3.2 Mining overview

The primary mining sector portrays advantaged outcomes for the environmental and financial indicators, but below average performance for the social indicators of employment generation, income and government revenue. The export propensity indicator is four times the average reflecting the industry’s contribution to helping improve the international trade balance. The lower than average contribution to government revenue may be an overestimate since resource rents paid for mineral and petroleum extraction to state and federal governments are not included as ‘payments to government’ in the internationally implemented ‘System of National Accounts,’ and thereby the national input-output tables. The lower than average indicators for employment generation and income are essentially structural due to the scale, capital intensity, and economic efficiency, required by each mine that exports to a competitive international marketplace. However there is some justification to claims from mining regions, that a significant component of resource rents be pledged to long term structural investments in those areas from which minerals are extracted, rather than being directed towards the maintenance of major urban centres where the political power lies.

Figure 2: A spider diagram presentation of triple bottom line performance for financial, social and environmental indicators, in the aggregated macro-sectors of ‘mining’ (13 sectors). The economy-wide scaled average (=1) is the regular polygon in the centre of the diagram. Indicators with above average performance are closer to the centre, while below average indicators are positioned closer to the outside boundary.
3.2.1 Options for Change

Given an emerging concern on the energy, greenhouse emissions and material transactions embodied in the acquisition of virgin metals, and their accumulation and eventual release from urban-industrial complexes, the concept of ‘cradle to cradle’ stewardship is moving steadily towards full implementation. The concept is already well developed for aluminium drink containers and steel recycling through electric arc ‘mini mills’, but is now moving into metals of concern such as lead, copper, zinc and some small volume but high toxicity metals such as mercury and cadmium. A new vision might transform a typical commodity miner to a metal steward who manages a metal stock that is based on the metals embodied in human artefacts, the collection and recycling chain, and the supplementation of metal stocks from virgin ores. Implementing this wider boundary for mining will improve its social indicators and, if industry and consumers buy into the full stewardship concept, its financial indicators as well. For industry, the challenges are more complex but two issues stand out. The first is to focus procurement for intermediate inputs into production, towards items with low environmental loadings certified through established conventions of life cycle analysis. The second more challenging option is to reduce the energy and material content of manufacturing by co-location of many industries into ‘industrial ecology’ complexes where waste materials are inputs into other products, process heat can be shared, and lower carbon electricity can be generated, so enabling manufacturing synergies while reducing fossil carbon content.

5. SOFTWARE DEVELOPMENT

At the University of Sydney, TBL Accounting has been formulated as a quantitative framework using an input-output-based LCA method. This framework has been applied to dozens of organisations in reporting on their sustainability performance - companies, government departments, NGOs. Experiences were collected in a 3-year pilot project. It became clear that the data collection burden for the organisation has to be as small as possible. As a result, a software tool was developed in collaboration with the using organisations, enabling users to create a comprehensive sustainability report solely by importing their existing financial accounts (www.bottomline3.com).
This software tool is called BottomLine³, or short BL³ ("BL-cubed"). It accepts any organisation’s financial accounts as imported input, and uses this financial information to calculate upstream, indirect impacts in terms of physical indicators chosen by the user. On-site physical impacts are entered separately. BL-cubed’s indicator set features all indicators in Table 1, plus material flow, the ecological footprint, emissions of more than 100 toxic, ozone-depleting, acidifying and eutrophating substances to air, water and soil, and two prominent Dutch LCA sets (the CML midpoint set and PRé’s endpoint Eco-indicator99). In total the whole database distinguishes 1270 indicators for 344 industry sectors.
Software outputs include aggregate figures, detailed breakdowns and rankings of indicators into supply chain contributions. These outputs enable the user to determine

- which of the operating inputs embody the largest impacts,
- whether these impacts occur at direct suppliers, or at more remote supply chain locations, and
- which single input paths carry the largest impacts (Structural Path Analysis, SPA).

Users perceive especially the latter information as very helpful, because it can be used for organisational planning and priority setting for informed action towards financial, social and environmental sustainability. In particular, it shows organisations alternatives for effective procurement policy changes, which may be applied instead of perhaps costly on-site measures.
The BL-cubed software has been extensively road-tested over three years. Users had no difficulty in understanding and accepting indirect impacts occurring off-site, in addition to on-site direct impacts. Users felt that assessing their organisation’s indirect impacts was a valuable feature because it increases abatement options, enables meaningful benchmarking, avoids loopholes in reporting and informs about real risk. Sydney University’s TBL software has been designed so it can readily be implemented for any economy that for which input-output data complemented with physical data are available. Trial versions include Australia, the UK, Japan, the US, and Germany. In principle it is possible to develop a version based on a multinational IO framework that covers international trade flows.
5. CONCLUSIONS AND FURTHER WORK

Numerate triple bottom line accounting at the whole-economy level has highlighted a number of key issues for the Australian economy. Given the high likelihood of incremental change as a policy constant in today’s democracies, technological innovation faces significant challenges as it attempts to reduce the environmental intensities in many sectors. Improving the social indicators is more of a challenge since sector aggregates such as mining for example, have evolved over many decades to be capital intense, skill rich and employment poor.

More radical interpretations of these Triple Bottom Line Accounts suggest a number of directions many of which will not find ready acceptance in today’s policy debate. Nevertheless there is sufficient support in statements such as ‘charging the real price for water’ and ‘including environmental externalities in the full cost of production’ to suggest that some movement is possible. For example, improving the social indicators for mining by moving to a full life cycle ‘metal stewardship’ approach, may seem extreme in today’s marketplace, but recycling programs for copper, lead, steel and aluminium are commonplace and the main challenge is moving to much higher levels of recycling while extraction of virgin ore stabilises and then decreases. This will allow the concept of a sustainable metals industry to bridge the current gap between rhetoric and reality.

There is a significant policy tension between implementing the changes suggested by this aggregated and macro-analysis, and stimulating those changes at a sector by sector level. The challenge of harmonising the effects across the whole economy are immense, particularly when international institutions and the global business cycle could be focused on goals that are completely opposite. The concept of fully free and open trade is still in reality a hypothetical one. However if, within the current international trading regimes, the farm gate price of Australian food and fibre products were substantially increased to internalise the environmental externalities, much domestically produced food could be replaced by imports, none of which were assessed by the same full chain analyses presented here. Allowing trade officials and industry blocks access to these domestic analyses, as well as similar ones for trading countries, would allow scope for informed trade negotiations based on triple bottom line concepts.
It is important to harmonise this analytical approach, with its strengths of integration and lack of boundaries, with international approaches rapidly gaining headway such as ‘The Global Reporting Initiative’ and ‘The Equator Principles’. These approaches have widespread support through many globalised companies and national governments. However they are currently orientated to a ‘within the factory fence’ approach, but do acknowledge a number of first order issues such as the origin of water and energy, and some second and third order effects particularly the labour practices used to supply intermediate inputs to production. Part of the harmonisation process will require the development of indicator datasets that match the requirements of these initiatives, as well as collaborating in the development of international software tools that enable the fluent use of whole economy accounting without boundaries.

Inevitably, today’s production chains reach across many countries and production processes and embody a wide range of positives and negatives in social and environmental areas. This current analysis focuses only on production processes that occur within the boundary of Australia’s continental shelf. To adequately represent imports of both final and intermediate demand both of goods and services, will require this level of analysis for five to ten of Australia’s main trading partners, predominantly Japan, China, New Zealand, and the US, and an aggregated ‘rest of world’ category. With appropriate collaboration between countries, this may be feasible.
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