WIDER Working Paper 2017/19

Towards contribution analysis

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January 2017

United Nations University World Institute for Development Economics Research

wider.unu.edu

Abstract: Since the early 1990s, at least 45 initiatives have been mounted to improve the environmental and social performance of the mining industry across the world. Many changes in the formal legal and regulatory systems have also been introduced. However, no systematic approach has been adopted to test whether this effort is making a useful difference. Without such monitoring of success, the ongoing tension between companies, communities, and governments regarding the role of mining in society will likely continue.

This paper makes the case for using 'contribution analysis' to fill this gap, a systematic means to assess and track mining's contribution to human and ecosystem wellbeing over the full project and product lifecycles. This is a higher test than current practice. It brings out a fuller picture of the positives and negatives, provides greater opportunity for the perspectives of all interests to be heard, and is fairer.

Keywords: contribution analysis, mining, sustainability, applied sustainability, sustainable development, natural resource management
JEL classification: D63, D74, F64, I31, L72, Q01

Acknowledgements: The ideas presented in this paper have evolved over the last 30 years, and along the way many people have contributed, including Al Freeze, Ron Rice, David Brooks, Alex Michalos, Britt Banks, and numerous friends and colleagues with whom I have shared professional assignments. Though these others remain unnamed here, I am deeply appreciative of the push and pull of debate along the way. The following reviewed this paper, offering many helpful comments: Tony Addison, Chris Anderson, Toni Aubynn, Jim Cooney, Robert Court, Lois Craig, Rodrique Djahlin, Liesel Filgueries, Bob Gibson, Anne Johnson, Mike McPhie, Lee Merkhofer, Alan Roe, Andrew Roman, Ian Thomson, and Mark Wade. Much of the richness is due to their input, while the weaknesses that remain are solely due to the author.

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This study has been prepared within the UNU-WIDER project on 'Extractives for development (E4D)', which is part of a larger research project on 'Macro-economic management (M-EM)'.

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ISSN 1798-7237 ISBN 978-92-9256-243-4

Typescript prepared by Gary Smith.

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The Institute is funded through income from an endowment fund with additional contributions to its work programme from Denmark, Finland, Sweden, and the United Kingdom.

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1 Introduction

The mining industry's boom–bust pattern is well recognized. During the last 20 years, the swings have been particularly extreme: the 2002–12 'super-cycle' was followed by a precipitous fall.[1] Now, in late 2016, recovery appears to be underway.

Societal attitudes towards mining are nested in these swings. However, they are more fundamentally governed by the evolution of deeper values related to human and ecological wellbeing and the perceived role of various human activities (such as mining) in contributing or not to that wellbeing.

In the 1990s and early 2000s, the evolution of societal values and a particular combination of events led to an unprecedentedly high level of criticism levelled at the mining and metals industry. Key contributing elements included the advent of internet communication, the rise of civil society organizations as key players in the public arena, and the emergence of the resource-curse literature.[2]

When the waves of public criticism coincided in the mid-1990s with depressed prices marking a low in the boom–bust cycle, investors began reducing investment in the mining and metals industry at a time when investment in clean, green, and innovative information technology offered other, more profitable and socially acceptable options. Thomson and Joyce (2006) also point out:

> By the late 1990s, mining was an industry whose role and contribution to society was in question in many parts of the world with well-organized grass roots opposition to mineral exploration projects and new mine developments. A series of high profile tailings dam failures and an explosion of conflicts around mining projects in Latin America had cast the industry in a very negative light.

Reflecting changing societal values towards the environment and a range of social issues, the mining industry found itself subject to an increasing level of regulation and public scrutiny for which it was ill-prepared. Within the industry, these changes brought discomfort. In some cases, companies expressed an attitude of hostile resistance and adopted a black-and-white, 'us–them' position. Militaristic language was adopted, accompanied by the use of muscled lawyers in and around licensing hearings.

This attitude of resistance fuelled a strong sense of 'unfairness' that was growing outside the industry. Augmenting a larger and growing concern about inequity in the world, many voiced concerns that the benefits accruing to mining companies far outweighed those going to host communities and countries. The high profits that characterized the 2002–12 'super-cycle' exacerbated this sense of unfairness. By 2005, resource nationalism, spawned at least partly by this sense of unfairness, was high on the list of 'risks' facing the extractives industry.[3] Meanwhile, on-the-ground conflict between operations and host communities was on the rise.[4]

From a number of perspectives, it was a 'perfect storm'. The turn of the millennium found the mining and metals industry reeling from the combined effects of public criticism, investor hesitation, unfavourable economic conditions, and changing laws and regulations, all of which added significant complications to the process of mine planning, financing, and decision-making.

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[1] See Humphreys (2015: 1) for a clear description of mining's 2002–12 super-cycle.

[2] The resource-curse idea was first introduced by Auty (1993), and was subsequently much reinforced by the analysis of Sachs and Warner (1995).

[3] See Stevens (2009) and Ward (2009) for a discussion.

[4] See Hodge (2014b), Franks (2015), and CIRDI (2016) for a discussion about the mining conflict trend and what it means.

The response to this changing operating environment inside and outside the industry has been marked. Within the industry, an unprecedented initiative was mounted at the turn of the millennium. This was the Global Mining Initiative, with its flagship project, Mining, Minerals and Sustainable Development. Over two years, multi-interest discussions about mining practices were convened across the world. Some 50,000 people participated in an examination of social and environmental practices that no other industry has sparked before or since. A blueprint for improvement was developed and the International Council on Mining and Metals (ICMM) was created to serve as a change agent in its implementation and further development over time (MMSD 2002).

Meanwhile, industry champions have spoken out against the negative critique. They point out the importance of the industry to contemporary society in its role as an essential primary industry in meeting the needs and aspirations of contemporary society through provision of: (1) metals and minerals essential for today's world; (2) primary, secondary, and tertiary employment; (3) revenue to government through taxes, royalties, licences, and fees (which would fund other needed services at the discretion of government); and (4) provision of infrastructure and services (health, education, transportation, energy, water, sewage, communication, etc.) that serves long after the operation closes. And they are at pains to point out the many steps they have taken and resources put to addressing society's environmental and social concerns.

At the same time, a remarkable number of initiatives *in addition to many changes in formal law and regulation* in countries across the world have been mounted since the early 1990s to improve industry performance. Box 1 lists 45 such initiatives, nine from within the industry, 36 from outside. There may be others. These are aimed either: (1) directly at the mining and metals industry; or (2) at a broader set of industries of which mining and metals is one important constituent part. The majority are multi-interest processes involving companies, civil society organizations, and government.

Box 1: Forty-five initiatives aimed at improving the performance of the mining and metals industry over and above the formal legal system

Table B1.1: Multi-interest performance-enhancing initiatives within the industry

Date	Initiative
1991–2001	1. International Council on Metals and the Environment; 29-company international coalition aimed at strengthe mining's environmental performance.
1992–94	2. Multi-interest Whitehorse Mining Initiative; Leadership Accord to govern mining practices
2000–02	3. The Global Mining Initiative (GMI) with its central element, the Mining Minerals and Sustainable Developme (MMSD) and subsequent creation of the ICMM
2003–ongoing	4. ICMM Principles and Sustainable Development Policy framework (with further position statements: 2003—M and Protected Areas; 2003/5/6/9—Transparency and Mineral Revenues; 2004/10—Mining: Partnerships for Development; 2006/9/11—Climate Change; 2008/13—Mining and Indigenous Peoples; 2010—ICMM public reporting first completed including independent assurance and consistent with GMI reporting requirements)
2003, 2009–ongoing	5. Prospectors & Developers Association of Canada (PDAC) e3 Plus, a web-based inventory of recommended g practice for environmental and social management of mineral exploration projects
2004–ongoing	6. Towards Sustainable Mining initiative of the Mining Association of Canada
2006–ongoing	7. Principles of Enduring Value established by the Mining Council of Australia based on the ICMM Principles, revised in 2015
2009–ongoing	8. Aluminium Stewardship Initiative
2011–ongoing	9. Conflict-Free Sourcing Initiative (CFSI) Smelter Program (CFSP)

Table B1.2: Performance-enhancing initiatives outside the industry aimed at influencing industry practices

Date	*Initiative*
Broadly focused, multi-interest initiatives from outside the industry	
1976–2011, ongoing	1. OECD Guidelines for Multinational Enterprises, Annex to OECD Declaration on International Investmer Multinational Enterprises (originally issued in 1976 with revisions in 1979, 1982, 1984, 1991, 2000, and 2011). guidelines are aimed at ensuring enterprises operate in a way that (1) is in harmony with government policies, spawns confidence with host societies; (3) improves the foreign investment climate; and (4) contributes to sustainable development
1995–ongoing	2. AccountAbility AA1000, Assurance Standard
1997–ongoing	3. Social Accountability SA8000
1998–2000; 2014–15, ongoing	4. The United Nations Millennium Development Goals (MDGs) adopted in 2000 and then the Sustainable Development Goals (SDGs) adopted in 2015
1999–ongoing	5. Dow Jones Sustainability Index (DJSI)
2000–ongoing	6. United Nations Global Compact (First Leader's Summit convened in 2004) (voluntary initiative based on c executive officer (CEO) commitments to implement universal sustainability principles (human rights, labour, environment, anti-corruption) and to take steps to support United Nations goals)
2000–ongoing	7. United Nations Voluntary Principles on Security and Human Rights (designed explicitly to guide extractive industry companies in maintaining the safety and security of their operations within an operating framework t encourages respect for human rights)
2000–ongoing	8. Global Reporting Initiative (mining supplement issued in 2011)
2001–ongoing	9. FTSE4 Good Index
2002–04	10. Extractive Industries Review by the World Bank Group concluding that extractive industries can contribu poverty reduction if done right and that World Bank Group involvement can positively influence industry standards
2003–ongoing	11. Equator Principles established in 2003, revised in 2006 (a risk management framework, adopted by financ institutions, for determining, assessing, and managing environmental and social risk in projects)
2003–ongoing	12. Extractive Industries Transparency Initiative (EITI) principles agreed on in 2003; Tripartite (governments companies, and civil society organizations) International Advisory Board established and six key criteria estab marking the beginning of implementation in 2005; Secretariat established in 2007. Current 'Standard' launche 2013
2004–ongoing	13. Electronic Industry Citizenship Coalition (EICC)
2006–2012, ongoing	14. International Finance Corporation Principles and Guidance on Social and Environmental Sustainability established in 2006, revised in 2012
2006–ongoing	15. Initiative for Responsible Mining Assurance (IRMA)
2007–ongoing	16. Devonshire Initiative
2009–ongoing	17. Equitable Origin, EO100™ Standard
2010–ongoing	18. Responsible Mineral Development Initiative, RMDI (World Economic Forum)
2010–ongoing	19. Free, Prior and Informed Consent (FPIC) Dialogue (The Forests Dialogue)
2010, ongoing	20. Natural Resource Charter launched (a set of principles for governments and societies on how to best harn the opportunities created by extractive resources for development); now part of the Natural Resource Gover Institute
2013–ongoing	21. OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and Risk Areas
2015–ongoing	22. Responsible Mining Index, under development by the Responsible Mining Institute (an index aimed at he translate the full potential of minerals and metals mining to positively benefit the economies, people, and environments of producing countries, particularly in some of the world's poorest regions. See www.responsibleminingindex.org/foundation)
Issue or commodity focused multi-interest initiatives from outside the industry	
2001–ongoing	23. Global Business Coalition on HIV–AIDS, tuberculosis, and malaria—GBC Health
2003–ongoing	24. Kimberley Process Certification Scheme (KPCS)
2004–ongoing	25. Business and Biodiversity Offsets Programme (BBOP)
2004–ongoing	26. Alliance for Responsible Mining (ARM)
2005–ongoing	27. Partnering Against Corruption Initiative (PACI) of the World Economic Forum
2005–ongoing	28. Responsible Jewellery Council
2005–ongoing	29. International Cyanide Management Code (ICMC) for gold mining

2005–ongoing	30. Diamond Development Initiative (DDI)
2011–ongoing	31. Public–Private Alliance for Responsible Minerals Trade
2011–ongoing	32. Solutions for Hope
2012–2014	33. Conflict-Free Tin Initiative
2013–ongoing	34. Better Gold Initiative
2016–ongoing	35. New mining code from the World Initiative of Mining Lawyers (WIOML)
2016–ongoing	36. World Bank Social and Environmental Framework

Source: this compilation builds on those compiled in Resolve Solutions Network and the World Economic Forum (2016). There may be others.

The obvious question that arises is whether or not all of this effort is making any difference. Is mining and metals' contribution to human and ecosystem wellbeing as good as it could or should be to reflect societal values and expectations—even after the influences of these well-intentioned initiatives have been factored in? This question is largely unaddressed: there is no accepted, systematic way to assess and track a mine operation's contribution over time, let alone the industry as a whole.

Given this gap, it is not surprising that industry champions and detractors disagree, sometimes vehemently, on the nature of mining and metals contribution to host communities and countries. In a way, this is a curious gap; in management sciences—public administration and business management—key performance indicators are an essential tool. At the same time, this very issue is contributing to the ongoing lack of a sense of trust and legitimacy in current project approvals processes, a significant issue for communities, governments, and project proponents alike.

However, the challenge of resolving these disagreements is far from trivial. The ecological, social, cultural, political, and economic setting of mining is global and complex, and discharging the task of fully assessing contribution requires a synthesis of many perspectives.

This paper takes up the challenge of how to fill this gap—how to understand, assess, and track mining's contribution to human and ecosystem wellbeing over the full project and product lifecycles. A conceptual foundation based on the linked ideas of sustainability and sustainable development is offered, along with a *four-part generic assessment cycle* that explicitly links measurement, story, synthesis/judgement, and communication. A case is laid out for addressing: (1) both *ends* and *means*; and (2) not only the *substance* of decisions and actions (the *what*), but also the *process* used in implementation (the *how*). Together, this is 'contribution analysis'.

While building upon the approaches of the more traditional environmental and social impact assessment and, more recently, cumulative effects assessment, it importantly represents a fundamental step beyond these. At its core is a conceptual shift from the current deeply entrenched practice of focusing on the identification and mitigation of negative effects (or 'impacts') to a 'higher test' based on the achievement (or not) of a net positive contribution to human and ecosystem wellbeing over the long term (first suggested by Gibson (2000)). This will require a fundamental shift in the culture of decision makers and assessment participants. The needed change will be driven by the linked ideas of *sustainability* and *sustainable development*.

Some important steps towards contribution analysis have already been taken by communities, by governments, and by companies. The academic literature contains some important insights. In sum, a start has been made. But significant distance remains on the path ahead. This paper attempts to go beyond that start.

2 Conceptual foundation

In the arena of mining–community relationships, it is not only *what* is done that matters, but also *how* it is done. Both the substance and process of action are important when considering the nature of the contribution that is or is not achieved. In the paragraphs below, a conceptual foundation for each is offered (summarized from Hodge 1995, 2011; MMSD North America 2002).

2.1 Substance

The origins and definitions for 'sustainability', 'development', and 'sustainable development' that are used in this paper are provided in Box 2.

Box 2: Applied sustainability: origins and three key definitions

During the 1980s, the Secretary General of the United Nations convened three linked international enquiries. Willy Brandt, former chancellor of West Germany, was asked to lead a review of North–South inequities (Brandt Commission on North–South Issues 1980); Olaf Palme, former president of Sweden, was asked to lead a review of international security (Palme Commission on Security and Disarmament 1982); and Gro Harlem Brundtland, prime minister of Norway was mandated to integrate the results and collaboratively develop a strategy that would reduce North–South inequities while increasing international security (WCED 1987). Brundtland called her strategy sustainable development. It is this concept that provides the anchor for this paper.

Three key definitions

The following three definitions serve as the starting point of this discussion.

> **Definition 1. Sustainability**: the persistence of certain necessary and desired characteristics of both people and the enveloping ecosystem (of which people are a part) over a very long time—indefinitely (modified from Robinson et al. 1990).

The words 'necessary and desired' means that this definition is values-based and therefore 'open' in the sense that what will be identified as 'necessary and desired' in any given case will depend on the values being exercised. For example, what citizens of one culture consider as 'necessary and desired' will not necessarily be the same as another. Such an open, values-based definition is sometimes very difficult for numerate businessmen, economists, engineers, and scientists to deal with. Their world is dominated by closed definitions whose interpretation does not depend on the values of the observer.

Because applying 'sustainability' ideas in practice is values-based, the process of resolving value-based differences becomes critically important. In the mining industry, this fact underlies the critical need for collaboration and dialogue to ensure that alternative values can be respected and brought to bear on mining system design, operation, and closure—and assessment of success throughout this full project lifecycle. When it comes to values, the experts are the people who hold them, whether that be community members, indigenous people, members of civil society organizations, company employees, or public servants. This fact underlies why 'process' is so important.

> **Definition 2. Development**: to expand or realize the potentials of; bring gradually to a fuller, greater, or better state (modified from Daly 1989).

Development has both qualitative and quantitative characteristics and is to be differentiated from growth, which applies to a quantitative increase in physical dimensions (NRTEE 1993).

A human analogy may be helpful. Each of us physically grows in size until some point in our mid-30s, at which time we begin to shrink, slowly at first, increasingly as we grow older. However, each of us continues to develop, learn, and hopefully gain greater understanding and wisdom until the end of our lives. Thus, even though quantitative growth may stop, the qualitative growth and development continues.

> **Definition 3. Sustainable development**: an ongoing process in which humans take actions leading to development (as described above) that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This is the classic Brundtland Commission definition which has stood the test of time (WCED 1987). It is the human and, most importantly, the *action* part of the sustainable development/sustainability set of ideas. It elegantly captures the idea that humankind is on a continuous quest for certain necessary and desired characteristics of both humans and the enveloping ecosystem over a very long time—indefinitely. The needed test of achieving success is whether or not

human actions (such as mining) contribute positively to human and ecosystem wellbeing over the long term—and thus meet current needs without compromising future needs.

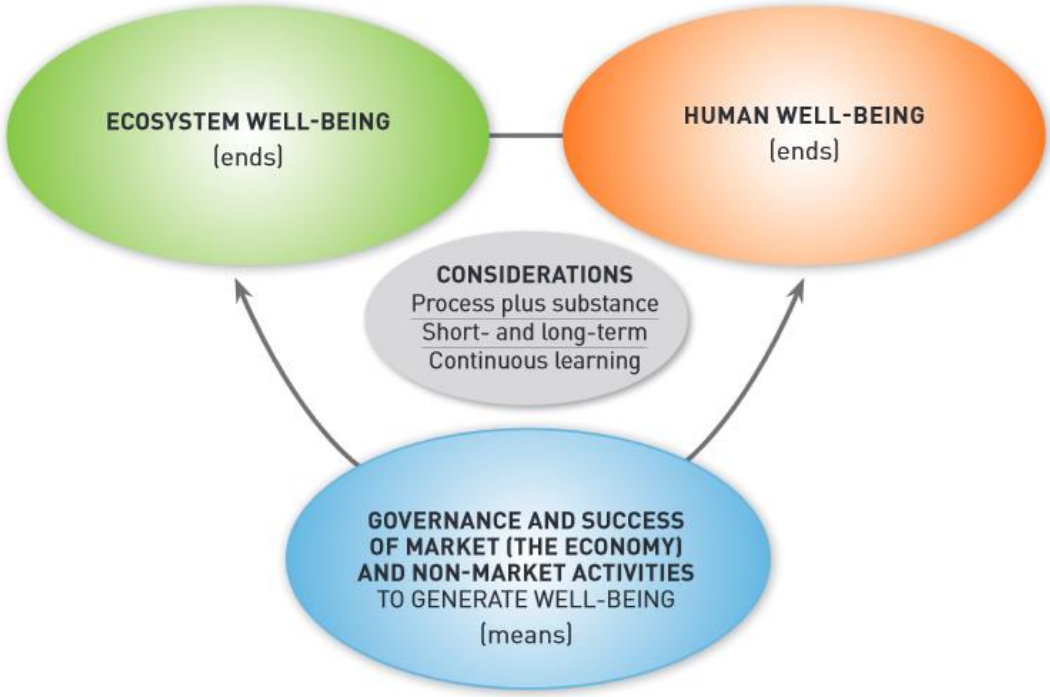
It follows that actions which do not achieve such a net positive contribution and thus reduce the ability of future generations to meet their own needs should be avoided if possible and minimized if not. If deemed essential to proceed through a societal-mandated process, they should only be accepted with an explicit and public recognition of and sensitivity to future implications. After all, it is fair that this generation accept responsibility for the consequences of their actions. Tracking and assessing performance must be framed in this spirit and time horizon.

In summary, what the three definitions described in Box 2 translate to is a value set that is best stated as 'parallel care and respect for the ecosystem and people within' (Hodge et al. 1995: xiii). To judge success, therefore, requires testing activities such as a mining operation for their compatibility with that value set. In practice this requires testing for the contribution of mining and metals to human and ecosystem wellbeing not only today, but also for future generations.

This assessment criterion—contribution to human and ecosystem wellbeing over the long term—represents a fundamental shift in approach to the management of human activities. From an engineering design perspective, the achievement of a positive contribution to human and ecosystem wellbeing over the long term serves as a kind of two-dimensional design criteria. From the perspective of 'results-based management', human and ecosystem wellbeing are the results or 'ends' that are to be sought, designed, and implemented, tested for over time, and finally publicly reported on.

Figure 1 draws all of these ideas together to provide the fundamental conceptual framework for assessing contribution.

Figure 1: Conceptual framework for assessing contribution



Source: Hodge (2014a).

Figure 1 differentiates 'results' or 'ends' as described above (human and ecosystem wellbeing) and the 'means' that society has to achieve these ends. In general terms, such *means* include: (1) human activities within the market economy such as mining; (2) those outside the market economy such as all the unpaid house- and volunteer work that is essential to society; and (3) the creation and operation of our systems of

written and unwritten rules and structures for governing those activities. Each of these needs to be carefully tracked by all interests, ideally collaboratively.

Figure 1 is a broad systems analogy of the results-based management approach to tracking and assessing inputs, outputs/outcomes, and results/ends. Each of these is important for any organization (company, community, civil society organization, government):

1. *Inputs* need to be tracked to establish commitment for action and set the budget.
2. *Outputs* need to be tracked to ensure commitments are fulfilled and people internally can be held to account.
3. *Results/outcomes* need to be tracked to know that the overall goal and the specific objectives are being met—and if not, adjustments can be swiftly made.

Combined with an effective feedback mechanism, these processes together facilitate continuous learning and performance improvement to gain efficiencies over time.

In Figure 1, ecosystem and human wellbeing are the sought results/ends, the lower bubble captures the 'means', while the central bubble identifies the need to consider: (1) both process and substance; (2) both short- and long-term time horizons; and (3) continuous learning.

The higher test of achieving a 'positive contribution to sustainability' was first articulated by Professor Robert Gibson (2000, 2002). It is a concept addressed directly by MMSD North America (2002: 7), who point out

> The above 'positive contribution to sustainability' criterion is different from, though built upon, the 'mitigation of adverse effects' criterion that is the focus of traditional environmental and social impact assessments. The implications of the shift are twofold. On one hand, the positive orientation opens the door to a much fuller treatment of the benefits that result from mining activities than has traditionally been the case with impact assessment approaches. On the other, the same positive orientation sets the assessment bar higher.

These assertions do not negate the fact that mining causes impacts, or that human and/or ecosystem wellbeing might be degraded and permanent ecosystem or social change might occur in the vicinity of the site. However, when the full lifecycle of projects/operations and products is considered, a net positive contribution to human and ecosystem wellbeing should be realized. If not, the mining/mineral activity will not be contributing positively to sustainability.

Clearly, it may be tougher to demonstrate positive contribution than to identify and mitigate negative impacts. However, by taking this approach, a fuller and fairer treatment of both positive and negative implications is facilitated than has typically been encouraged through traditional social, environmental, and economic impact analyses (Hodge, 2014b). Better decision-making will thus be facilitated. Importantly, a 'contribution' approach provides more opportunity for each interests' perspective of both positive and negative implications to be vetted in the assessment process.

This approach also shows that the concept of *sustainability* is much more than environmental protection in another guise. It is a positive concept that has as much to do with achieving wellbeing for people and ecosystems as it has to do with reducing stress or mitigating impacts (Hodge 1995; Hodge and Taggart 1992; Hodge et al. 1995; NRTEE 1993; Prescott-Allen 2001). Or, as articulated by Gibson et al. (2006: 165), 'the aim is to deliver multiple, lasting, mutually re-enforcing gains rather than just mitigation of environmental damage'.

MMSD North America (2002) point out also that these ideas veer sharply away from thinking in terms of a 'trade-off' between human and ecosystem wellbeing. There are obviously many small trade-offs in any practical application: between interests, between components of the ecosystem, across time, and across space. Gibson et al (2006: 130–41) propose a carefully considered set of six rules for dealing with such trade-

offs. However, in an overarching sense, the idea of sustainability calls for both human and ecosystem wellbeing to be maintained or improved over the long term. Contributing positively to that improvement provides the conceptual starting point for assessing the substantive aspects of mining's success.

2.2 Process

Some 40 years ago, John Rawls proposed the idea of 'overlapping consensus' (Rawls 1971, 1987). In the context of a mining operation–community relationship this idea would be achieved if community, company, and government each agreed on a way forward for their own internal reasons (Wenar 2013). Such a state reflects a consensus based on overlapping values held by different interests.

In other words, an overlapping consensus emerges when interests affirm a decision or approach from their own perspective and moral position. It is each citizen's first-best option given their own beliefs—not a citizen's second-best compromise in the face of the power of others. Simply put, Rawls argues that agreement based on an overlapping consensus is significantly stronger than a situation based on a balancing of power between interests reflected in an explicit trade-off or 'deal'. The weakness of such 'deals' is that a power shift can trigger a loss of social stability if the position of one of the parties to the 'deal' changes.[5] A values-based overlapping consensus offers a much stronger, more stable, and longer-lasting arrangement, exactly what effectively applied sustainability concepts call for.

Clearly an ideal state of overlapping consensus will not always be possible to achieve or, once established, to endure. However, it is the best route to social stability that a free society can hope to attain. It is an ideal to be sought and it fits comfortably with the framework for assessing contribution presented in Figure 1.

For any mine project—regardless of where in the project lifecycle it sits—multiple interests are inevitably implicated. Thus a critical ingredient is to use collaborative processes of dialogue and action to ensure that these participating interests (community, company, government) are heard, that they can influence decision-making, play a part in implementation, and see for themselves that their concerns are addressed.

Applying these ideas to the challenge of understanding, tracking, assessing, and publicly reporting on the 'contribution' of a mine operation to people and ecosystems over time offers a special opportunity. Through such a process, continuous learning and improvement for all interests can be facilitated. Resulting consensus on the nature and adequacy of the contribution will contribute to a sense of respect, trust, integrity, fairness, justice, authenticity, and overall security for community, company, and government that the right thing will be done in the right way. In short, social stability will be greatly reinforced.

Doing this requires the building of relationships between individuals and groups that bring different values to society, ranging across community, company, and government. Such relationships inevitably evolve over time as conditions and people's feelings change through the project lifecycle and on-the-ground experience and understanding is gained. This is not a task that can be theoretically addressed in a licensing hearing and then set aside if and when approval is received. Continuous effort by all parties through the full project lifecycle is essential.

Not surprisingly, the broad engagement of key interests and the seeking of such a consensus is one of the success factors that has emerged in achieving a 'social licence to operate'.[6] This same concern for engagement is now a central component of most mining law and regulation; it is a key part of every progressive company's policies.

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[5] Note that such a shift can occur when a change in ownership of a mining property or operation leads to reneging on company–community agreements made between the community and the former owner.

[6] The 'social licence to operate' is a concept first proposed by James Cooney, vice president of Placer Dome Inc. in 1997. See Joyce and Thomson (2000) for an early treatment of the proposition and Owen and Kemp (2013) for a useful cautionary critique.

One very successful initiative that has demonstrated the power of effective engagement is the ICMM's set of activities originally labelled 'Resource Endowment' and more recently 'Mining Partnerships for Development' (ICMM 2016). Another successful model is the Ahafo Social Responsibility forum in Ghana, now in its tenth year of seeking overlapping consensus in mining-related issues (Anderson, personal communication, 2016).

However, in spite of examples of success, there remain many examples of ineffective engagement processes across the mining industry and much remains to be learned—by communities, companies, and governments—about design and implementation of effective engagement processes. An evolving systematic compilation of examples of good and bad practice from which to learn would be very helpful.

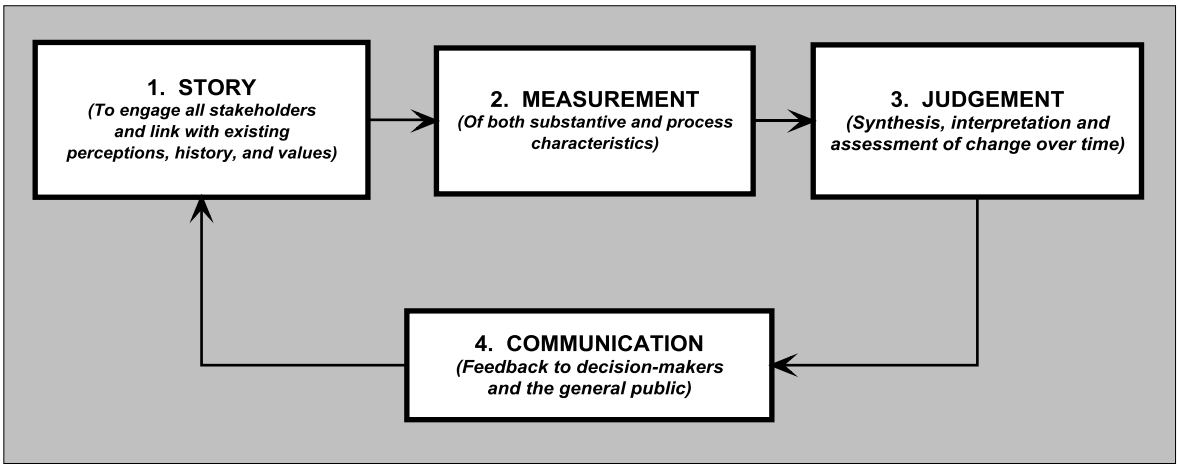
The Rawlsian-based ideal of seeking an overlapping consensus provides a strong conceptual basis for assessing the 'process' part of success in contributing to human and ecosystem wellbeing. In practical application, it creates the means to establish a scale and then to judge where on that scale current success should be scored. The ideal may not be achieved, but continuous improvement towards that ideal is essential as learning takes place.

3 Generic assessment cycle

In recent years there has been much emphasis devoted to generating clear but *measured* indicators of change. This interest has been felt within many aspects of human endeavour, including mining. It has been reinforced by the common saying 'you manage what you measure so best measure what you want to manage'.[7]

However, the real challenge is not to measure but rather to understand and track change or success with rigour and integrity using all the means available—including measurement. And while there is power in measurement, measured indicators serve as only one element of a more complex generic assessment cycle. Figure 2 shows that cycle and its four essential elements: (1) story, (2) measurement and indicators; (3) judgement; and (4) communication.

Figure 2: Generic assessment cycle



Source: Hodge (2006).

[7] Maureen Hart, an expert in community indicators and since 2013 the executive director of the International Society of Sustainability Professionals (ISSP) suggested in 1993 that 'we are what we measure, it's time to measure what we want to be.' See: www.sustainablemeasures.com (accessed 5 October 2016).

Story

Many aspects of contribution have not been or cannot be measured. But they are known about by people in the organizations and communities who carry the institutional memory. Real insight emerges through the 'story' that these people have to offer. Over the past several decades, there has been a major resurgence of interest in the role of story in policy development, decision-making, and organizational behaviour (for example, see Denning 2001; Fischer and Forester 1993). Importantly, seeking the stories of various interests offers a powerful and respectful means of engagement, particularly because the storytellers are the experts in what their values are—and their values need to play a central role in project decision-making.

Formal quality control techniques of 'story' remain less developed than for measurement. Interestingly, many earth scientists develop a capacity for 'story' because of the logic and rigour that is required in making good geological interpretations. However, the link between that skill and the same approach applied to assessing performance and progress—and a project's contribution as it evolves over time—is rarely made.

Gathering stories requires strong listening and hearing skills. These capacities have not typically been strengths of the mining industry. In general, the technically oriented people who comprise the majority of mining industry personnel have a high comfort level with numbers and counting, and a low comfort level with storytelling, particularly when the issues to be described range into social, cultural, political, economic, and environmental concerns that are outside their immediate training—but critical to understanding the values of community and government, and therefore critical to any operation.

There is much to be gained by embracing the concept of story in capturing a contribution. In many communities, the livelihoods brought by mining are important not only because of jobs, wages, and cash contributions to local charities and organizations, but more importantly because of the stability, respect, and confidence it brings to families and the community during and after the life of the mine. There are many examples of where this sense of community and psychological security based on hope in the future and the absence of fear far outweighs the significance of what may be only short-term mining income. While this side of mining's contribution defies capture in easily measured indicators, over the long run it may be more important than all the 'quantities' that are typically measured in the annual reporting cycle demanded by managers and investors. To get a sense of this part of mining's contribution requires building relationships with people so they will share their true feelings based on a mutual sense of respect and integrity.

At the same time, storytelling includes the dark side—the negative experiences. And mining, like every facet of human activity, has its share of negatives. These might include loss of life from accidents or poor design, labour strife and violence, environmental disaster, unintended contribution to a substance-abuse culture or the spread of sexually transmitted disease, the wrench of ill-prepared-for closure, or overall community discontent about lost land-uses, displacement of people from their lands, unassigned responsibilities, lack of accountability, and unfairness in the distribution of mining-related benefits, costs, and risks. By honestly sharing the bad along with the good stories, a sense of honesty and integrity can be earned that contributes to finding solutions to these challenges while building the long-term trust that is significantly more important than the details of any particular issue. A significant barrier to overcome here is the overarching attitude of legal advisers that any admission or apology that might infer liability—even by association—is to be avoided.

Measurement

In the broad sweep of history, trying to capture the nature of change over time has been a topic of interest since at least the ancient Greeks. However, the last half of the nineteenth century and through the twentieth century saw an increasing focus on counting. Lewis Mumford (1934) voiced a concern about this when he wrote:

> The new attitude toward time and space infected the workshop and the counting house, the army and the city. The tempo became faster, the magnitudes became greater; conceptually, modern culture launched itself into space and gave itself over to movement. What Max Weber called the 'romanticism of numbers' grew naturally out of this interest. In time-

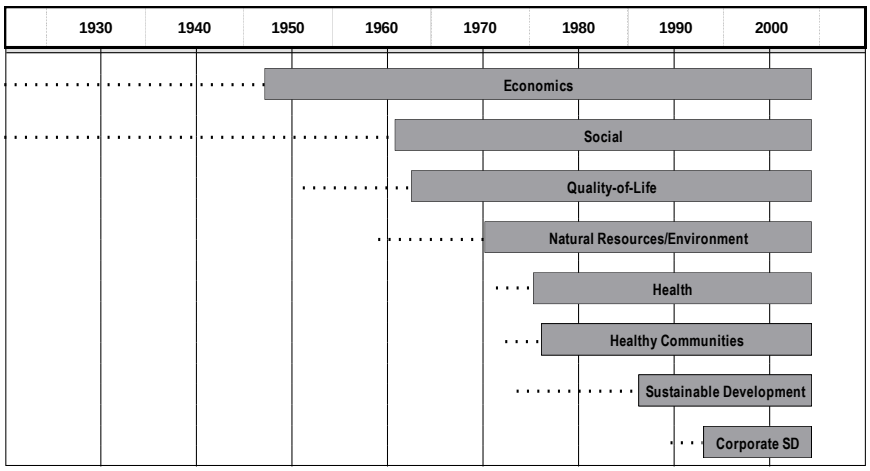
keeping, in trading, in fighting, men counted numbers, and finally, as the habit grew, only numbers counted.

Even Albert Einstein added a note of caution with a sign hung on his Princeton University office door that read *not everything that can be counted counts and not everything that counts can be counted.*

The overall power of counting can only be realized by seeing it as part of a larger generic cycle that is needed to recognize, track, record, and understand change and, in the context of this paper, the contribution of mining and metals activities. The specific role of measured or counted indicators is to provide a firm 'backbone' for assessing contribution. They serve to confirm and give confidence to the observations that are often first recognized through 'story'. And importantly, measurement often provides counter-intuitive insight that opens up whole new perspectives.

The concern for counting has led to a vast literature addressing 'indicators' coming from a range of fields across various parts of human endeavour. Figure 3 shows the extent of this literature over the past 50 years.

Figure 3: The span of the late twentieth-century indicators literature



Note: these timelines reflect the emergence of a significant 'indicators-focused' literature in the various fields indicated.

Source: Hodge (1995).

Synthesis and judgement

In tracking progress towards sustainability, whether the scale be that of the project, organization, community, industry, or political jurisdiction, the greatest challenge is to bring together the power of both quantitative and qualitative analysis in a synthesis that can be respected across all interests.

Even when 'measured' indicators have been compiled and nested in the story of place or issue, the task remains of weighing the elements and judging the significance of the gathered evidence. This means establishing the relative significance of both measured indicators and articulated story and combining the result in a synthesis that allows an overall assessment of contribution and progress.

Gibson et al. (2006: 165–79) offer a set of criteria for evaluating the significance of effects drawn mainly from the environmental assessment literature (which includes social and economic as well as ecological effects). However, while providing a strong base for establishing significance of effects, they point out that little of the available literature on this topic has been developed with sustainability criteria in mind. And in summary:

> Adopting a sustainability-based approach to assessment entails attention to the full suite of sustainability requirements and the full range of effects, positive and negative. It aims not just to avoid serious adverse effects but also to identify the most positive ways of meeting sustainability criteria, preferably through multiple, mutually re-enforcing gains. And the

> sustainability criteria—properly specified for the specific context—are to be the unifying foundation for all key decisions … this is much more ambitious than environmental assessment as usually practiced. Applying sustainability-based criteria will bring a bigger set of considerations and a more coherent and better overall agenda, into judgments about significance.

Synthesizing aspects of story and measurement in a rigorous way is essential but challenging. It is the classic problem of apples and oranges, or more realistically, rhinoceroses, daffodils, and socks. But it is a challenge that must be met.

There is much relevant experience in courts of law across the world where significance must be assigned to different pieces of evidence and those pieces weighed to draw a judgement.[8] Critically, 'reasons for decisions' are carefully developed and made public to serve as a continuously growing body of knowledge from which to draw. In this way, continuous learning concepts can be applied to the assessment processes. The importance to process integrity and trust building of developing and publicly disseminating such 'reason for decisions' cannot be overemphasized.

One leading-edge process that has been used to effectively synthesize and bring rigour to establishing significance of inputs from both story and measurement is *multi-attribute utility analysis*. Box 3 provides an example of such an application in which sustainability-driven objectives are used to assess alternative closure options. Performance against these objectives is carefully scaled to provide an effective means of comparison.

Box 3: Sustainability-driven assessment of mine closure options

The Faro lead–zinc mine project operated for roughly 30 years from the late 1960s to the late 1990s. By any standards it was large. Towards project end, ownership changed several times, and in due course the final owner declared bankruptcy and responsibility for closure and post-closure defaulted to the government of Canada working closely with the government of Yukon.

By late 2006, closure options had been narrowed to a short list of alternatives, brought to advanced engineering design, costed, and reviewed by an Independent Peer Review Panel (IRP 2007). Regardless of the strategy chosen, total closure costs (net of social costs) would exceed C$750 million over some 40 years and a perpetual stream of several million dollars would be required to cover ongoing water and materials treatment costs. By 2015, this estimate had risen to C$950 million plus ongoing water/materials treatment costs.

An 11-person, multi-interest 'Assessment Team' was formed, including participants from the federal and territorial governments, the Selkirk and Kaska First Nations, technical advisers, and the Independent Peer Review Panel that had just completed its work. The Assessment Team was directed to (1) illustrate and test a formal method for evaluating alternatives; and (2) apply the method to assess the relative performance of closure alternatives.

The Assessment Team analysis would be used as input to the extensive process of public consultation. Because of the cost magnitude and responsibility to the taxpayers of Canada, the final decision would be taken by the Federal Cabinet.

The eight sustainability-driven objectives listed below drove the entire process; they reflect the values of participating interests.

The eight objectives of the Faro Mine Closure options analysis:

1. To maximize public health and safety.
2. To maximize worker health and safety.
3. To maximize restoration, protection, and enhancement of the environment.
4. To maximize local socioeconomic benefits.
5. To maximize Yukon (regional) socioeconomic benefits.
6. To minimize cost.
7. To minimize restrictions on traditional land use.

[8] A similar 'weight-of-evidence' approach was adopted long ago by the government of Canada for addressing a broad range of social and environmental issues (see Canada, 1993).

8. To minimize restrictions on local land use.

A form of multi-attribute utility analysis was then applied based on the assumption that the best alternative will be the one that best meets the most objectives. A negotiated process of scoring and weighting was undertaken in which the Assessment Team collectively estimated the performance of each alternative against each objective in each of two time frames: (1) short term—the initial 40 years involving a 15-year construction period and a 25-year period of monitoring and adjustment; and (2) long term—the post-short-term period extending out some 500–1,000 years.

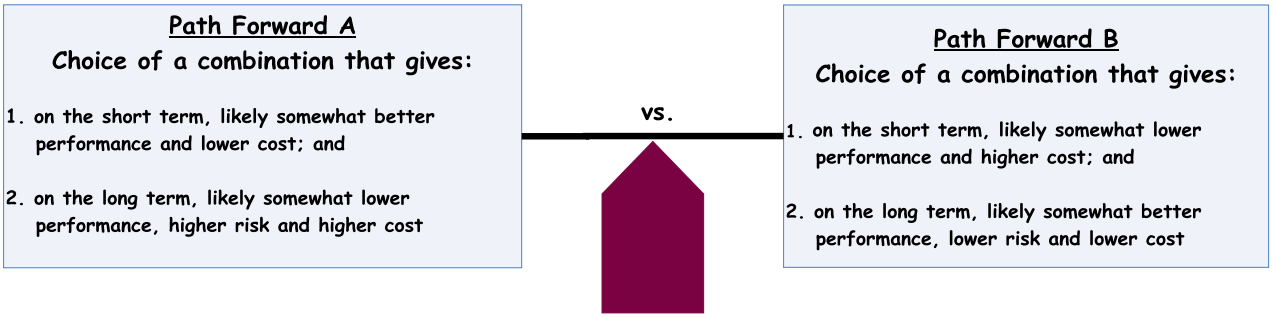
To account for risk, each alternative was also scored under two operating scenarios: (1) a normal scenario that assumed the alternative would perform as designed and that no unexpected risk events would occur; and (2) a risk scenario (or scenarios) in which Assessment Team members specified specific risks events (such as dam breach leading to tailings release, transportation accidents, and failure to provide necessary funding leading to inadequate maintenance and subsequent containment failures). Each risk scenario was assigned probabilities to indicate the likelihood that these risk events would occur.

Three sets of results were developed:

1. An unaggregated objective-by-objective assessment of each alternative.
2. An aggregation of the objective-by-objective results plus a sensitivity analysis that varies the weights in the aggregation equation.
3. For comparison purposes, a classic benefit–cost analysis, also undertaken on an objective-by-objective format.

The assessment results suggested that the final decision may require choosing between (a) a less expensive combination of alternatives that is perceived most likely to perform slightly better in the short term but which will pose somewhat higher risk, higher cost, and slightly lower performance in the long term; and (b) a more expensive combination that is perceived to most likely be slightly poorer performing in the short term but characterized by lower risk, lower cost, and slightly better performance over the long term.

Figure B3.1: The choice ahead



Source: Hodge and Merkhofer (2008).

However, a more overarching conclusion was that the best path forward may only emerge over time—as greater technical and social understanding comes to light. It may result from a strategy that combines elements of current thinking in a way that improves performance on some or all of the objectives while reducing risk. This does not imply a different technical alternative but rather would depend on an *implementation strategy* that more thoroughly addresses some of the issues of greatest concern to participating interests. Here again, the critical importance of the values-sharing process emerged—not simply the technical substance.

In this particular part of the deliberation, two priority issues of concern emerged. The first was the issue of financial surety. Doubt existed that ongoing financing could be assured, given the time horizon that needed consideration. As a result, more extreme risk scenarios were scored more pessimistically than they might have been if there were greater confidence that resources to ensure ongoing implementation would be available when required.

Second, significant unknowns remained about technical performance in the long term—the experts did not always agree. Experience at design and implementation of engineered systems with time horizons of hundreds of years is only now accumulating. Although technical research can enhance understanding and is needed to do so, there will inevitably be surprises within the hundreds of years that this system will be in place. Therefore, an important way to build confidence in system performance is to design, implement, monitor, and adjust to the inevitability of changing and unexpected conditions. As a result of this, the project committed to an *adaptive management* approach the details of which would only become clear over time.

Within the multi-interest Assessment Team, a consensus emerged on the set of options that would make the greatest contribution to human and ecosystem wellbeing over both the short and long term in terms of the eight objectives

that drove the assessment process. The results of these deliberations were fed into the much more extensive public consultation that followed and a consensus agreement by all interests was achieved on the best way to proceed with closure of the Faro Mine Project. The project is now ongoing, following the adaptive management approach that was agreed upon.

Source: Hodge and Merkhofer (2008).

An important feature of the application described in Box 3 is the use of risk analysis and alternative risk scenarios, which greatly strengthens the insight that emerges.

Communication

All is for naught without effective communication with all of the interests involved in a project. Communication is a two-way process. So the starting point of this is *listening*, not telling. Listening to the stories, listening to what is important to others and, through that, developing a sensitivity to others' culture and values. If that is done, the chances of being able to then *tell* in a way that is appropriate to the listener is greatly enhanced.

Summary

In summary, each aspect of the assessment cycle requires a special skillset. No one person has all of these. Those expert in story may not be those expert in measurement. In fact, those comfortable with story are often uncomfortable with the rigour of counting and vice versa. This is the classic cultural divide between those trained in the hard sciences and those in the social sciences and humanities. Not surprisingly, 'storytellers' and 'bean counters' often have difficulty communicating because they think in different terms. However, neither storyteller nor bean counter may be proficient in synthesis, weighing evidence, and making judgements about significance. Further, none of these groups are necessarily effective at communicating. The inevitable conclusion is that a multidisciplinary team is essential for success.

The assessment cycle described above is generic, whether the application be the annual performance review (of an individual, company, government, or country) or the broader issue of assessing mining and metals' contribution to sustainability-driven success as discussed in this paper.

3.1 The particular challenge of attribution

Almost always, a mining/metals operation is one of a number of contributors to the state of social, cultural, economic, and ecological conditions. Individuals, households, communities, other companies, and organizations within and outside the market system and governments also play important roles, often defined and bounded by law. In fact, a significant issue that is all too common can arise when boundaries of responsibility between community, company, and government become blurred.

In one sense, if well-meaning participating interests find common ground, there may be no fundamental need to attribute proportions of credit to any one player. However, companies, communities, and governments must operate within strictly defined boundaries—shareholders, citizens, and voters demand it to ensure accountability. Good intentions are not adequate. Thus, a central question remains of how to apportion contribution—positive and negative—among interests when multiple interests are contributing.

For measurable indicators such as the following, clear-cut answers to the attribution issue can be established, provided accurate statistical systems are in place and maintained:

- standard project key performance indicators—production cost numbers relative to the expected mine life, financial numbers tracked by company management;
- supplies and services drawn from the local community and region;

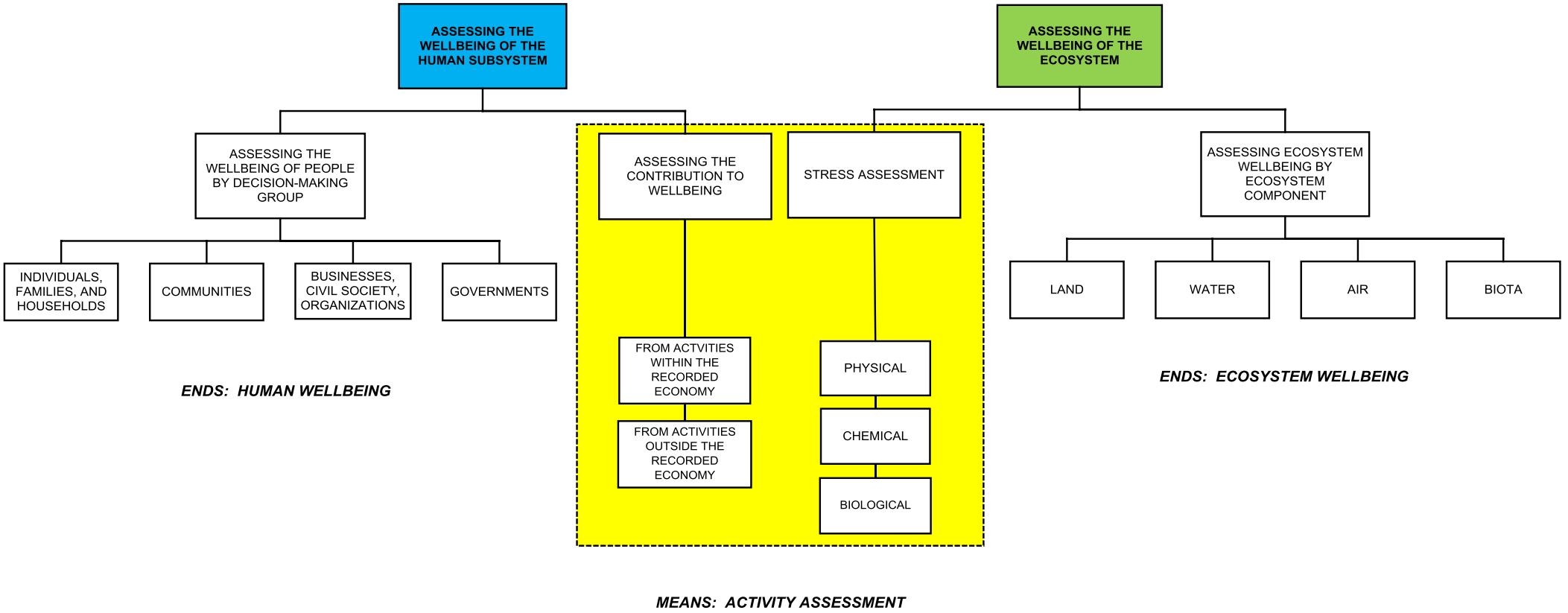
- employment numbers (primary, secondary, tertiary);
- household members associated with employees and their participation in community activities;
- payment of taxes, royalties, licences, and fees; and
- contributions to local infrastructure, charities, and a range of civil society organizations (sport, cultural, recreational, advocacy, education).

Unfortunately, the above numbers do not get at the feeling of a community about the presence of a mining project, their sense of fairness about the distribution of benefits, costs, and risks, and, most importantly, the feelings of a community about itself—its own sense of current and future security and wellbeing. This part of contribution can only be accessed by talking to people and drawing out their stories in a way that is acceptable to local cultural norms. On this front, all interests—company, community, and governments—are at an early stage of learning about how best to do this. There is no formula to draw on for apportioning contribution on this front when it is essential to do so—only the use of common sense and courtesy in processes of open and collaborative assessment that are marked on all sides by respect and integrity.

4 Contribution analysis in practice

Figure 4 translates the concepts of Figure 1 into the form of a high-level hierarchical system. It maps elements from the most general (above) to more detailed (below). At the lowest level, each element can be further disaggregated. Note that such a hierarchical form does not imply that the most important element is at the top. Rather, following the concept of 'panarchy' proposed by ecologists Gunderson and Holling (2009), the most important element at any given time may turn up anywhere in the 'hierarchy'.

Figure 4. Assessing contribution—hierarchical system, but in function a *panarchy*



Source: author.

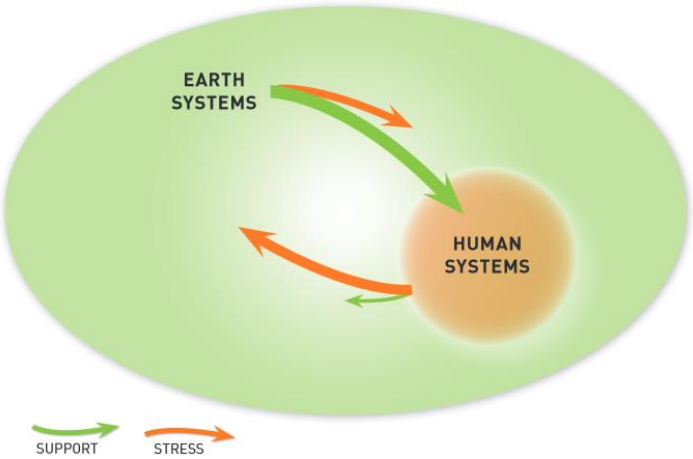
Figure 4 shows the three broad categories important to assessing contribution: (1) to human wellbeing (in blue); (2) to ecosystem wellbeing (in green); and (3) to the activities that generate or detract from that contribution (in yellow). This broad categorization applies whether the scale of application is the individual, household, community, company, government, nation, or beyond. However, the details of each would vary depending on the scale, boundaries of enquiry, and application.

In this case, human wellbeing is considered in terms of four broad groups of 'decision makers': (1) individuals, families, and households; (2) communities; (3) businesses and civil society organizations; and (4) governments.[9] This classification is particularly useful because: (1) if the wellbeing of these four decision-making groups is high or is threatened together or individually, it closely reflects the overall state of human wellbeing (regardless of scale from local through regional to national); (2) each of these groups or interests (to varying amounts depending on a given society) plays a critical role in bringing change and improvement; and (3) data and information about these four groups are relatively easy to access.

For its part, ecosystem wellbeing is shown disaggregated in four parts: (1) land, (2) water, (3) air, and (4) biota (living organisms). This categorization is useful in that it reflects the regulation of human activity and the organization of many relevant departments of government, business, and civil society organizations. However, ecologists have rightly pointed out that such a compartmentalization of the ecosystem does not effectively capture the state of structure, function, and diversity. Nor does it address systemic flows (for example of energy, nutrients, and materials) within the ecosystem nor the holistic nature of the ecosystem itself. It is thus deficient from an ecological perspective. Another option is to use this categorization (to facilitate a link to governance and decision-making) but include an additional form of analysis and synthesis that speaks to ecologists' concerns.

The third category focuses on our means to achieve the wellbeing that is sought. As shown in Figure 4, our activities always generate some balance of 'support' and 'stress' (the positive and the negative) that add up to some degree of contribution to human and ecosystem wellbeing. Not to be forgotten, however, is that the natural ecosystem similarly not only provides nourishment to human kind but from time to time generates significant stress from extreme natural events such as drought, extreme rainfall, earthquakes, tsunamis, volcanic eruptions, and explosive diseases (Berger 2007). A high-level systems representation of this symbiotic relationship is shown schematically in Figure 5.

Figure 5: A high-level systems representation of the human–ecosystem relationship



Source: Hodge (2014a).

To develop an understanding of this from a community or societal perspective requires a consideration of activities both within the market economy (for example as organized by the standard industrial classification)

[9] This categorization was first suggested by Alex Michalos (personal communication 1992), the founding editor (in 1972) of the *Journal of Social Indicators Research*. It was adopted by the Sustainable Development Reporting Task Force of the Canadian Prime Minister's National Round Table on the Environment and the Economy (NRTEE 1993).

as well as those outside the market economy (for example housework and volunteer/not-for-profit activities). A useful description of the nature and richness of volunteer/not-for-profit activities is provided by the United Nations/John Hopkins University classification of not-for-profits (United Nations 2003).

The above discussion is generic and societal in scope. This discussion now turns to application for operations within the mining and metals industry.

An approach that greatly facilitates navigation of this maze can be borrowed from the auditors who use concrete and specific questions for which answers can be sought in practical terms. This approach is championed in the 2003 multi-interest work 'Seven questions to sustainability—how to assess the contribution of mining and metals activities' (MMSD North America 2002). Figure 6 provides the high-level seven-question framework that emerged in the MMSD North America work.

Figure 6: The MMSD North America framework: 'Seven questions to sustainability—how to assess the contribution of mining and minerals activities'

Source: MMSD North America (2002).

For each question, an ideal answer can be offered and then data and information sought that will facilitate crafting a response for the application at hand that allows an assessment of how close to the ideal is being achieved. An example is shown in Box 4.

Box 4: Ideal answer example

Initial question in detailed form

Engagement. Are processes of engagement committed to, designed and implemented that:

- ensure all affected communities of interest (including vulnerable or disadvantaged sub-populations by reason of for example, minority status, gender, ethnicity or poverty) have the opportunity to participate in the decisions that influence their own future; and
- are understood, agreed upon by implicated communities of interest and consistent with the legal, institutional and cultural characteristics of the community and country where the project is located?

Ideal answer

Satisfactory processes of engagement have been designed and implemented that:

- ensure all affected communities of interest (including vulnerable or disadvantaged sub-populations by reason of for example, gender, ethnicity or poverty) have the opportunity to participate in the decisions that influence their own future; and
- are understood, agreed upon and consistent with the legal, institutional and cultural characteristics of the community and country where the project is located.

Example Indicator 1.1: Engagement Processes are in place for all phases of the project/operation lifecycle to serve as a mechanism for: (1) collaboratively identifying desired objectives, best approaches for gathering evidence in support of achieving objectives (quantitative and qualitative), assessment criteria and trade-offs and the bases for judging trade-offs; and (2) overseeing the application of the approach to assessing the contribution to sustainability articulated here.

Example metrics

- Comprehensive mapping of interests are completed: yes/no
- The design of an engagement strategy has been completed including guidelines that are agreed upon by all interests: yes/no
- Effective implementation is achieved as signalled by participant satisfaction indicated by a periodic survey that is jointly completed by company, community and government: yes/no

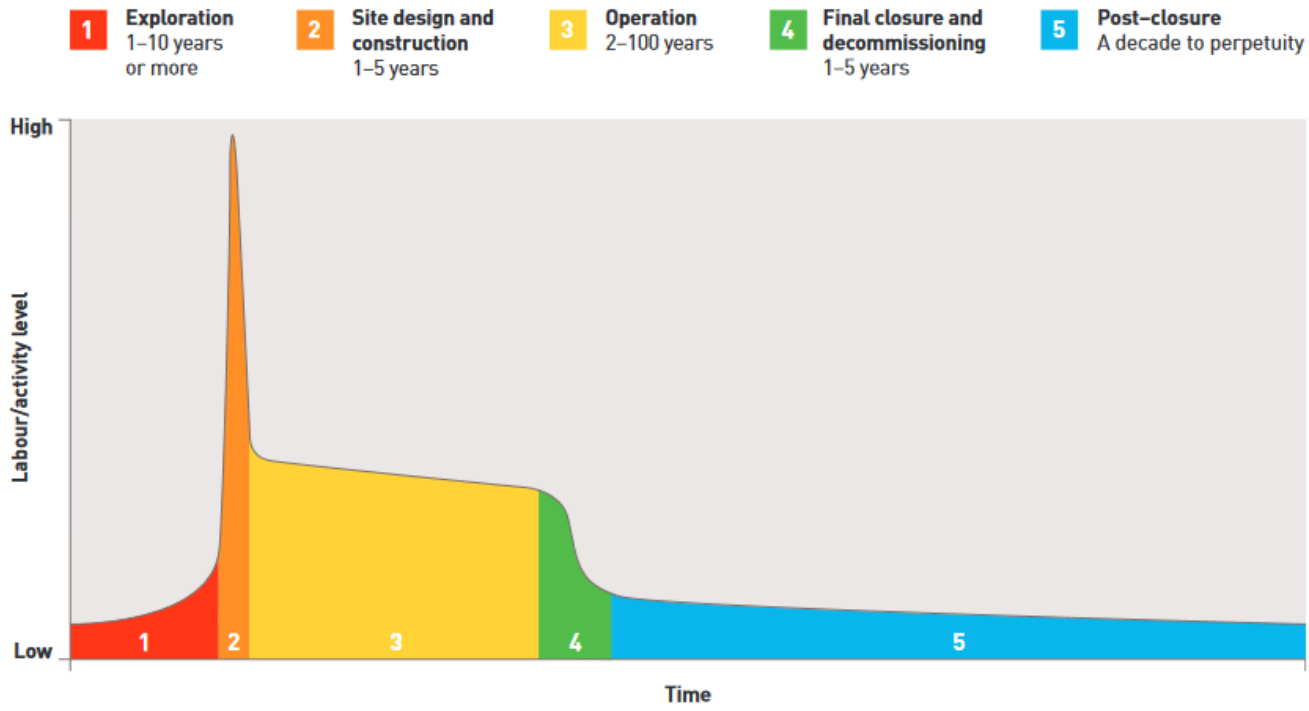
Source: MMSD North America (2002).

A detailed summary of the approach described above is provided in MMSD North America (2002), including a catalogue of various sub-elements, indicators, and specific metrics. A synthesis of the answers to all seven questions can then serve as the foundation for a multi-interest assessment of contribution achieved (or sought or not being achieved) in which different parties are motivated by different but almost always overlapping sets of values.

To be effective, the process of assessing contribution needs to be ongoing from project inception through the full lifecycle, not simply to be undertaken once to obtain a legal or social licence to operate. A concrete assessment and reporting schedule is required that matches the project time horizon.

Figure 7 shows the mine project lifecycle in terms of different levels of human activity on-site. There is a great variation in activity levels throughout and the related implications to human and ecosystem wellbeing, all of which need consideration.

Figure 7: The mine project lifecycle with indicative activity levels



Source: ICMM (2012).

Boxes 5, 6, and 7 provide three concrete examples of steps that have been taken towards contribution analysis.

In Box 5, a precedent-setting approval process is described that is based on a project's projected contribution to sustainability. This is the 1997–2002 assessment and approval of the Labrador-based Voisey's Bay nickel project, the first major mining project to have its initial approval process driven by sustainability criteria

Box 6 provides an application of the 'Seven questions to sustainability' approach while also drawing on the full generic assessment cycle. In this case, it is the work of the Tahltan First Nation in British Columbia in an assessment of their relationship with the mining industry 50 years ago, today, and projecting how they would like it to be 50 years in the future. It is a powerful example of capturing this evolution.

In today's world, the issue of poverty alleviation and addressing the imbalance between haves and have-nots is a mounting concern. It is the highest priority issue that is addressed by the SDGs adopted by the United Nations in November 2015. Box 7 addresses the issue of mining's contribution to poverty alleviation in general and offers an approach to tracking and assessing mining's contribution to poverty alleviation.

Box 5: Mine/mill project approval based on assessment of projected contribution to sustainability

Voisey's Bay's rich deposits of nickel with associated copper and cobalt in Labrador were discovered in 1993. Regulatory processes were initiated a few years later and in 2002 approval in principle to proceed with the close to C$3 billion project was signed by the five key participating parties—INCO the mine owner (since acquired by Vale of Brazil), the government of Canada, the government of Newfoundland, and two First Nations—the Innu Nation and the Labrador Inuit Association. It covered the mine/mill complex at Voisey's Bay plus a closely linked metal processing/refining operation to be established at Argentia, Newfoundland.

The environmental assessment process that led to the approval to proceed was a landmark in both Canadian and global assessment practice because it introduced 'contribution to sustainability' as the basic test of acceptability. Explicitly, the presiding Panel stated:

> It is the Panel's interpretation that progress toward sustainable development will require the following:

- the preservation of ecosystem integrity, including the capability of natural systems to maintain their structure and function and to support biological diversity;
- respect for the right of future generations to the sustainable use of renewable resources; and
- the attainment of durable and equitable social and economic benefits.

Therefore, in reviewing the EIS (environmental impact statement) and other submissions, the Panel will consider:

- the extent to which the Undertaking may make a positive overall contribution towards the attainment of ecological and community sustainability, both at the local and regional levels;
- how the planning and design of the Undertaking have addressed the three objectives of sustainable development stated above;
- how monitoring, management and reporting systems will attempt to ensure continuous progress toward sustainability; and
- appropriate indicators to determine whether this progress is being maintained

(Voisey's Bay Mine and Mill Environmental Assessment Panel 1997: s3.3)

The above requirements meant that for the first time, a proponent was obligated to go beyond the avoidance or mitigation of significant negative environmental effects (defined broadly to include aspect of the human as well as biophysical environment) to address a much higher test—the achievement of a positive overall contribution towards the attainment of ecological and community sustainability both at the local and regional scales.

As a result of the review process (and including some very tough discussions), INCO reduced its planned use of a 20,000 ton/day processing plant to 6,000 ton/day, extending the mine life to some 30 years while significantly enhancing the opportunity for the community to build a more lasting economic base. Additional means of meeting the higher test were enshrined in the 2002 Approval in Principle that included:

- an environmental co-management agreement to monitor project effects and project modifications;
- impact and benefit agreements between the company and the two First Nations that allow the project to proceed on traditional lands in return for revenue sharing, local employment and contracting, training programmes, and community roles in ongoing review of project implementation; and
- commitments to address additional details in special Voisey's Bay chapters in land claim final agreements with the Inuit and Innu.

Adoption of the sustainability-based decision criteria based on achieving a net positive contribution changed how the main issues were addressed, how the project was designed, and what was approved. Further, it shifted the focus from the mitigation of negative effects during the life of the mine to attaining net gains over the long term. Critically, it entrenched a collaborative and ongoing process for monitoring and reporting on project performance against the sustainability-based criteria.

Now in 2016, the project is well into operation. A strong foundation has been established for long-term success, but the critical test will come when it enters the closure and post-closure phases.

Source: Gibson et al. 2006: 1–13.

Box 6: Community assessment of mining's contribution—past, present, and future

The traditional territory of the Tahltan people covers some 100,000 km² in north-western British Columbia. They have been involved in providing services for mining exploration for well over 50 years. Increasingly they have been active in mine development, mine closure, and post-closure monitoring and follow-up. In the spring of 2003, they set out to:

1. assess the relationship—past, present, and sought future—between themselves, their land, and the mining industry, taking into consideration activities on their traditional territory from exploration through operation, closure, and post-closure; and
2. build a strategy to guide that relationship in the future.

Seeking an outcome that would be beneficial for both themselves and the mining industry, they convened a multi-interest symposium involving the Tahltan people, government, and industry. The 'seven questions to sustainability' assessment framework (MMSD North America 2002) was used to guide both the assessment process and design of the resulting 'Tahltan Mining Strategy'.

Answers for each of the seven questions were developed by the community and other interests (government and industry) for three time periods: (1) past (1950 to early 1990s), (2) present (2003), and (3) future (desired). For the third category, specific actions were identified that would facilitate achieving the desired future.

The process involved completing the following matrix for each of (1) exploration, (2) operation, and (3) closure/post-closure activities that had, are, or will occur on their traditional territory.

Time period	*Engagement* *Are engagement processes in place and working effectively?*	*People* *Will people's wellbeing be maintained or improved?*	*Environment* *Is the integrity of the environment assured over the long term?*	*Economy* *Is project economic viability assured; will the economy of the community and region be better-off as a result?*	*Bush/non-market* *Are bush/non-market activities better-off as a result?*	*Institutions and governance* *Are rules, incentives, programmes and capacities in place to address project consequences?*	*Synthesis, continuous learning* *Does a full synthesis show that the net result will be positive in the long term; is there periodic re-assessment?*	*Summary of situation at that time*
Past *(e.g. 20–50 years ago)*								
Present								
Desired Future *(including specific actions required)*								
Summary of trends over time								

The three matrices were completed using both available data and experiential anecdotes of elders and others in the community. The assessment process and final report were driven by the community.

The Tahltan Nation made it very clear that they were prepared to support mining activities as long as mining interests and government respected their values and concerns and that a fair distribution of benefits, costs and risks, responsibilities, and accountabilities could be achieved.

The collaborative assessment process combined with the seven-question framework provided a means to fairly and openly treat not only direct and indirect employment and local procurement of services, but also more sensitive and difficult issues that included:

1. innovative collaborative approaches to the overall management/co-management of mining-related activities;
2. how to move towards a fairer distribution (considering all participating interests) of all benefits, costs, and risks; and
3. more effective approaches for addressing environmental and health/social/cultural implications of mining/mineral activity that in their view continue to receive inadequate attention.

Source: Tahltan Nation and the International Institute for Sustainable Development (2004).

Box 7: Strengthening mining's contribution to poverty alleviation

In November 2015 and building on the early MDGs, the United Nations General Assembly adopted 17 SDGs. Highest priority among these is the first goal, which deals with poverty alleviation. This short discussion focuses on strengthening mining's contribution to poverty alleviation. In doing so, it weaves together threads of two thought processes that emerged simultaneously on opposite sides of the world.

On Saturday, 7 September 2013, the Vatican's Pontifical Council on Peace and Justice convened a day of reflection involving some 25 from the mining world and 15 from the Church and related civil society. The following Monday, 9 September 2013, the Integrity of Creation Working Group, of the Justice, Peace and Integrity of Creation Commission of the International Union of Superiors General convened a meeting of some 20 individuals representing 15 religious orders of the Catholic Church along with the president of the International Council on Mining and Metals. In both cases, the focus of discussion was the role of mining activities, particularly in low- and middle-income countries, and how the contribution of these activities could be strengthened for host communities and nations.

This 'faith outreach' that brought together elements of the mining industry with those of the Catholic Church (and subsequently the Church of England and Methodist Church) was sparked by Mark Cutifani, the CEO of Anglo American, motivated by a belief that mining interests urgently needed to reach out and interact with other key interests—both to better understand others' perspectives while at the same time, sharing mining's story about its role in contemporary society and the efforts that were underway to harmonize these efforts with the values of society.

The Integrity of Creation Working Group met again on 14 May 2014, and zeroed-in on the key issue of mining's role in poverty alleviation. They did so because of: (1) the importance and urgency of this issue; (2) their recognition of the potential significant and positive results of a contribution from mining on this front; and (3) a sense that to gain trust, the mining industry needed to send a concrete signal that they were not simply following a course of 'business-as-usual', in spite of many fine words being expressed to the contrary.

While these events were proceeding, Jim Cooney, a former vice president of Placer Dome Inc. (a large Canadian gold-mining company that subsequently merged with Barrick Inc.) was also reflecting deeply on mining's role in poverty alleviation. In a short note entitled *Mining within the Context of a 'Preferential Option for the Poor'* Cooney (2014) pointed out that while mining contributes demonstrably to economic growth in host countries and local areas of operations, it also tends to widen the income gap. Or, the rich get richer faster than the poor get richer.

Cooney argued that this is because the distribution of wealth generated by mining is skewed in favour of the haves against the have-nots. In turn, this is because mine-generated wealth is more likely to be directed into the hands of those with the greatest ability to capture and capitalize on that wealth. For their part, the poor are not only less able to take advantage of it, but greater numbers of poor compared to rich mean that the share of wealth that is captured is diluted. And since poverty has both an absolute and a relative dimension, even though incomes per family may increase as a statistical average or as a real experience in many households, a widening income gap can lead to a sense of growing poverty among the poor.

Drawing on his corporate experience, Cooney also pointed out that a few simple steps taken by mining companies would greatly strengthen mining's contribution to poverty alleviation. He proposed that companies review the following:

1. **Knowledge base.** Commit to developing a comprehensive and in-depth understanding of poverty around their operations, keeping in mind the political, social, cultural, psychological, and environmental aspects of poverty, as well as its physical dimensions in terms of nutrition, health, housing, and personal security. This would mean improving baseline social impact assessments of local communities in a manner that would better capture the nature, causes, and effects of poverty in all of its dimensions, in both absolute and relative terms,

including a risk assessment of a possible widening of the income gap in local communities based on a distribution of benefits biased to favour the haves over the have-nots.

2. **Make poverty reduction an explicit corporate objective.** Incorporate the objective of narrowing the income gap in local communities within the mining industry's sustainable development framework and work collaboratively with others to develop practical approaches for bringing about a more equitable and sustainable distribution of the benefits from mining. As part of this, include poverty reduction, in relative terms as well as absolute terms, on the agenda in negotiations with community leaders and government officials concerning the impacts and benefits of proposed mining projects.
3. **Track change collaboratively, adjust if need be**. Assess regularly the changes in the income gaps in local communities, and if widening is evident, adopt corrective interventions.
4. **Embrace a Poverty Action Plan for the marginalized**. Contribute in concrete terms to the empowerment of the poorest segments of local communities and to their improved quality of life through the establishment and strengthening of local civil society institutions that are able to assert and advance the best interests of communities within the communities themselves and with higher governmental authorities.

Cooney's ideas were communicated to the Integrity of Creation Working Group and reviewed at their May 2014 meeting. They in turn adopted them and in addition called for: (1) ensuring that all subsidiaries and service providers were included in the envelope of any given operation, and (2) industry consideration of participating in the United Nation's Universal Human Rights Periodic Review—a Human Rights review of each member nation conducted every four years (Integrity of Creation Working Group 2014).

Strengthening mining's contribution to poverty alleviation as suggested above:

1. is central to strengthening mining's contribution to human and ecological wellbeing over the long term—the core idea of sustainability;
2. in form is nothing more or less than what any company would do to address other objectives that they would prioritize; and
3. as is argued for in this paper, includes an ongoing collaborative process aimed at understanding and tracking success at enhancing mining's contribution to poverty alleviation—and triggering corrective actions if needed—to ensure that over time mining's presence is contributing to the reduction of poverty, not serving to exacerbate it.

The examples provided in Boxes 5, 6, and 7 provide concrete evidence of the inevitable evolution towards contribution analysis as described in this paper.

5 Progress made, progress needed

Over the last 25 years, dozens of initiatives have been implemented aimed at strengthening mining and metals' contribution to human and ecosystem wellbeing. The examples in the previous section provide strong evidence for the evolution underway towards the use of an integrated and ongoing assessment of success at achieving that contribution. However, the full step has not yet been taken. The task urgently needs addressing.

The elements needed for assessing contribution are available, the conceptual foundation is clear, and effective practice of various steps along the way has been demonstrated. In short, much progress has been made. However, the majority of companies, communities, and governments have yet to commit to assessing contribution even though the practical benefits of doing so are clear. Instead, they focus most of their attention on the identification and mitigation of 'impacts'—something that is deeply entrenched in law and regulation. This remains the situation, even though the benefits of shifting the emphasis to encouraging a net positive contribution over the long term are clear. This gap is contributing to the ongoing tensions that exist between communities, companies, and government.

The paper makes the following six assertions.

1. **Foundation in applied sustainability.** Contribution assessment must be driven by the interlinked ideas of sustainability and sustainable development. At the core is a value set best described as parallel care and respect for people and the enveloping ecosystem, both today and over the long term.
2. **Positive contribution is the fundamental test.** Achieving a 'net positive contribution to human and ecosystem wellbeing over the long term' should be adopted as the fundamental test for project approvals and ongoing success, including careful and respectful inclusion of local and regional perspectives. This is a higher test that shifts the focus from the mitigation of negative effects during the life of the mine to attaining net gains over the long term. However, it is a fairer approach and provides greater opportunity for the perspectives of all interests to be addressed explicitly. Importantly, contribution analysis is needed to re-establish trust in approvals processes, and to reduce the ongoing tensions that lie between community, industry, and government. The shift will require a change of culture on all sides.
3. **Three-part fundamental components.** Assessing contribution should be based on understanding and tracking three considerations: (1) the end result of human wellbeing; (2) the end result of ecosystem wellbeing; and (3) the 'support' and 'stress' provided by the community, company, and government that add up to some degree of contribution to human and ecosystem wellbeing. Doing so thus spans both results/*ends*—human and ecosystem wellbeing—and *means*—the success of market and non-market activities and our governance systems at achieving those ends. Each of these three considerations can be mapped out in a hierarchical form from the general to progressively more detailed sub-components to facilitate tracking the performance of both components and the whole.
4. **Four-part assessment cycle.** For effective assessment of contribution, a generic assessment cycle is essential, which includes compilation of insight through both story and measurement, a rigorous form of judgement of significance and synthesis, and careful communication that includes listening and respectful sharing of results.
5. **Consideration of substance and process.** Contribution has both a substantive and process dimensions. Both must be addressed.
6. **Consideration of full project and product lifecycles**. Contribution analysis must span the full project and product lifecycles. This will involve projections and significant unknowns, with the result that the overarching assessment will evolve as knowledge is gained through continuous learning and following an adaptive management strategy.

Extractive industries are *bridging activities* that are taking us from now into the future (MMSD North America 2002). They are not 'sustainable' in and of themselves but their contribution to human and ecosystem wellbeing should be—and needs to be tested for, tracked over time, and with so many unknowns, a learning culture instilled if we are to achieve the kind of insights for low- and middle-income countries that this project is seeking.

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