility.

IMC wants to understand the impact of the alternative project locations on specific environmental and social

[1] In this paper, sustainability outcomes refer to the benefits that people receive from nature (and how a company's actions affect these benefits).

outcomes and the relative importance of each outcome in reaching a decision.

Figure 1

Project Details

The project site and its vicinity are comprised of grassland and other uplands, and a large wetland area bounded by forest along the south side and by steep hills to the north and west. The wetland drains off the site to the east, becoming a creek that flows into canyons as it makes its way downstream. The region in which the project site is located is mostly grass and shrubland with few large forests. There are numerous farming communities in the general vicinity of the project site. These villages rely on the project site and its surroundings for a variety of resources, including:

- Grazing – Shepherds from nearby villages use the site for grazing sheep and cattle. The shepherds from the three surrounding villages all have a traditional route and timing for moving their livestock through the site (see Figure 1).
- Wood Gathering – The forest area is a source of firewood for local communities. Although cutting trees is restricted, villagers gather the available downed wood from the forest as a supplemental fuel source. Four villages are largely dependent on the forested area for their fuel.
- Fishing – The wetland area is fed by springs above the site. As this water leaves the site, it joins additional springs to create a moderate sized creek. All the villages use the creek to supplement their food sources, and one village is particularly dependent on the fish.
- Water supply – The creek and nearby springs are the water source for several of the villages. Site W would have a limited impact on the supply of water within the basin due to surface water withdrawals. However, the changes to the system will potentially have much greater water use impacts since the project would adversely affect the timing of the runoff by impacting an area that currently provides considerable subsurface storage and replacing it with an impervious surface that will result in immediate runoff.
- Cultural – The spring that flows into the wetland from above the site are consecrated waters. The spring bubbles up into a small Greek Orthodox chapel where it is collected before flowing out and into the wetland (see Figure 2). The chapel is shared by all of the local villages
- Food - The forested area provides forage opportunity for nuts, berries, and mushrooms. The forage areas for the villages closely match the fuel gathering locations for the respective villages. The foraging activities provide approximately 10 percent of the daily food needs for the villages.
- GHG Emissions – Site F would require more electricity because of the need to pump groundwater. Site W is closer to a river and the facility could use surface water.
- Protected species - Site W has no species of concern associated with it, being comprised primarily of native grasses. The forest is protected in part because of the presence of Krueper's Nuthatch (Sitta krueperi), a species listed as a near threatened on the IUCN 3.1 list.

Figure 2

IV. Framework Implementation

A. Outcomes and metrics

Identifying and evaluating sustainability outcomes is an iterative and context-specific process that involves both corporate stakeholders and technical experts. Relevant factors include data availability; company policy and values; and the extent to which alternatives will produce different outcomes.

By far, the most challenging part is making sure that we use outcomes and metrics that can ultimately be used to reflect the value of ecosystems to people. For example, a direct ecological metric for assessing the impact to fishing would be the effect on local fish population or habitat, but the number of people affected by the change in fish population is what we need to value. Developing the appropriate ecological understanding is a two-step process:

1. Recognizing the **ecological consequences** of the project;

2. Understanding the relationship between change in ecological systems and the **benefits provided to people**.

Step 1 involves consideration of what features on the landscape are being changed (e.g., type of vegetation, soil composition, water features, or topography) and correlating those changes with the ecological processes performed on the site. Based on the level of decision-making required, these correlations can range from general estimates based on a common understanding of ecology, to specific quantified estimates based on ecological models.

For instance, this project might remove trees from a site which will change basic ecological processes such as shading, interception, and transpiration, among others; disturbing soils will change basic processes such as infiltration and alter soil stability.

Step 2 provides insight into how ecological changes impact the benefits that people receive from nature.

Continuing the example above, the loss of shading, interception, and transpiration due to removing trees could have considerable impact on temperature regulation (shade and transpiration), or storm flow management (interception). Disturbing soils could have a detrimental effect on residents through increasing erosion (soil stability), impacting seasonal access to water (loss of water quantity control due to loss of infiltration), or impacts to water quality (due to erosion and loss of infiltration).

The ESII tool provides a user-friendly way of applying this two-step process. It uses a relatively simple data sheet that allows the data collector to choose between pictures of different site and landscape conditions for a variety of landscape variables. The ESII tool will then quantify the correlations described above to provide the resulting changes in outcomes, such as water supply.

Through the two-step process, an analyst can gain a better understanding of what outcomes will be lost, why they will be lost, and how that loss can be mitigated.

B. Values

This part of the framework determines how corporate stakeholders ‘value’ each of the sustainability outcomes. This does not rely upon monetary values to measure the outcomes. Instead, we convert a range of heterogeneous information and metrics into a format which helps decision-makers. Basically, the framework creates “exchange” rates among the outcomes so that they can be aggregated and compared.

The NCDA tool estimates the value (or weight) of the outcomes through a voting exercise. The voting takes place during a meeting/workshop/webinar among appropriate corporate stakeholders. The exercise is a combination of focused conversation and statistical modelling that allows participants to quickly arrive at a consensus about which outcomes are important and the relative weights to use in comparing alternatives.

C. Alternatives Analysis

ESII also allows for the comparison of alternative project locations. Initial data can be used to generate a set of baseline outputs, and these can be compared to outputs based on alternative facility sites (in our example, Site W or Site F). Each location is modeled to predict change in landscape features based on the changes to site-level data associated with the proposed facility (step 1 above). The corresponding changes to human benefits (step 2) can then be considered.

D. Decisions

The alternatives identified from the previous steps are then ‘scored’, based on their total impacts across all of the outcomes. ESII/NCDA is not prescriptive and does not tell decision-makers which alternative to choose. Instead, it provides a focused approach for evaluating and determining the appropriate path forward.

V. RESULTS

ERM and ESG conducted an interactive workshop to evaluate the sustainability outcomes and metrics of the illustrative project. The workshop was attended by technical experts in topics including ecology, economics, water resources, and cultural heritage. The participants evaluated a variety of outcomes and metrics, and participated in the voting exercise. The voting results indicated that the participants collectively value Site W more than Site F (Figure 3). In this case because it has fewer negative impacts. The impact on forest products was the largest negative impact. However, the sensitivity analysis showed that when the weight for forest products had a significant impact which alternative has the least impact on natural capital (Figure 4). Therefore, additional discussions, possibly with external stakeholders about mitigation activities may be warranted

Figure 3 – Natural Capital Scores for Sites F and W

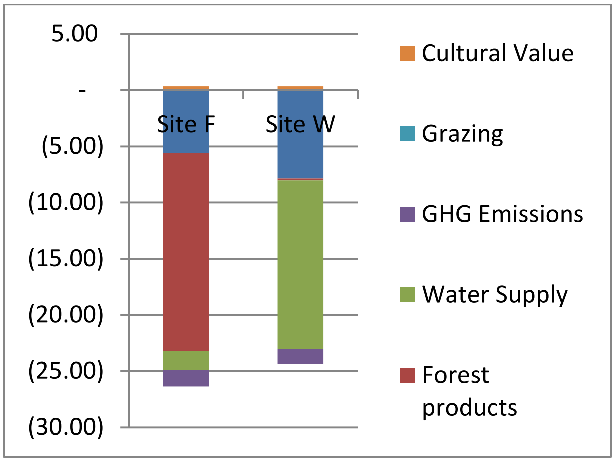
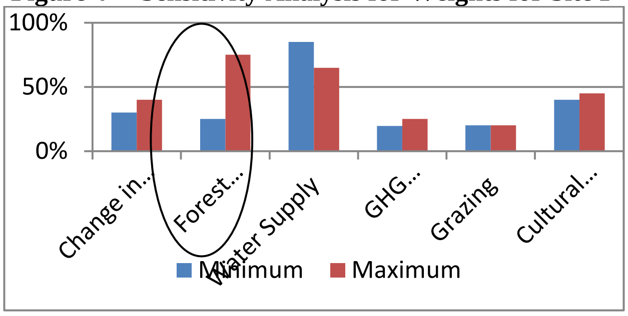


Figure 4 – Sensitivity Analysis for Weights for Site F



The graph shows the probability Site F has the highest score when each weight is at its minimium or maximum value.

VI. Discussion

The results for the illustrative project are consistent with our experience with actual projects. Our general findings are:

1) When selecting metrics to measure impacts on the environment and local communities, decision makers rarely select monetary measures. While they obviously focus on the financial impacts to the company, most decision makers struggle with using monetary values of other outcomes, such as forest products, grazing, or cultural values. This is because of the challenge of reliably estimating monetary values (especially at the local level and for outcomes such as cultural values) and the difficulty of putting monetary values in context. Knowing that the value of forest products lost in $X may be less important than knowing that 200 people will lose their primary source of income.

2) The ecosystem and social metrics used by decision makers at the project level are often vastly different from common high level sustainability metrics. While decision makers are often very concerned about these broad metrics, they choose to focus on outcomes that can be related directly to the issue at hand and use metrics they understand.

However, these two observations provide some significant challenges for measuring sustainability and, by extension, natural capital. First, "home-grown", project-specific values can be beneficial and appropriate because they reflect local context and information. However, they can also lead to biases based on local decision maker assumptions, preferences, and experience. Moreover, the extent to which these biases exist and whether home-grown values reflect corporate values is difficult to assess. Decision support tools, such as NCDA/ESII can be valuable because they incorporate best practices from both ecological and the decision analysis fields. Quantitative tools can help reduce the biases and make them easier to see and address by making them explicit.

Second, while high level dashboard metrics may be useful and necessary for corporations desiring to report out to the public, real sustainability planning is the cumulative consequence of many project level decisions. Accordingly, if companies want to make better, more informed and consistent decisions, it is important that the high level dashboard metrics incorporate the attributes and benefits that affect project level decisions. However, even the best traditional methods for rolling up disparate outcome metrics, monetary values, are not sufficiently reliable for measuring environmental and social outcomes.

VII. Conclusion

The decision support framework described in this paper can help companies systematically explore which sustainability outcomes are of most value to them, and diverge from the traditional suite of sustainability metrics. Together ESII and NCDA can provide: a more rigorous basis for understanding who benefits from environmental changes and why; guidance on how to construct new alternatives that might provide increased total benefits; and insights into the areas where reducing uncertainty will be most valuable.