Paper submitted for IAIA Conference, Viña del Mar, Chile, 2014

EROVA ecosystem services impact assessment tool

James Spurgeon, Director, Sustain Value, james.spurgeon@sustainvalue.co.uk
Gabriel Fuenzalida, Head of Environment, Antofagasta Minerals, gfuenzalida@aminerals.cl

Introduction

This paper outlines a decision-support tool that can help evaluate environmental and ecosystem service impacts and dependencies as part of the environmental and social impact assessment (ESIA) process. Known as the EROVA tool (standing for Environmental, Risk, Opportunity and Valuation Assessment), it is a simple, flexible framework-based tool for businesses to account for natural capital. The tool was developed by Sustain Value, a UK consultancy firm, in conjunction with Antofagasta Minerals, a Chilean mining company. The paper begins by explaining how the tool evolved and how it works. This is followed by a brief description of some applications in Chile, in particular focusing on a wetland restoration scheme linked to a mine operation. It then discusses how the tool can potentially be used to support the ESIA process before drawing a few conclusions.

Origins of the tool

In recent years a number of businesses have committed to some form of 'no net loss' or 'net positive impact' policy. In 2008, Rio Tinto announced they would have a net positive gain in relation to biodiversity at new mines, whilst in 2012 the Kingfisher Group in the UK stated that they aim to become Net Positive by 2050. As part of their vision, Antofagasta Minerals sets out to 'create environmental value' at their mining operation sites. In support of this, the company's 2012 Biodiversity and Ecosystem Services Guideline states that their aim is to have a 'net positive impact' on biodiversity in carrying out their mining activities.

An obvious challenge is how to measure and prove such objectives. In 2012, Antofagasta engaged Sustain Value to develop a suitable tool to help them demonstrate just that. Between 2012 and 2013 three project phases were undertaken. Phase 1 involved scoping out what features and issues the proposed decision-support tool should address and which three pilot studies could best help 'road-test' the tool. In Phase 2, the tool was developed and tested on two of Antofagasta's operational mining sites as well as on their Conchali Lagoon restoration and management scheme. Phase 3 involved conducting 'willingness to pay' questionnaire surveys to ascertain more accurate estimates of visitor and general public values generated by the Conchali Lagoon scheme.

How the tool works

EROVA is a spreadsheet based analytical framework tool that combines two well-established forms of business related ecosystem assessment. It starts out with an ecosystem services risk and opportunity approach, as set out in WRI's (2008) Corporate Ecosystem Services Review. It then integrates the outputs of this with an ecosystem services valuation approach, as detailed in WBCSD's (2012) Guide to Corporate Ecosystem Valuation. In effect, this allows for an initial screening and prioritization approach to identify relevant parameters, followed by a 'values' based assessment of impacts. The EROVA tool has also been designed to align with requirements of IFC's Performance Standard 6.

The assessment covers not only ecosystem services but also all potentially significant 'wider environmental impacts' (e.g. air emissions, noise and waste). The ecosystem services are split into what is termed as 'living' natural capital (e.g. habitats and species) and 'non-living' natural capital (e.g. minerals and fossils). This breakdown allows an assessment of which categories, if any, generate net positive impacts.

The tool starts by defining the scope, which includes identification of 'with' and 'without' (business as usual) scheme scenarios. It then involves developing a baseline summary of the

relevance, importance and status of living natural capital, split into key habitats and species. This aligns closely with IFC PS6 requirements. It is then followed by an Environmental and Ecosystem Services Review (EESR) assessment of which ecosystem services and wider environmental issues are relevant and to what extent (i.e. identifying priority ecosystem services). These are assessed in terms of scheme impacts and dependencies. For key topics of relevance (e.g. biodiversity, agriculture, water), associated underlying trends are also analyzed. This includes consideration of direct and indirect drivers, such as climate change, demographics and development, as well as Antofagasta's and stakeholder activities.

This all leads to an evaluation of potential associated risks, opportunities and management options. The latter are likely to include various mitigation measures and biodiversity offset options. These are analyzed based on the relative probability and significance of impact, together with a set of implementation criteria such as likely relative benefits and costs.

The tool then comprises a qualitative relative valuation of potential impacts (positive and negative) resulting from the scheme. These values are initially scored using a scale of 25. The tool then allows for a distribution analysis that compares different impacts across a range of stakeholder groups.

If so desired, the tool then moves to a monetary valuation assessment of those impacts for which monetary valuation is feasible. This is mainly conducted through a value (benefit) transfer approach, whereby values calculated using detailed valuation methods for the same type of impacts occurring elsewhere in similar contexts are used. The results of the monetary valuation assessment are then used to adjust the relative qualitative valuations, so that the qualitative and monetary values are generally aligned and consistent. As is demonstrated in the case of Conchali Lagoon, there is scope to improve the accuracy of the assessment by including more accurate values based on primary valuation studies.

Applications to date

During the three Phases to date, the EROVA tool has been applied four times, with others planned. Two applications were for major mining operations and two were for mine related conservation/restoration schemes, all in Chile. Each assessment was based on reviewing documents and literature available, site staff interviews during site visits, and professional judgement (based on 20 years experience of impact assessment and valuation studies).

The tool was applied up to a qualitative valuation stage for the Minera Los Pelambres mine. This was the first pilot study, which demonstrated how it could be applied at a high level to a major multi-faceted operation that includes extraction, processing, long pipelines and port operations. The second mine operation application was Esperanza mine. This was a full assessment going all the way to monetary valuation, using value (benefit) transfers.

Another application of EROVA is that of the restoration and management of Conchali Lagoon. The lagoon is a 50 ha coastal wetland important for foraging, nesting and habitat of more than 100 species of birds, most of them migratory. The site was purchased in 1997 by Antofagasta in order to voluntarily protect it and thereby comply with an environmental permit to operate the Minera Los Pelambres copper mine. It is therefore effectively a form of biodiversity offset. See Figure 1 below for before and after photos.

Figure 1 – Images of Conchali Lagoon before and after restoration

At the time the site was purchased, it was covered in 5.5 tons of rubbish, which Antofagasta collected and disposed of. In 2000 it was designated a Nature Sanctuary, and then in 2004, 34 hectares of it were designated a Ramsar site (i.e. a wetland of international importance). In addition to building a number of recreational facilities for visitors, Antofagasta also installed a fence to reduce illegal hunting, trapping and fishing activities. Furthermore, Antofagasta established the Centro Andrónico Luksic Abaroa (CALA), an educational visitor centre at the site in 2006. This has received many thousands of visits by the general public, as well as many school visits.

The EROVA tool was initially applied in Phase 2, providing a useful analysis of the key impacts, dependencies, risks and opportunities associated with managing the Lagoon and the visitor centre. The study also included qualitative and monetary valuations of the key impacts based on a value (benefits) transfer approach. It was then decided to supplement the assessment with some willingness to pay questionnaire surveys in Phase 3, to elicit more accurate monetary values for some of the key impacts.

The results of the environmental and ecosystem services review (EESR) are shown in Table 1. This highlights several key dependences, in particular the lagoon relying on a supply of water from upstream, and upstream regulation of water flows. The visitor centre also depends on energy from water (i.e. hydropower within the region) and freshwater for day-to-day operations. In terms of impacts, there are clearly many more, most of which are positive. These mainly relate to the enhancement of regulating services (such as erosion control and water purification) and cultural services relating to recreation, biodiversity conservation value and provision of information in the centre on archaeology, wildlife and geology etc.

Table 1 – Summary output of the Environmental and Ecosystem Services Review

Environmental parameter	Depend-ence	Impact	
Provisioning Services			
Livestock		○	-
Capture fisheries		○	+
Wild foods		●	-
Energy from water	●		
Freshwater (water)	●		
Regulating Services			
Maintenance of air quality		○	+
Global climate regulation	○	●	+
Regional/local climate regulation		?	
Regulation of water timing and flows	●		
Erosion control		●	+
Water purification and waste treatment		●	+
Pollination		?	+
Natural hazard mitigation		●	+
Cultural Services			
Recreation and ecotourism		●	+
Biodiversity conservation (ethical, spiritual, non-use)		●	+
Education, research and inspiration		●	+
Supporting Services			
Habitat & species support (e.g. nursery, refuge & feeding)		●	+
Non-living Natural Capital			
Archaeology/historic		●	+
Modern cultural assets (e.g. arts & crafts)		●	+
Geology (rocks & minerals)		●	+
Landscape		●	+/-
Other Environmental Impacts			
Vehicle movements		●	-
Non-hazardous waste		○	-

Key

● High ○ Medium Low

\+ Positive impact - Negative impact ? Don't know

The trend assessment suggested that biodiversity/habitats, water quality and quantity, and landscapes in the area may decline; and potential natural hazards may increase (due to climate change). These trends may all have potential negative impacts on the Lagoon condition and values in the future. On the other hand, possible improvements in tourism, education and other cultural trends may help enhance Lagoon values.

The most significant risks identified relate to a potentially significant decline in water quality and quantity in the river flowing into the lagoon in coming years, exacerbated by climate change, drinking water abstraction in Los Vilos, and increased mining and agriculture in the region. Other risks include the potential of pollution from mining and agricultural activities, and the invasive species 'apple snail' damaging the lagoon ecosystem. On the other hand, potential opportunities relate to enhancing recreational benefits through additional features (e.g. a boardwalk) and better advertising. There is also great scope for increasing local art and craft benefits, requiring a carefully thought out strategy. The potential to claim 'biodiversity offset credits' in the future for past actions was also highlighted.

As mentioned earlier, most of the impacts are positive and relate to the enhanced living natural capital values generated by the restoration and management actions. This includes enhanced carbon sequestration, water quality regulation, erosion control, recreational value, and biodiversity conservation (ethical/non-use) values. The latter relates to the value gained by the general public from the site being protected even if they have not visited the site yet themselves. Using a value (benefit) transfer approach in Phase 2, the overall net benefits (excluding management costs) over a 25 year period (using a 3% discount rate) were estimated to be around US$11.5 million.

However, the results of three separate contingent valuation (willingness to pay) questionnaire surveys undertaken in Phase 3 demonstrated a considerably greater value.

The surveys targeted visitors to the site, the general public within Chile, and passers by driving past the site. To date, interview sample sizes of 148, 322 and 28 have been conducted respectively. The wording of each questionnaire was similar, but adapted to the particular target audience.

Based on the questionnaire results, it was assumed that visitors had a willingness to pay value of US$4.50 per visit, local residents a non-use willingness to pay of US$ 1.50/adult/year, residents of the Metropolitana Region (where Santiago is located) a value of US$ 2.00/adult/year, and for other residents in Chile, a value of US$ 1.00/adult/year. Passers by were assumed to gain a value of US$ 0.16 per trip past the site.

The general public values applied were all significantly reduced compare to the values actually elicited, just to be on the conservative side. Taking these adjusted values into account gives rise to an overall benefit (excluding management costs) over a 25-year period (with a 3% discount rate) of around US$295 million. Of this, around 85% is non-use value, 9% is value from regulating services value, 4% is from habitat support value, 1.3% is recreational value, and 0.5% is from passers by.

The questionnaire surveys also gleaned a great deal of useful information on the relative values gained to both visitors and the general public in relation to restoration of the Lagoon and provision of a visitor centre. It also demonstrated differences in value associated with improvements in, and information on ecology, landscapes, archaeology and minerals.

Potential for use in EIAs

Based on the above applications, it is considered that the EROVA tool is well suited to supporting ESIA studies in many ways. Potential applications include the following:

1) Assessing potential alternatives. The approach is ideal for evaluating environmental trade-offs between alternative projects.

2) Undertaking ecosystem services assessments. The EESR component of the EROVA tool is directly set up to perform an ecosystem services assessment in line with IFC PS6. It provides a suitable format to identify the most significant ecosystem service impacts and dependencies (i.e. priority ecosystem services).

3) Assessing the significance of environmental impacts. The qualitative valuation component provides a summary evaluation of ecosystem services impacts as well as wider environmental impacts from a 'value-based' perspective. This could be extremely useful for ascertaining the relative significance of impacts, taking into account the societal value of natural capital and environmental impacts. There appears to be a strong transition towards taking such an approach.

4) Informing appropriate levels of mitigation measure. Understanding the relative value of impacts can be extremely useful in helping to inform what level of expenditure is suitable for mitigation measures.

5) Assessment of net positive impacts. The EROVA tool can set out whether the impact assessment generates a no net loss or net positive gain from either a pure ecological perspective, or from a societal value perspective. From an ecological perspective, the Living Natural Capital Assessment sets out the overall net change in habitat quantity and quality. This can be supplemented by an overview of overall changes in species/organisms. From a societal value perspective, the valuation steps allow this assessment to be conducted in a transparent way.

6) Determining which stakeholder groups deserve what level of mitigation and compensation. The stakeholder analysis component can help evaluate how different stakeholder groups are affected overall. This can help highlight where additional mitigation and compensation efforts are needed, and could help target expenditure for additional community investment funds and strategies. This represents a powerful and transparent way to spread the benefits in a more equitable way amongst stakeholders.

The EROVA analysis can also be readily applied at different levels. On the one hand, it can be applied at an overall project level, for example, to assess whether a project generates an overall net positive impact. Alternatively, it can be applied at a project component level, for example comparing alternative locations for one element of a development (such as a jetty), or evaluating a particular mitigation or offset measure.

Future development of the tool

In early 2014, Sustain Value established the EROVA Natural Capital Group to enable other companies interested in using and adapting the EROVA tool to benefit from its development. As part of this initiative, it is envisaged that the tool will be further developed and used to support a number of ESIAs.

Conclusion

The EROVA tool has been successfully applied to a number of situations of direct relevance to ESIAs. In the Conchali Lagoon case it has been used to establish a better understanding of the nature and extent of the significant benefits generated. It has also been developed to align with, and help fulfill the requirements of IFC PS6. As such, it clearly has potential to support decision-making associated with ESIAs in the future. This includes, for example, undertaking ecosystem services assessments, evaluating the significance of environmental impacts, informing appropriate levels of mitigation, assessing net positive impacts, and ensuring equitable compensation and social investment for different stakeholder groups.

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