Application of ecologically sustainable development principles to mining in Western Australia: The Windimurra Vanadium Project

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Abstract

Today, mining is seen by many in the world community as one of the greatest threats to ecosystems and water resources worldwide. Irrespective of the accuracy of this opinion, clearly both for perceptual and practical reasons the application of Ecologically Sustainable Development (ESD) to mining is an important and necessary step for the mining industry. This paper presents a summary of a dissertation which explored the relationship between extractive mining and ESD in Western Australia (Beckingham, 2000). This was done using the Windimurra Vanadium Project as a case study. The Windimurra Vanadium Project is located approximately 80km southeast of Mt Magnet and was constructed by Vanadium Australia in 1999 at a cost of approximately $A120 million.

The analysis of the Windimurra Vanadium Project utilises ESD issues identified in the Mining, Minerals and Sustainable Development Project Draft Action Plan for Australia (Solomon \& Lovel, 2000), the Commonwealth’s National Strategy for ESD (Commonwealth of Australia, 1992) and the Australian Conservation Foundation’s Arid Lands Policy (ACF, 1991). The analysis is presented under the premise that mining companies are now viewing ESD as not only an essential next step for the industry, but also a must in order to remain competitive.

The results of the analysis highlight the high degree of overlap between the current environmental management practices at the Windimurra Vanadium Project with ESD principles. There are, however, several key issues that are not explored in this paper including indigenous and women’s issues.

The Windimurra Vanadium Project now sets a world benchmark for environmental impact and management associated with vanadium processing. A small number of additional areas for further application of ESD principles were
revealed through Beckingham (2000). The high degree of conformance with ESD principles for the Windimurra Vanadium Project is attributed to project-specific variables that include the regulatory framework of Western Australia, the financial strength of the company and the commitment of the personnel involved. It is an important finding that the Windimurra Vanadium Project has achieved the majority of the principles of ESD without being conducted under a specific ESD policy. It is considered however, that in order to maximise Vanadium Australia’s potential to apply ESD principles, a commitment to ESD would need to appear as an over-arching aim in their Environmental Policy and other corporate policies. With this in place it is considered that Vanadium Australia’s management would be more likely to explore the possibilities of ESD application and to provide strategic direction in new project developments.

Finally it is noteworthy to add that an associated off-shoot of Beckingham (2000) was to identify the potential for Vanadium Australia to on-sell its calcine waste (0.8mtpa) based on its iron content, which would be by far the biggest single recycling project in Western Australia.

1 Background

This paper explores the relationship between mining and the concepts and practices of Ecologically Sustainable Development (ESD). This is done within the context of the Western Australian mining industry and by examining the application of ESD to a specific mining project - the Windimurra Vanadium Project. This is a medium sized mining project constructed by Vanadium Australia in 1998/99 for a cost of approximately $A120 million.

The author is very familiar with the Windimurra Vanadium Project having assisted Vanadium Australia in writing a large portion of their environmental documentation.

2 Study area and scope

The broad area of focus for this paper is the mining sector in Western Australia. Western Australia is by the far the largest producer of minerals and petroleum compared with the other States and Territories of Australia. It can be stated without question that Western Australia is a mining State. In 1995/6 the minerals industry was the largest single industry in WA accounting for 18% of the State’s goods and services (Chamber of Minerals and Energy, 1998).

The Windimurra Project area is located approximately 80km east southeast of the town of Mt Magnet in the Murchison Region of Western Australia. Other mines in the vicinity include Golden Grove and Hill 50. The project area can be accessed from Perth by road via the Great Northern Highway to Mt Magnet, a distance of approximately 670km, and then by unsealed road from the Sandstone turn-off. Alternatively air services fly directly from Perth to Mt Magnet and also via Meekatharra and Wiluna.

For the purposes of this paper the term “Windimurra Project” will be used henceforth as applying to the entire Windimurra Vanadium Project study area including the plant, mine site and accommodation village.
The overall scope of this paper is to examine the relationship between ESD and the extractive mining industry in WA using the example of the Windimurra Project. Encouraging the mining industry to examine their operations with respect to ESD represents an initial step in possibly changing their impacts and hence perception of mining in the community.

3 Definitions and context of ESD

The term ESD is also open to a wide range of interpretations and hence it is important to provide a definition for reference in this paper. The 1987 World Commission on Environment and Development, chaired by Dr Gro Bruntland, produced the report “Our Common Future” which provided the first definition of sustainable development widely accepted by the international community, and is as follows: “Development that meets the needs of the present, without compromising the ability of future generations to meet their own needs” (Bruntland, 1987).

The Commonwealth Government (1992) expanded Dr Bruntland’s original definition to include the protection of the natural environment, hence adding the term ecological. The Commonwealth’s definition of ESD is as follows: “ESD means using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased” (Commonwealth of Australia, 1992). This definition is, ultimately, the one that any legislation in Australia promulgating ESD would utilise. Hence, as this paper considers an Australian mine site, this definition will be utilised.

It is important to note that governments throughout the world do differ in their definition of sustainable development. However the international community (represented by the United Nations) essentially accepts the basic concepts of sustainable development. These can be summarised as follows:

- many natural resources on earth are finite with respect to human usage;
- there are significant interconnections among environmental, economic and socio-cultural pressures; and,
- we are morally obliged to consider the needs of future generations (Stocker, 1999).

The application of these principles is of course an area of great divergence. This relates not only to differing political frameworks, economies, philosophies and environments but also to the specificity of individual activities (Strongman, 1998). This paper provides the application of ESD to a particular operation and in doing so demonstrates the interdependency of many variables when applying ESD.

4 Application of ESD principles to the Windimurra Vanadium Project

In order to analyse how ESD principles can be applied to the Windimurra Project it is necessary to consider current site environmental management practices. The
current environmental management framework is based upon government environmental conditions and the environmental documentation to which the company is bound. As a result of these conditions and company commitments, Vanadium Australia developed an Environmental Management Plan (EMP) to cover the relevant environmental factors (Alan Tingay & Associates, 1999). This EMP (which also forms part of an Environmental Management System) is a practical working document that is used on-site by designated personnel as a reference resource. Its purpose is to ensure that all relevant environmental factors have been identified for the project and are managed appropriately, according to best environmental practice. These environmental factors generally relate to ground disturbing activities and the impact of these on the local environment, including surface water, groundwater, soil, vegetation, fauna and the atmosphere. The document also stipulates periodic environmental auditing.

The discussion presented in the dissertation (Beckingham, 2000) examined some areas of overlap between the current environmental management practices at the Windimurra Project with ESD principles, and areas where there exists scope for further application of ESD principles. The analysis was presented in some of the categories that the Draft Action Plan for the Australian component of the Mining, Minerals and Sustainable Development (MMSD) project (Solomon & Lovel, 2000) identified, that is:

**NATURAL ENVIRONMENT**
- overall environmental impact and management;
- rehabilitation;
- innovation in design (minimising environmental impacts); and,
- re-use of waste.

**HUMAN ENVIRONMENT**
- local community returns;
- stakeholder involvement;
- public reporting; and,
- education and training.

**ECONOMIC ENVIRONMENT**
- resource depletion, life-cycle analysis and vanadium recycling; and,
- Best Practice Product.

Whilst not all the possible individual issues of each MMSD category were explored in Beckingham (2000), the majority of issues that are of pertinence to the Windimurra Project were. Consideration of aspects of the Commonwealth Government’s National Strategy for ESD and the Australian Conservation Foundation’s Arid Lands Policy was also given in relevant sections.

### 5 Analyses of project specific variables

The Windimurra Project has been constructed and implemented against a background of achieving best practice and within a framework of environmental protective legislation that is approaching or equivalent to world’s best practice. With this in mind it must then be asked what more can be done? The analyses
presented in Beckingham (2000) indicated there is only a small number of areas where the project could investigate actions that may move the project closer towards ecological sustainability (based on the issues assessed). In summary these areas are:

- investigation of innovative methods of public reporting of environmental performance;
- further investigation of additional stakeholder involvement and community involvement under an ESD framework;
- investigation of waste recycling on a more regional basis;
- investigation of the lifecycle of its product;
- investigation of opportunities for vanadium recycling;
- commitment to re-invest a portion of profits into the local community;
- investigation of decommissioning issues during operations; and,
- inclusion of an explicit commitment to ESD in the Environmental Policy.

The Windimurra Project has achieved the majority of the principles of ESD without being conducted under a specific ESD policy. Thus the analysis presented in Beckingham (2000) has shown that the ease of application of ESD principles to a project to an extent will depend on an array of project-specific variables. These are discussed below.

6 Implications of the regulatory framework

The results of the study demonstrated that the regulatory framework within which the project operates is closely linked to the degree of environmental impact of the project (compared with similar projects operating under different regulatory frameworks). What made this all the clearer was the dearth of information available to Vanadium Australia in the international forum on the environmental (health, safety and ecological) impacts of processing vanadium metal. In the context of many vanadium plants and mines around the world there is in fact only a relatively small amount of impact management information available. As a result Vanadium Australia has had to put considerable resources into developing an appropriate Health and Safety Plan and Environmental Management System specific to the processing of vanadium.

The root cause behind the question as to why Vanadium Australia needed to invest in research and development stems from the fact that the countries that have historically produced vanadium do not have comprehensive regulatory frameworks for environmental and social impact management. Historically the Republic of South Africa has been the largest supplier of vanadium followed by the former Soviet Union and then China (United States Geological Survey, 2000). These countries are not world leaders in the field of social and environmental impact management and consequently no role model management success stories could be followed. In contrast, the Vanadium Australia project was established under a comprehensive set of environmental regulations and partly for this reason, now sets an impact and management benchmark for vanadium projects around the world.
In the Windimurra Project’s case the regulatory framework is in the context of one of the world’s largest mining areas and consequently governed by best practice in the industry. Hence Vanadium Australia had a minimum benchmark to which it had to comply. This format covered a very high standard of impact assessment. In some areas Vanadium Australia went beyond legislative requirements (eg. waste management). In others, simply by meeting regulatory requirements, the project met a world’s best practice model. This translates to a relatively easy future transition for the project to adopt ESD principles.

7 Financial strength of the company involved and timeline issues

Vanadium Australia is a public company - its shareholders invested into the company trusting that the $A120 million needed to construct the project will return a profit through product sales. As with all mining projects, there is a commissioning period where production is slowly increased to full capacity. Vanadium Australia is still in the increasing to full production phase. The costs of the project need to be considered in the context that the project was referred to the EPA in 1991 and then took seven years until detailed engineering design commenced in August 1998. Construction started in November 1998, pre-commissioning started in late 1999 with production starting in December 1999. Clearly the project has had at least two years, after capital commitment, with no or limited profit and with a significant debt.

The lag time between construction and profits for medium to large mining projects means that the application of certain ESD principles (such as investing into the local community), can only be applied in the medium term when the project is profitable, that is unless the company is very large and could afford to start the process early. The notable exception to this is the strategy of employing local people during the construction phase.

The primary point to be made is that the application of ESD principles to a project is somewhat timeline and capital specific. Whilst the importance of forward planning is recognised, it must be balanced with the companies need to establish a profitable business. Hence it is considered that the Windimurra Project may at this stage only be able to plan for some of the ESD objectives identified in this paper.

8 Commitment of the personnel involved

If key project personnel do not have the will to implement ESD strategies set out in a project’s Environmental Policy, then the reality is that the project is unlikely to meet its ESD goals and commitments. This would be the case even if there were an appropriate regulation framework in place and the company had a financial commitment to achieve ESD.

It is perhaps useful to briefly outline an example of where application of ESD to mining developments failed. A workshop was held in South America in 1998 to discuss failed attempts to apply ESD to certain mining projects in Peru
The following reasons were identified as contributing to failure:

- the development of high expectations that were hard to fulfil;
- short timelines for complex processes;
- lack of communication among stakeholders;
- lack of commitment of certain parties to the process;
- the absence of decision-making processes;
- changes of people or attitude among those representing stakeholders in the course of the development;
- misunderstandings among parties;
- conflicts within stakeholder group (e.g., conflicts inside a company); and,
- all encompassing, non-binding, principle-based initiatives, which had limited value (Institute for Sustainable Development & International Development Research Centre, 1998).

From the above points it is apparent that attitude and education of company personnel and stakeholders account for at least five of the nine points relating to failure to successfully apply ESD to mining. This suggests a strong commitment from management for environmental and social impact mitigation is required, to effectively make the transition to ESD.

Part of the reason behind the success of the Windimurra Project from an environmental impact perspective is the use of specialist environmental contractors during construction and the use of a dedicated Environmental Officer during operation. This decision by management has ensured that throughout the history of the project the staff have had access to expertise and guidance in the area of environmental management.

9 Conclusion

This paper presented a summary of a dissertation that explored key aspects of the relationship between mining and the concept of Ecologically Sustainable Development as defined by the Commonwealth Government of Australia. The analysis was undertaken in the context of the Western Australian mineral and metals mining industry using the specific example of the Windimurra Project.

Beckingham (2000) highlighted that the international and Australian mining community is now taking ESD very seriously and viewing ESD as not only an essential next step for the industry but also a must to remain competitive. Australia as a nation is inextricably linked with the minerals and energy industry and Western Australia is by far the largest producer of minerals and petroleum compared with the other States and Territories. Perhaps as a result, regulation of the environmental and social impact of mining has become very much a public affair and has become amongst the best in the world.

The case study analysis and policy work presented focused on a medium sized mining project - the Windimurra vanadium mine and processing plant. The project is built in a remote location in a semi-arid environment. The project was
subject to a relatively rigorous State assessment process and a component of Federal assessment. The result of these assessments was a comprehensive set of conditions and commitments to manage the social and environmental impacts of the project.

The relationships between current project practices, impacts and management and the principles and policies of ESD were examined. Areas of overlap between the current environmental and social management practices at the Windimurra Project with ESD principles, and areas where scope for further application of ESD principles exists, were highlighted. The analysis was presented in the broad categories that are identified by the Draft Action Plan for the Australian component of the MMSD project. Individual components were in accordance with issues raised by the MMSD project and the Commonwealth Governments Draft Action Plan for Sustainability 1992.

The analysis presented in this paper showed that the Windimurra Project has been constructed and implemented against a background of achieving best practice and under a framework of environmental protective legislation that is approaching or equivalent to world’s best practice. Beckingham (2000) demonstrated that there were only a small number of areas where the project could investigate further actions relating to application of ESD to the project. There are however, several key issues that are not explored in this paper including indigenous and women’s issues.

This paper demonstrates that the Windimurra Project has achieved many of the principles of ESD without being conducted under a specific ESD policy. This suggests that the ease of application of ESD principles to a particular project will depend on an array of project-specific variables. It is considered the primary variables in approximate order of importance are as follows:

1. Regulatory framework in the Country and State in which the project operates.
2. Financial strength of the company involved.
3. Commitment of the personnel involved to uphold the commitments/conditions.

Vanadium Australia’s financial and management commitment, together with the legislative requirements of State and Federal Governments, have ensured that the Windimurra Project has met many of the elements of ESD. However, it is considered that in order to maximise Vanadium Australia’s potential to apply ESD principles in the future, a commitment to ESD should appear as an overarching aim in their Environmental Policy and other corporate policies. With this in place Vanadium Australia’s management may be more likely to explore the possibilities of ESD application and question what more could be done. ESD policy suggestions for the Windimurra Project are presented in Beckingham (2000).

Finally, it is noteworthy that an associated off-shoot of this study has been to identify the potential for Vanadium Australia to on-sell its calcine waste (0.8mtpa), which would be by far the biggest single recycling project in Western Australia.
References


