MEASURING THE NON-FISCAL COSTS AND BENEFITS OF EXTRACTION

JULY 2017

PREPARED FOR

The Natural Resource Governance Institute

PREPARED BY

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Natural Resource Governance Institute

Measuring the non-fiscal costs and benefits of extraction

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Questions and Comments

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Author

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EXECUTIVE SUMMARY

MEASURING THE NON-FISCAL COSTS AND BENEFITS OF EXTRACTION

i. overview

Oil, gas and minerals projects have the potential to provide their host countries with substantial fiscal revenues: financial flows to the state such as royalties, taxes and levies.

Thanks to widely accepted standards for financial accounting, these fiscal revenues can be modelled, acquitted, audited and disclosed by governments, extractive companies and their observers.

The same is not true for the 'non-fiscal' costs and benefits of extraction: the positive and negative social and environmental impacts that result from extractive projects. Unlike their fiscal counterparts, the non-fiscal impacts of the extractive sector tend to be underestimated, under-measured and under-reported by industry, governments and markets alike.

The failure to adequately model and measure the non-fiscal costs and benefits of the extractive sector makes it difficult for politicians, regulators, investors, citizens and impacted communities to govern and manage the net impacts of extractive projects at the local, regional, national and transnational levels.

This report presents an overview of the tools and methods available for modelling and measuring the non-fiscal costs and benefits of extractive projects. The report was commissioned by the Natural Resource Governance Institute (**NRGI**) to assess opportunities for integrating non-fiscal tools and methods into NRGI programmes.

The methodology for the study included search-engine searches for articles and reports, stakeholder questionnaires and interviews, and questionnaires for each NRGI priority country.

> ***THIS REPORT PRESENTS AN OVERVIEW OF THE TOOLS AND METHODS AVAILABLE FOR MODELLING & MEASURING THE 'NON-FISCAL' COSTS & BENEFITS OF EXTRACTIVE PROJECTS.***

ii. key findings

01. // Profile of non-fiscal tools & methods

The study identified 73 tools and methods that model or measure non-fiscal impacts[1].

Eighty-nine percent of the tools and methods identified in the study quantify impacts to natural capital[2]. Social capital (36%) was the next most frequently measured capital, followed by financial capital (29%), human capital (25%), cultural capital (15%) and physical capital (10%).

The specific types of impacts measured by the tools and methods were general environmental impacts (36%), total impacts[3] (21%), general social impacts (16%), biodiversity (13%), water consumption or pollution (11%), and air, climate or greenhouse gas emissions (3%).

Most tools and methods identified use quantitative (92%) or qualitative (59%) methods to quantify impacts; a number of tools also assign a monetary value to impacts (24%).

The majority of tools and methods measure impacts at the enterprise (42%), site (37%) or multiple levels of analysis (18%); only 3% of tools and methods assess impacts at the industry level. Approximately half of the tools and methods identified have been applied to the extractive sector (51% of total tools), with others also being applied in the construction, transportation and agricultural sectors (6% for each sector).

02. // Rating and visualisation of non-fiscal tools & methods

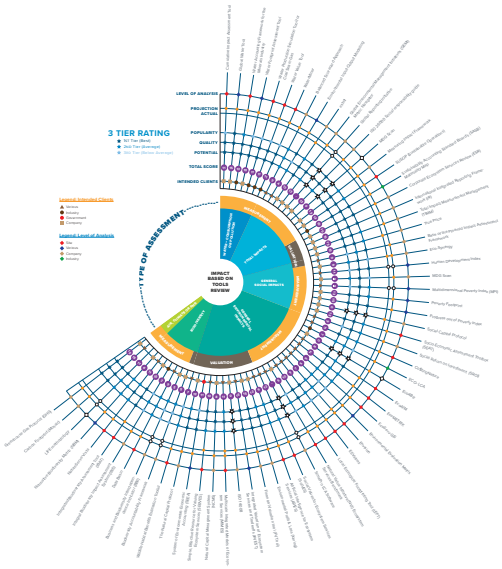
The study distinguished between methods and tools when assessing the popularity and potential of existing methodologies.

A 'method' is a general technique for assessing non-fiscal impacts, with prescribed principles, approaches or processes for data collection, analysis and reporting. The most frequently identified methods were Input-Output Models (39%), Ecosystem Service Valuations (28%), Triple-Bottom Line approaches (12%), Impact Analysis (7%), Footprinting methods (5%) and Life-Cycle Analysis (2%).

A 'tool' is a specific assessment instrument that typically operationalises one or more general methods, and is sometimes subject to proprietary rights. All tools were rated by popularity, quality and potential for application to the extractive sector to generate a measure of overall utility. High-potential tools are shown on pages 34-39 of this report, and full reviews of each tool are included in Appendix C.

As shown in Figure 1, a 'circumplex' was also developed to visualise tools across the various capitals, impact types and levels of analysis[4].

FIGURE 1
NON-FISCAL MEASUREMENT CIRCUMPLEX



03. // No single tool or method is capable of measuring all impacts

No single tool or method is capable of measuring all material non-fiscal impacts in a way that is 'extractive sector-ready'.

1 The term 'measure' is often used throughout the report to include both measurement 'tools' and 'methods'.

2 Tools and methods often measure more than one type of capital or specific impact.

3 Total impacts are defined here as impacts that measure both social and environmental impacts.

4 See Figure i.1 for an extract of the circumplex. The full circumplex is shown on Page 32-33.

Rather, the selection of a general method or tool to guide the overall approach to non-fiscal measurement, coupled with specialised tools to measure specific impacts, would appear to offer governments and stakeholders the best approach when using existing measurement methodologies.

When selecting a general method to guide the overall framework for assessment, some level of customisation to the extractive sector may be required, with the exception of the SUSOP tool which was developed for the extractive sector.

04. // Standardisation initiatives

With the emergence of tools and methods to measure non-fiscal impacts, there is a need to standardise accounting and measurement protocols to improve interoperability, utility and practicality for end-users. Among these standardisation initiatives are:

- Natural Capital Coalition's Natural Capital Protocol.
- World Business Council for Sustainable Development's (**WBCD**) Social Capital Protocol.
- Global Reporting Initiative's (**GRI**) standards for sustainability reporting.
- The International Organization for Standardization's (**ISO**) upcoming standard for 'Monetary valuation of environmental impacts from use of natural resources'.
- International Integrated Reporting Framework (**IR**).
- Sustainability Accounting Standards Board's (**SASB**) Standards for Formal Sustainability Accounting.
- System of Environmental-Economic Accounting.
- Wealth Accounting and the Valuation of Ecosystem Services (WAVES).

05. // Current practice in the Extractive sector

Despite these developments, the results of the stakeholder interviews and questionnaires conducted for this study indicate that general knowledge of tools, methods and standardisation initiatives for the measurement of non-fiscal impacts in the extractive sector is low across all stakeholder groups.

Stakeholders felt that it is equally important to measure the impacts of extractive projects across the different forms of capital; yet they acknowledged that measuring social capital, political capital, cultural capital and to an extent natural capital, is more difficult than measuring financial and physical capital. It is perhaps not surprising, therefore, that there was a perception that financial and physical capital, and to a lesser extent natural capital, are being measured in the extractive sector more effectively than social capital, human capital, political capital and cultural capital.

The review of current practice across English-, Spanish-, French- and Mandarin-speaking countries revealed a similar theme. Although government legislation tends to provide for environmental and social impact assessments (**ESIA**) in the approval process for extractive projects, the exact tools and methods used to quantify these impacts is typically left to the discretion of extractive companies and their consultants.

To compound this situation, the multi-stakeholder governance process that is used to evaluate non-fiscal impacts in the approval and monitoring of extractive projects is almost always lacking in one or more key principles such as inclusivity, transparency, impartiality, rigour or accessibility. As a result, extractive projects are rarely evaluated in a way that holistically models and assesses all material impacts.

06. // NRGI Priority Country impacts and capacity

Questionnaires focused on NRGI Priority Countries[1]. Analysis of data revealed that net positive impacts are expected from extractive projects across financial capital, physical capital and human capital indicators, whereas net negative impacts are expected for natural capital, political capital, social capital, and cultural capital indicators.

In NRGI Priority Countries, multilaterals and civil society organisations (**CSOs**) are viewed as placing more importance on non-fiscal impacts for existing and new projects, compared with local communities, extractive companies and governments. There was also a perception that extractive companies, consultants and academia have greater capacity to directly assess, review and comprehend non-fiscal impacts, compared to CSOs, governments and local communities, who were viewed to have the least capacity.

1 The purpose of the questionnaire was to identify which non-fiscal impacts should be prioritised when identifying methods and tools for quantification, and how these methods and tools could be applied in NRGI priority countries.

iii. principles for measurement

Based on the stakeholder interviews, questionnaires and a scan of the extant literature, the following principles for integrating non-fiscal measurement into the governance of the extractive sector were developed.

WHO

» **Principle 1: Inclusive multi-stakeholder governance is key.**

Different people, in different places, will place different values, on different things, at different times. Multi-stakeholder governance—with an inclusive representation of local, regional and national interests—is a foundational platform to promote shared understanding of non-fiscal measurement throughout the *Natural Resource Charter Decision Chain*.

» **Principle 2: Interdisciplinary teams are necessary from the start.**

Appropriate interdisciplinary expertise for non-fiscal costs and impacts should be accessible to all stakeholders. With the input of interdisciplinary teams of environmental scientists, economists, anthropologists, town planners, geologists, engineers, metallurgists and people with other diverse backgrounds, a wide range of data sources can be accessed to improve the validity and reliability of non-fiscal measurements and valuation methods.

WHEN

» **Principle 3: The quantification of non-fiscal impacts should begin before the project is approved & continue for the life of the project.**

Non-fiscal impacts should be modelled as key inputs when deciding whether to extract. Measurement should continue over time as impacts shift from the hypothetical to the actual—from things that can be modelled, to things that can be measured. Modelling and measurement should also follow the extractives project life-cycle of pre-feasibility, feasibility, construction, commissioning, operation, decommissioning and post-closure.

HOW

» **Principle 4: Use a simple guiding methodology with specialised tools.**

Measuring the non-fiscal impacts of extraction can be relatively simple or staggeringly complex. It is important to select a guiding methodology that models net impacts in a way that can be understood by a diverse range or stakeholders. This guiding methodology can be supplemented with specialised tools that measure the specific impacts of the project.

WHAT

» **Principle 5: Account for impacts across all capitals, project scenarios, scales and times.**

Multiple project plans and scenarios should be modelled in a way that maximises net value creation and minimises net risk across all capitals. The 'null' case of not proceeding with the project should also be considered, as should the cumulative impacts that emerge over time and, where possible, across multiple industrial activities and geographies. Assessment should be spatially and temporally explicit at scales meaningful for policy formation or project evaluation, acknowledging that both ecological functioning and economic values are context, space and time specific. Only then can an informed decision be made on whether or not to extract, as well as the mitigation and control strategies that are required to mitigate or offset the non-fiscal costs of extraction.

iv. NRGI engagement

With the field of non-fiscal measurement still emerging, NRGI is well-positioned to catalyse efforts to integrate non-fiscal methods and tools into the governance of the global extractive sector.

By leveraging existing networks and programmes, the following pathways provide NRGI opportunities for partnership, thought leadership and practice.

Immediate next steps include:

1. Development of an online database of tools with a 'decision tree'.
2. Regional or country versions of this report in collaboration with partners.
3. Incorporating other capitals into NRGI's fiscal modeling work.
4. Developing a training module for use in NRGI's training courses.
5. Integrating capitals into the natural resource charter chain.

These immediate next steps could be supported by the following medium-term strategies:

Cultivate strategic partnerships

First, strategic partnerships with one or more of the following initiatives or groups may provide opportunities to leverage knowledge and resources:

- Natural Capital Protocol and Social Capital Protocol.
- Natural Capital Project and Natural Value Initiative.
- Principles for Responsible Investment.
- The Sustainable Minerals Institute - SUSOP.
- ETH Zurich consortium - Resource Impact Dashboard (**RID**).
- SASB - Sustainability Accounting Standards Board.
- World Bank - Wealth Accounting and the Valuation of Ecosystem Services (WAVES).
- United Nations - System of Environmental-Economic Accounting (SEEA).

Pilot projects - NRGI countries

Second, to further assess how NRGI may incorporate non-fiscal measurement and governance methodologies into existing programmes, it would be instructive to pilot measurement methods in one or more priority country.

During the consultation process for this report, the teams from NRGI country offices expressed a willingness to support the piloting of non-fiscal measurement methods and tools.

If NRGI proceed with a pilot study, the following steps are suggested:

- Select a country based on stakeholder willingness to engage with non-fiscal considerations.
- Trial an overarching method that can integrate impacts across capitals, with specialised tools utilised for specific impacts.
- Select a methodology that assesses impacts across all of the capitals.
- Do not seek to monetise all impacts—use an index and/or qualitative measurements for any impacts that are considered too difficult to assess for the pilot study.
- Involve a broad range of stakeholders in the project, including government, community and CSO representatives.
- Treat the results of the exercise as a 'learning exercise', rather than an official input into the regulatory process.
- Use the opportunity as a training exercise for stakeholders.
- Document experience and lessons-learned.

NRGI non-fiscal knowledge contribution

Third, given the surprisingly low levels of knowledge of tools and methods that measure non-fiscal impacts in the extractive sector—even among those who work in extractives—NRGI could also consider helping to promote

> ***"WITH THE FIELD OF NON-FISCAL MEASUREMENT STILL EMERGING, NRGI IS WELL-POSITIONED TO CATALYSE EFFORTS TO INTEGRATE NON-FISCAL METHODS AND TOOLS INTO THE GOVERNANCE OF THE GLOBAL EXTRACTIVE SECTOR."***

the importance of measuring non-fiscal impacts by contributing to knowledge of the field.

This could include further developing this preliminary research and report for a public audience, or other outputs such as multimedia content and social media campaigns.

Non-fiscal symposium

A related option is for NRGI to host a symposium on non-fiscal measurement in extractives, bringing together the key stakeholders working in this field.

While there is various work that is being undertaken in this area, it tends to be very broad (e.g., Natural Capital Protocol) or very narrow (e.g., tools for specific impacts e.g., water, air) in it's focus.

The purpose of the symposium would be to discuss the state of the field and chart a way forward to galvanise efforts to improve non-fiscal measurement in the extractive sector. There does not appear to be any other group catalysing efforts around non-fiscal measurement in extractives in this way.

To get the most out of the symposium, a facilitated process should be used that gathers information from participants in the pre-work stage; uses the time in the symposium proper for key discussions; and has key actions for post-symposium outcomes.

NRGI non-fiscal methodology

Finally, and potentially drawing from one or all of the strategic partnerships, pilot studies, knowledge contribution, curriculum and symposium, NRGI could develop a standardised methodology for measuring non-fiscal cost and benefits in the extractive sector.

At present, there is no methodology that systematically integrates non-fiscal tools and methods into the broader governance process of the extractive sector.

NRGI is strategically positioned to develop an extractive-sector methodology that helps governments, companies and stakeholders better assess and manage the non-fiscal costs and benefits of extractive projects.

NRGI could also consider:

1. The development of an overarching methodology that is fit-for-purpose for the extractive sector
2. Further developing and customising an existing method or tool to the extractive sector.
3. An overall approach for the extractive sector that draws on existing methodologies and/or provides guidance on what should inform selection of specific methodologies.
4. Either of these could be pursued with one or more strategic partners mentioned previously.

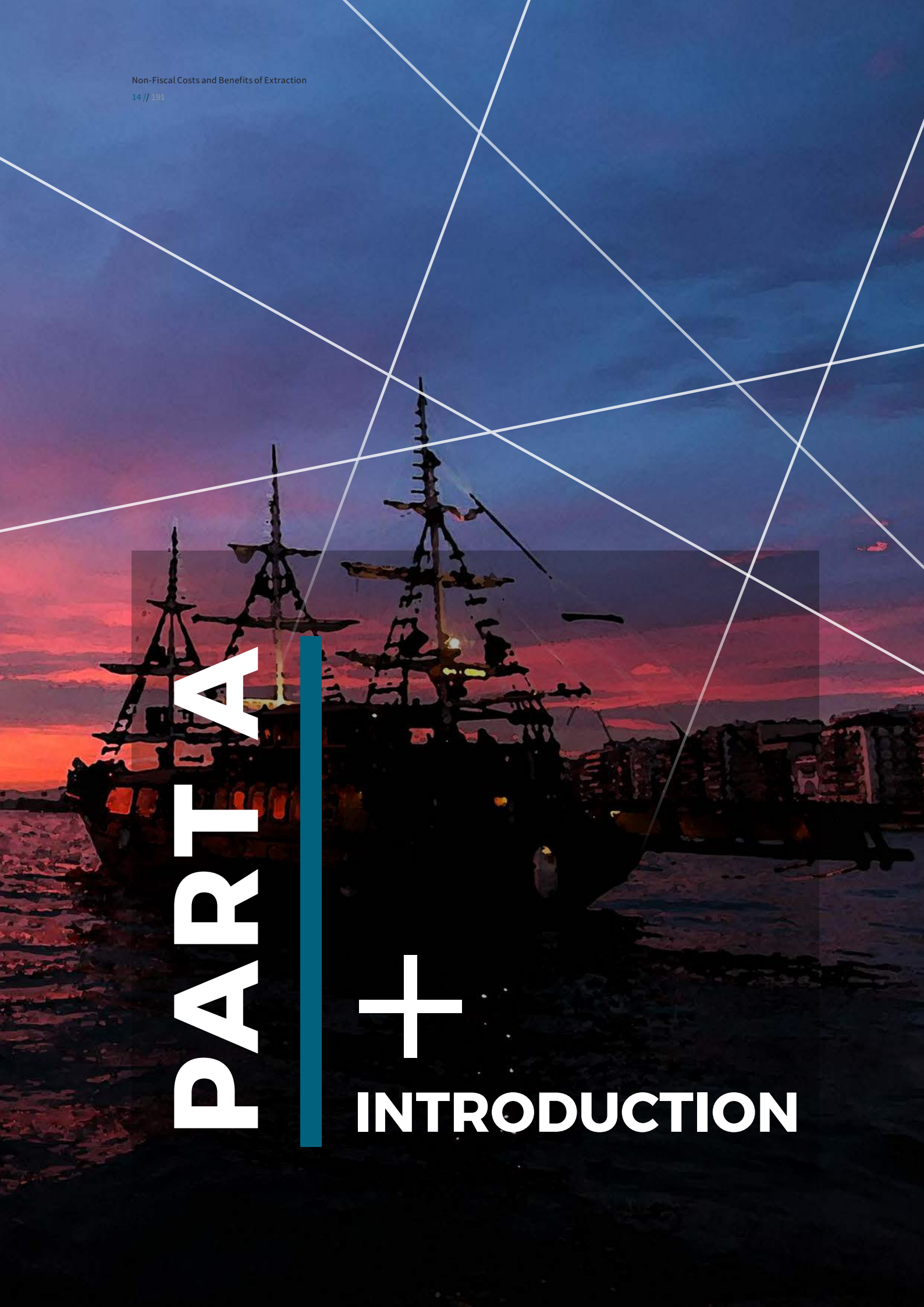
When developing or customising a tool or method for the extractive sector, the following principles are suggested:

- Develop an overarching method that can integrate costs and benefits across all capitals, with specialised tools utilised for specific impacts.
- Do not seek to monetise all impacts—use an index, qualitative measurement or visual representation for any impacts that do not lend themselves to valuation.
- Partner with one or more existing standardisation initiatives.
- Link to existing NRGI models and programmes, including *The Natural Resource Charter* and *Natural Resource Charter Decision Chain*, including non-fiscal cost-benefit analysis (**NFCBA**) as essential elements of Precepts 3 and 5
- Develop the NRGI approach iteratively with governments, extractive companies, CSOs and affected communities using a 'learning-by-doing' approach.

TABLE OF CONTENTS

TABLE OF ACRONYMS

ACRONYM	DEFINITION
CESR	Corporate Ecosystem Services Review
CO2e	Carbon Dioxide Equivalent
CSO	Civil Society Organisations
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortisation
ES	Ecosystem Service
EIA	Environmental Impact Analysis
ESIA	Environmental and Social Impact Assessments
FARI	Fiscal Analysis of Resource Industries
GIS	Geographic Information System
GRI	Global Reporting Initiative
IBAT	Integrated Biodiversity Assessment Tool
ICT	Information and Communication Technologies
IFC	International Finance Corporation
ICMM	International Council on Mining and Minerals
IMF	International Monetary Fund
InVEST	Integrated Valuation of Ecosystem Services and Tradeoffs
IPIECA	The International Petroleum Industry Environmental Conservation Association
IOM	Input-Output Model
IR	International Integrated Reporting Framework
ISO	International Organisation for Standardisation
LEFT	Local Ecological Footprinting Tool
MOOC	Massive Open Online Course
MDG Scan	Millennium Development Goals Scan
MCA	Material Flow Analysis
NCC	Natural Capital Coalition
NCP	Natural Capital Protocol
NFCBA	Non-fiscal Cost Benefit Analysis
NPV	Net Present Value
NRGI	Natural Resource Governance Institute
PNG	Papua New Guinea
SASB	Sustainability Accounting Standards Board
SETAC	Society of Environmental Toxicology and Chemistry
SIA	Social Impact Analysis
SROI	Social Return on Investment
SUSOP	Sustainable Operations Tool
TBL	Triple Bottom Line
WBCSD	World Business Council for Sustainable Development



PART A

+ INTRODUCTION

ABOUT THIS REPORT

SECTION I

01. // Purpose of the report

This report presents an overview of the tools and methods available for modelling and measuring the 'non-fiscal'[1] costs and benefits of extractive projects.

The report also considers the broader governance and management of non-fiscal impacts in the extractive sector to inform opportunities for the improvement of practice in this area.

The report was commissioned by the Natural Resource Governance Institute (**NRGI**) to assist with internal discussions on how tools and methods that measure non-fiscal impacts might be incorporated into NRGI programmes.

02. // Structure of the report

The main report is structured into the following sections:

- **Part A** introduces the report by contextualising the measurement of non-fiscal costs and benefits in the extractive sector within the broader movement towards accounting for the social and environmental impacts of business.
- **Part B** presents an overview of existing tools and methods for measuring and valuing non-fiscal impacts in the extractive sector.
- **Part C** profiles initiatives to standardise the measurement of the non-fiscal impacts of business.
- **Part D** focuses on the approaches that governments, companies and non-government organisations (**NGOs**) take when assessing non-fiscal impacts in the extractive sector.
- **Part E** discusses issues and challenges in the measurement of non-fiscal impacts, deriving key principles for theory and practice.
- **Part F** presents avenues for NRGI engagement, including opportunities for partnership, pilot studies, contribution to knowledge, training, hosting a symposium and developing an overall approach for the extractive sector that draws on existing methodologies and/or provides guidance on what should inform selection of specific methodologies.

The appendices of the report contain the following supplementary analyses:

- **Part G** focuses on research and practice in Spanish-, French- and Mandarin-speaking countries.
- **Part H** reviews the impacts that are most acutely felt in NRGI Priority Countries, so that these impacts can be prioritised when selecting tools and methods for application in these countries.
- **Part I** contains the individual reviews of non-fiscal measurement tools.
- **Part J** provides information on the search methods and the questionnaires used in this study.

03. // Acknowledgements

The author would like to thank NRGI for commissioning this project. In particular, Nicola Woodroffe and Patrick Heller have provided active support and intellectual contribution into the project. In addition, invaluable input has been provided by NRGI Priority country teams, who have helped to identify the non-fiscal impacts most relevant to NRGI Priority Countries.

A broader range of stakeholders have also contributed to the study, including representatives from governments, extractive companies, multilaterals, donors, academics, consulting companies and Civil Society Organisations (**CSOs**).
Finally, the author would like to acknowledge research assistance support from Andrew Saunders, Cecilia Reategui Olguin, Eléonore Lèbre and Shirley Shi, as well as the invaluable peer-review input from Sefton Darby.

BACKGROUND

FROM MONEY TO FINANCIAL ACCOUNTING TO ACCOUNTING FOR NON-FINANCIAL CAPITALS

SECTION 2

01. // Money and financial functions

The creation of money revolutionised the world's economic system.

Money, and specifically financial currencies[2], serve three primary functions.

First, as a *medium of exchange*, financial currencies offer durability, transportability, non-counterfeitability, divisibility and fungibility[3]—helping to move beyond the barter system to provide a more efficient way to exchange goods and services. Second, as a *store of value*, financial currencies enable wealth to be saved and retrieved, with at least some ability to predict future value[4]. Third, as a *unit of account*, financial currencies provide a standard measurement of the value of goods, services, economic activities, assets and liabilities[5].

Through these three financial functions, almost infinite financial complexity has been reduced to a single unit of exchange in each country, providing the ability to transfer goods, services and currencies themselves within, and between, countries[6].

02. // Financial governance, accounting standards and value creation

It is from this financial foundation that the global financial system has been constructed.

Governments shape macro economic conditions for the flow of financial capital through key policy instruments including fiscal, monetary, tax, exchange rate, trade and investment policies.

Global capital markets respond to these policy settings, and with widely accepted standards for financial accounting, disclosure and reporting, investors are able to compare the financial performance of publicly traded businesses[7].

Standardised financial accounting metrics and practices such as debt and liquidity ratios, net present value (**NPV**), discount values for the time value of money, and 'earnings before interest, tax, depreciation and amortisation' (**EBITDA**), all reveal important information about the financial viability of a business.

These financial accounting practices are codified into legal requirements for the transparent disclosure of corporate financial performance, which play a fundamental role in the efficiency, liquidity and resilience of global capital markets.

Yet multilaterals, governments, civil society organisations, industry, investors and citizens alike have come to recognise that the financial performance of a company is a necessary but insufficient means by which to assess investment risk and return, much less the broader contribution that an organisation, or an industry, makes to society. Here, a more fundamental, first principles question is at play: whether the sole purpose of an enterprise is to create financial returns for investors[8], or whether corporations have a broader responsibility to act in the public interest.

Another, equally vexing question, is whether existing methods of financial accounting and valuation effectively price non-fiscal impacts and liabilities over the short- and long-term. Many of the firms that are profitable under existing financial accounting regimes, may no longer be profitable with a full accounting of non-financial externalities and liabilities—particularly those

that aren't easily quantified and reasonably imminent.

03. // Shared value and accounting for non-financial capital

As if to answer these questions, the last few decades have seen a broad range of global actors promote the idea that businesses have a 'social responsibility' to act in a way that supports sustainable and inclusive development. This epochal shift has positioned private enterprise as having the potential to create positive social impacts for society, or 'shared value'[9]. Attention has also been drawn to the externalities of business activities[9]—negative consequences of industry which affect other parties, but are not reflected in market prices.

A multitude of institutions[11], initiatives[12], business structures and models[13] and management fields[14] have emerged to promote this global programme for sustainable business. A key component of this movement has been the measurement and reporting of the social and environmental impacts of business activities, highlighting the symbiotic relationship between business and the ecosystems in which they operate.

For instance, enterprises and their citizens alike benefit in a multitude of ways from the natural environment. These 'ecosystem services' can be grouped into four broad categories: provisioning, such as the production of food and water; regulating, such as the control of climate and disease; supporting, such as nutrient cycles and crop pollination; and cultural, such as spiritual and recreational benefits[15].

A pre-eminent study estimated the total financial value of global ecosystem services in 2011 at USD 145 trillion per year[16]. The loss of eco-services from 1997 to 2011 due to land use change was estimated at USD 4.3–20.2 trillion per year, depending on which unit values were used.[17] By way of comparison, the cumulative gross domestic product (**GDP**) of all nations as calculated by the World Bank was $97 trillion in 2012[18].

Despite the advances in research and practice in environmental accounting[19], these comparisons between global GDP and the value of global ecosystem services are a poignant illustration of the limits of economic growth indicators. Moreover, to fully account for the broader impact of business on their ecosystems, there are other forms of non-financial capital that must be taken into account, such as social capital, human capital, cultural capital, physical capital and political capital. To make matters more challenging, compared with financial accounting systems, the measurement and reporting standards that are in place for other forms of capital are rudimentary[20], and are rarely interoperable.

Creating a common way to measure and account for non-financial value is crucial in accounting for the positive and negative impacts of business, and contributing to the broader sustainability agenda.

By learning from the principles in place for the world's economic accounting systems, a broader notion of business 'value' can be measured, standardised and created.

> ***BY LEARNING FROM THE PRINCIPLES IN PLACE FOR THE WORLD'S ECONOMIC ACCOUNTING SYSTEMS, A BROADER NOTION OF BUSINESS 'VALUE' CAN BE STANDARDISED, MEASURED AND CREATED.***

FOREGROUND

NON-FISCAL COSTS & BENEFITS IN THE EXTRACTIVE SECTOR

SECTION 3

01. // Non-fiscal costs and benefits in the extractive sector

The need for tools and methods to measure the non-financial impacts of industry is perhaps felt most acutely in the extractive sector[21].

Extractive projects have the potential to provide significant fiscal revenues to host countries through royalties, taxes and other fees[22]. It is these fiscal flows where most governments, companies and NGOs have focused their accounting and transparency attention over the past decade, predominantly through fiscal analysis methods such as the International Monetary Fund's (**IMF**) Fiscal Analysis of Resource Industries (**FARI**)[23], and the Extractive Industries Transparency Initiative (**EITI**).

Extractive projects also have the potential to provide significant 'non-fiscal' financial revenues to non-state actors, in particular local communities[24]. For instance, extractive projects sometimes make payments for land rentals, project equity or investment dividends to landowners and local groups. These financial transactions have the potential to penetrate deeply into local economies, often resulting in an in-flux of cash and electronic payments in resource regions[25].

Other potentially positive societal impacts from extractive projects can include direct and indirect employment, procurement of goods and services, improved infrastructure, human capital development and strengthening of local institutions. These impacts are often felt most acutely in developing and emerging nations, where the extractives industry is often a leading source of revenue and infrastructure development—from Mongolia to Myanmar; Sierra Leone to Papua New Guinea; Peru to Tanzania.

Yet the potential benefits of extractive projects must be weighed against their social and environmental costs. The business model of extractive companies can be transformatively disruptive to communities and the natural environment. Examples of environmental degradation[26], human rights abuses[27], industrial relations issues[28], cultural heritage loss[29], social conflict[30] and general angst over the distribution of benefits[31], have become widespread in the extractive sector. Over the last few decades, these 'non-fiscal' impacts have become a flashpoint issue for regulators, communities and extractive companies alike.

2. // Non-fiscal governance, management and reporting frameworks

In response to these sector-wide social and environmental performance challenges—or what some have labelled a 'broken business model'[32]—the global extractive industry has embarked on a significant programme to improve the sustainability of the sector[33].

These efforts have included the introduction of various international policies and standards[34], as well as a suite of tools and frameworks that assess the anticipated and actual impacts of extractive projects at the site, sub-national, national and transnational levels[38].
At the same time, cross-sectoral standards and frameworks with relevance to the extractive sector have also been developed, such as the International Finance Corporation's (**IFC**) Policy and Performance Standards on Environmental and Social Sustainability, and The World Bank's Environmental and Social Framework, to name a few.

Despite the emergence of these performance standards and impact frameworks, the 'externalities' of extractive projects—consequences of the industry which affect other

1. GOVERNANCE FRAMEWORKS

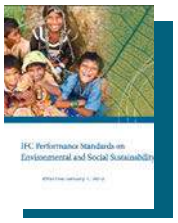
Overview: Regional and national visions, policies and acts that govern the sector.

Examples: Africa Mining Vision, Solomon Islands Mining Policy, Uganda Mining Act, Canada Petroleum Resources Act

2. PERFORMANCE STANDARDS & CODES

Overview: International standards and codes for social and environmental performance.

Examples: ICMM 10 Principles, IFC Performance Standards on Environmental and Social Sustainability, Cyanide Code



3. OHSEC GOOD PRACTICE FRAMEWORKS

Overview: Global, regional and national frameworks for good practice in Occupational Health, Safety, Environment and Community

Examples: ICMM Water Stewardship Framework

4. COMPANY STANDARDS

Overview: Internal company social and environmental performance standards.

Examples: Anglo Social and Environmental Toolbox, Rio Tinto Cultural Heritage Management Guidance

5. EIA & SIA METHODOLOGIES

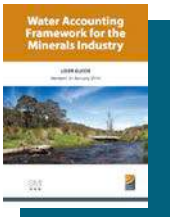
Overview: Environmental Impact Assessment and Social Impact Assessment Methodologies..

Examples: IAIAs Social Impact Assessment Guide, IAEA's Guidebook on environmental impact assessment.

6. MEASUREMENT METHODS & TOOLS

Overview: Tools or methods to measure non-fiscal costs and benefits.

Examples: Water Accounting Framework, Integrated Biodiversity Assessment Tool, IFC's Financial Valuation Tool



7. MEASUREMENT STANDARDISATION INITIATIVES

Overview: Initiatives to standardise sustainability accounting and measurement.

Examples: Natural and Social Capital Protocols. ISO 14008, SASB's Sustainability Accounting Standards

8. SUSTAINABILITY REPORTING

Overview: Frameworks to standardise sustainability reporting.

Examples: Global Reporting Initiative's (GRI) standards for sustainability reporting.

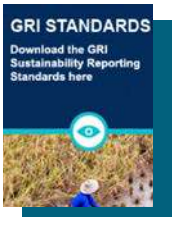


FIGURE A.1
EXTRACTIVE SECTOR NON-FISCAL GOVERNANCE AND MANAGEMENT

parties, but are not reflected in market prices—tend to be underestimated or ignored by industry, governments and markets alike. This failure to assess the 'non-fiscal' costs and benefits of the extractive sector is in part due to the lack of standardisation and appropriate use of impact assessment frameworks, making it difficult for politicians, regulators, investors, citizens and impacted communities to assess the net contribution of extractive projects at the local, regional and national levels.

Further, during project evaluation and approval, the absence of non-fiscal modelling can polarise views about extractive projects to the extremities; projects are either approved in their current form, or not at all. Both propositions might be risky for all parties. The recent cases of mining being banned in El Salvador[35] and Columbia's Tolima province[36], and the lifting of the moratorium on mining in the Autonomous region of Bougainville in Papua New Guinea[37], may be examples of this polarisation.

Measurement, even if it is non-monetised measurement (for instance the use of indexes, qualitative measurements or visual representations), at least allows a conversation around the relative value of non-fiscal impacts.

When thinking about the specific purpose of tools and methods that measure non-fiscal impacts, it is instructive to consider the broader range of governance, management and reporting frameworks that are in place to improve the social and environmental performance of business generally, and the extractive sector specifically. Figure A.1 provides an overview of this broader framework.

The focus of this report is on tools and methods that measure non-fiscal impacts, as well as the emergent initiatives that seek to standardise the accounting framework for these tools and methods (6 and 7 in Figure A.1).

There are, however, obvious linkages between measurement tools and methods, and, for instance, the governance frameworks that require companies to employ them, or the reporting frameworks that standardise the way that companies disclose social and environmental impacts. Accordingly, this report also considers this broader governance, management and reporting framework when reviewing the tools and methods that measure non-fiscal impacts, and making recommendations for NRGI engagement.

03. // Non-fiscal impacts and capitals

To aid the review of these non-fiscal measurement tools and methods, this report adopts a 'capitals' framework, which has been used in the extractive sector as a way to categorise the broader range of positive and negative impacts that occur from extractive projects[38].

A 'capital' is a stock of something of value, that can be enhanced of depleted. There are various approaches to how capitals are grouped, including the original categorisation of five capitals by Jonathon Porritt[39]: natural capital, physical capital, social capital, human capital and financial capital. As shown in Figure A.1, Given the focus of this report, a more granular version of the capital framework is favoured (see Figure A.2)[40]:

A. Social capital—social networks and trust; social rules, norms and obligations; and the reciprocity arrangements embedded in social relations and social structures.

B. Human capital—levels of knowledge and skill; informal and formal education; the health and nutrition of individuals; as well as their motivation and aptitude.

C. Cultural and Spiritual capital—the way people know the world and their place within it; the extent to which local culture, values, traditions, language and religion promote or hinder wellbeing, social inclusion and social development.

D. Political capital—the existence and effective functioning of society's governance mechanisms, including the governance institutions themselves, as well as the standards, rules and regulations they apply.

E. Financial capital—the financial resources available to society's institutions, groups and individuals.

F. Physical capi[418]—the stock of equipment, physical plant (e.g. factories), infrastructure (e.g. roads, airports, hospitals, schools), and other productive resources owned by individuals, the business sector, or the country itself, as well as the management systems needed to make them work.

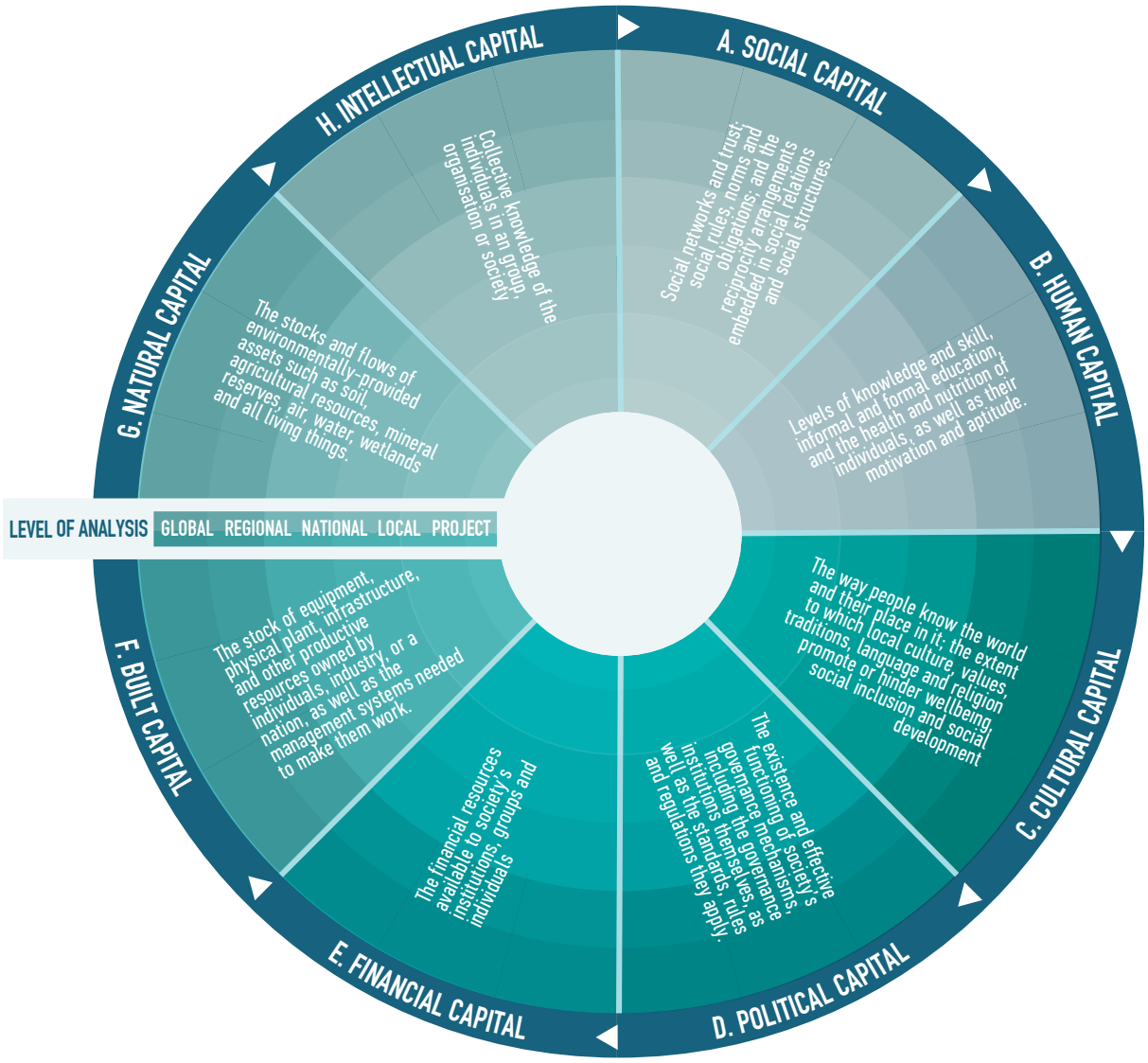


FIGURE A.2
EXTRACTIVE SECTOR NON-FISCAL IMPACTS ACROSS CAPITALS

G. Natural capital—the stocks and flows of environmentally-provided assets (i.e. ecosystem services) such as soil, agricultural resources, mineral reserves, air, water, wetlands and all living things.

H. Intellectual Capital—the collective knowledge of the individuals in an organisation or society.

04. // Cross-cutting impacts and cumulative impacts

It is important to acknowledge that the non-fiscal impacts of extraction often 'cross-cut' the various forms of capital.

For instance, when local communities become 'dependent' on a resource project, this dependency often

> ***A 'CAPITAL' IS A STOCK OF SOMETHING OF VALUE, THAT CAN BE ENHANCED OF DEPLETED.***

manifests across multiple forms of capital including financial capital, human capital and social capital.

Finally, as illustrated in Figure A.2, the non-fiscal impacts of extraction often cumulate and manifest at different 'levels of analysis'.

Cumulative impacts are the successive, incremental and combined impacts (both positive and negative) of an activity on society, the economy and the environment. Cumulative impacts arise when:

- Impacts at different levels of analysis interact, for instance at the project, local, national, regional or global level.
- Activities of an extractive project interact with other extractive projects in a region.
- Activities of a single or multiple extractive projects interact with other past, current and future activities that may not be related to extraction.

The cumulative impacts of extraction can often manifest in intermediary or long-term impacts, such as food security; or impacts that are beyond the project area (or country in which the project is located), such as project-induced inequality or transboundary migration or conflict. At times, the cumulative impacts of extractive projects produce irreversible impacts to landscapes and their inhabitants.

1 A definition of 'non-fiscal' impacts is provided on page 16 of this report.

2 Including fiat currencies that are backed by governments, as well as cryptocurrencies.

3 The property of a good or a commodity whose individual units are capable of mutual substitution. Source: Https://decentralize.today/bitcoin-fungibility-the-most-important-feature-of-bitcoin-4b87a381f21a#.le8l4eg0q

4 Store of value is not a function solely of currencies, but of assets in general.

5 These three functions of currencies are drawn from course notes from a course on cryptocurrencies from The University of Nicosia.

6 Abal et al 2008.

7 It is important to acknowledge that lower levels of accounting transparency often exist in privately owned firms, companies not listed in a primary G7 exchange, and at times State-Owned Enterprises and NGOs.

8 As, for instance, envisioned by Milton who argued that the 'social responsibility' of business was to maximise returns for shareholders. Source: 'The Social Responsibility of Business is to Increase its Profit'. The New York Times Magazine September 13, 1970. Source: Http://umich.edu/~thecore/doc/Friedman.pdf

9 The concept of 'shared value' was popularised by Porter and Kramer in the 2011 Harvard Business Review article titled 'Creating Shared Value'. Source: Https://hbr.org/2011/01/the-big-idea-creating-shared-value. There have also been applications of the shared value approach to the extractive sector, such as the Mining Shared Value Initiative (see: Http://miningsharedvalue.org) and the 'Extracting with Purpose' report from the Shared Value Initiative (see: Http://sharedvalue.org/extracting-purpose)

10 See for instance Alexander, G., & Munoz, C. Wind, coal, and the cost of environmental externalities. Energy Policy, Nov, 2013, Vol.62, p.1385-1391.

11 For instance, the World Council for Sustainable Business Development.

12 For instance, Business for Millennium Development and the European Initiative for Sustainable Development in Agriculture.

13 For instance, business models such as 'social businesses' and 'impact investment', and business structures such as 'Benefit Corporations' in the United States (see: Https://en.wikipedia.org/wiki/Benefit_corporation) and 'B-Corporations' in Australia (see Http://bcorporation.com.au/).

14 For instance, 'corporate social responsibility', 'triple bottom-line reporting', 'balanced scorecard'.

15 Erik Meijaard, Douglas Sheil, Manuel R. Guariguata, Robert Nasi, Terry Sunderland, Louis Putzel. Ecosystem services certification: Opportunities and constraints. CIFOR, 2011.

16 $125 trillion/yr (assuming updated unit values and changes to biome areas)

17 Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S., J., Kubiszewski, I., Farber, S., & Turner, K. (2014). Changes in the global value of ecosystem services. Global Environmental Change 26, 152–158.

18 Source: Http://databank.worldbank.org/data/home.aspx

19 For instance the UN's System of Environmental-Economic Accounting (see: Http://unstats.un.org/unsd/envaccounting/default.asp).

20 Abal, E., Boully, L., Byron, N., Green, P., Lowe, I., Tarte, D., & Trewin, D. (2008). Accounting for Nature: A Model for Building the National Environmental Accounts of Australia.

21 The term 'extractive' is used here to include mining projects as well as upstream and downstream oil and gas projects.

22 See for instance, the International Council for Mining and Metal's (ICMM) Mining Contribution Index.

23 Other open models are also now available to stakeholders and governments alike. See, e.g. Http://openoil.net/contract-modeling/ and Https://www.globalwitness.org/reports/good-deal-better/.

24 That is, financial revenues that go to non-state actors.

25 Grice, T. A. (2015). Mobile Transparency? Financial inclusion, mobile money and Papua New Guinea's resources sector. The University of Queensland (CSRM) and the International Mining for Development Centre (IM4DC).

26 Smith, R. (1990). Investigations of the impact of effluent from the Ok Tedi copper mine on the fisheries resource in the Fly River, Papua New Guinea. Environmental monitoring and assessment. 14(2-3):315-3

27 Albin-Lackey, C., Ganesan, A., & Human Rights Watch (Organization). (2011). Gold's costly dividend : human rights impacts of Papua New Guinea's Porgera gold mine. New York, NY: Human Rights Watch.

28 Farrell, L. A., Hamann, R., & Mackres, E. (2012). A clash of cultures (and lawyers): Anglo Platinum and mine-affected communities in Limpopo Province, South Africa. Resources Policy, 37(2), 194-204.

29 Akiwumi, F. A. (2014). Strangers and Sierra Leone mining: cultural heritage and sustainable development challenges. Journal of Cleaner Production, 84(1), 773-782.

30 Franks, D. M., Davis, R., Bebbington, A. J., Ali, S. H., Kemp, D., & Scurrah, M. (2014). Conflict translates environmental and social risk into business costs. Proceedings of the National Academy of Sciences, 111(21), 7576-7581.

31 Garvin, T., McGee, T. K., Smoyer-Tomic, K. E., & Aubynn, E. A. (2009). Community-company relations in gold mining in Ghana. Journal of environmental management, 90(1), 571-586

32 See Kellogg Innovation Network, 2013

33 For instance, Development, I. I. F. E. A. (2002). Breaking new ground: mining, minerals, and sustainable development: the report of the MMSD project. London: Earthscan Publications.

34 See for instance the International Council on Mining & Metal's 10 Principles.

35 Https://www.nytimes.com/2017/04/01/opinion/sunday/el-salvadors-historic-mining-ban.html?_r=0

36 Http://www.cnbc.com/2017/03/27/reuters-america-colombia-municipality-home-of-anglogold-project-votes-to-ban-mining.html

37 Does not include the Panguna mine. Source: Http://www.mining.com/png-autonomous-region-lifts-mining-ban-excludes-controversial-panguna/

38 See for instance Vanclay, Frank, Esteves, Ana Maria, Aucamp, Ilse and Franks, Daniel M. (2015) Social Impact Assessment: Guidance for assessing and managing the social impacts of projects Fargo ND, United States: International Associate

39 Porritt, J. (2005). Capitalism as if the World Matters. Routledge.

40This framework is more in line with later work, such as the SIA Framework described in footnote 31.

41Physical capital is also known as 'produced capital', 'physical capital' or 'physical capital'.

METHODOLOGY

SECTION I

The methodology for the study included four key components:

1. Search-engine searches for articles and reports.
2. Stakeholder Questionnaires.
3. Stakeholder Interviews.
4. NRGI Priority Country Questionnaires.

01. // Search-engine searches

First, a series of search-engine searches was conducted to identify research articles and applied reports that contained descriptions of tools and methods for measuring non-fiscal impacts across all of the capitals.

The purpose of these searches was twofold: (a) to systematise the approach for identifying tools and methods, and (b) to gather descriptive data on the popularity of tools and methods.

The main search process was carried out in English. Additional searches were carried out in Spanish, French and Mandarin. For these non-English language searches, search terms were translated from English in a way that favoured the retention of meaning, rather than a literal translation of the terms.

Google and Google Scholar were used for all searches.

Search 1.1. //

Natural capital - extractives

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Biodiversity OR "natural capital" OR (environment or environmental) OR ecosystem OR landscape OR air OR water OR ("Greenhouse Gas" OR GHG)"

Search 1.2. //

Natural capital - business

- "Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Biodiversity OR "natural capital" OR (environment*) OR ecosystem OR landscape OR air OR water or Green House Gas / GHG

Search 1.3. //

Social capital[1] - extractives[1]

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Social OR "social impact" OR "social return" OR employment OR jobs OR conflict OR (culture OR cultural) OR community OR governance

Search 1.4. //

Social capital - business

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: Business OR Industry OR Company
- Term 3: Social OR "social impact" OR "social return" OR employment OR jobs OR conflict OR (culture OR cultural) OR community OR governance

FIGURE A.3
KEY SEARCH TERMS FOR FIRST SEARCH

Google scholar has the vast majority of academic articles (one study found 90%) and it is open source. So ultimately I think it is a better and more easily replicated choice. A Mandarin search-database, Baidu, was also utilised for the Mandarin searches.

A three-step search method was utilised to identify research articles and applied reports that contained descriptions of tools and methods for measuring non-fiscal impacts.

The first search utilised the search terms in Figure A.3. The amount of 'hits' from each search was recorded. Each hit was reviewed to see if it contained an article or report with information on a relevant tool or method. Because the searches returned very large numbers of hits[1], the systematic review of these hits was abandoned at the point of diminishing returns (i.e., when articles or reports were no longer being identified). This point of diminishing returns was usually reached within reviewing hits 50-75 or 75-100.

For the second search, a more targeted set of terms was developed and trialled, resulting in 64 individual searches. Due to the large volume of the searches and 'negative-hits', it was decided that the hits produced for all of these searches would not be reviewed.

The third search was an uncontrolled search where research assistants for English, French, Mandarin and Spanish were allowed greater discretion when selecting search terms, and accessing websites to identify articles and reports.

Collectively, the searches returned a total of 379 articles and reports that identified tools and methods for measuring non-fiscal impacts.

Figure A.4 shows the breakdown of articles and reports identified by language group.

Two databases were created:

1. Article database - containing all articles and reports identified in the search-engine searches.

2. Tools database -containing all tools and methods identified in the search-engine searches.

02. // Stakeholder questionnaire

A stakeholder questionnaire was also developed to gather information on tools and methods to assess the non-fiscal costs and benefits of extraction[2].
The main purpose of the questionnaire was to identify other stakeholders who are working on tools, methods and best-practice frameworks to measure non-fiscal impacts in the extractive sector. As such, and due to the expected small sample size, most questions were qualitative[3].

The questionnaire was publicised on social media platforms and blogs. The instructions in these posts and the questionnaire proper advised potential participants that their participation would be voluntary, and that their responses would be de-identified and aggregated. Participants were also provided with brief background information on the project, and advised that the questionnaires should be filled out by respondents who were either "working

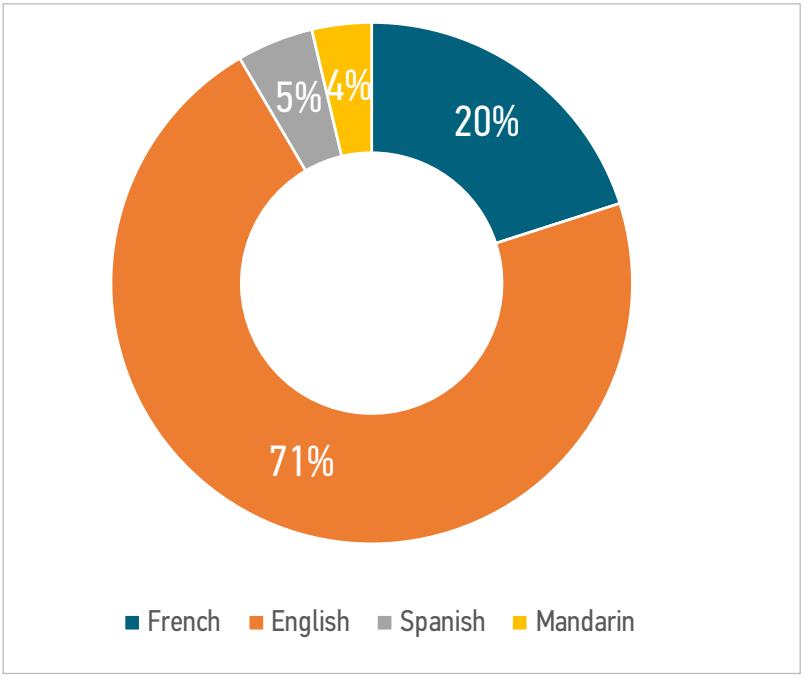


FIGURE A.4
ARTICLES AND REPORTS X LANGUAGE

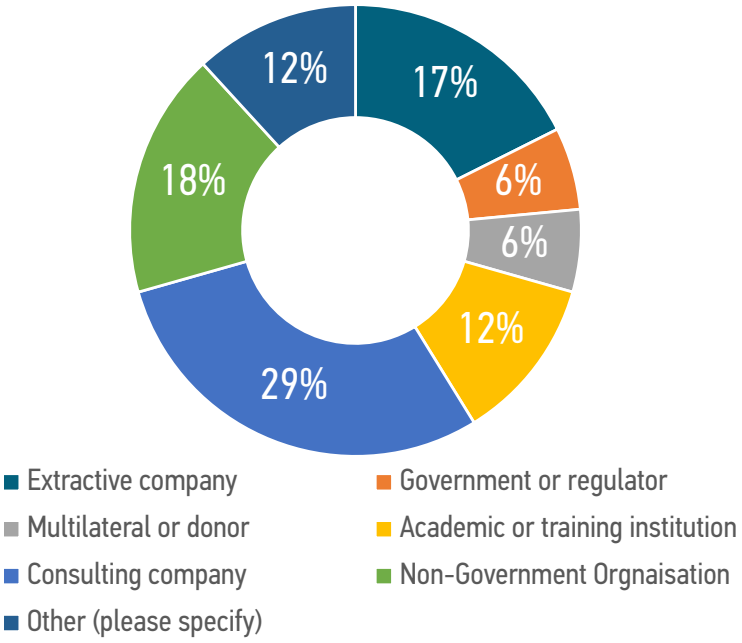


FIGURE A.5
AFFILIATION OF STAKEHOLDER QUESTIONNAIRE SAMPLE

- **Colombia**
- **DRC**
- **Ghana**
- **Guinea**
- **Indonesia**
- Mexico
- Mongolia
- **Myanmar**
- Nigeria
- **Tanzania**
- **Tunisia**
- **Philippines**

FIGURE A.6
NRGI PRIORITY COUNTRIES

Natural Resource Governance Institute

in academe, industry, a civil society organisation, a multilateral organisation or donor, a consulting company, or a government agency with responsibility for extractive projects".

A total of 27 people completed the questionnaire. The breakdown of respondents across the different employment groups is presented in Figure A.5.

03. // Stakeholder interviews

A series of stakeholder interviews was also conducted with key representatives from government, academia, consulting, CSOs and industry.

These interviews were used to collate general themes, identify tools and explore partnership opportunities.

04. // NRGI Priority Country questionnaire

Finally, a questionnaire was developed to assess the range of impacts in NRGI Priority Countries[4].

The purpose of the questionnaire was to identify which non-fiscal impacts should be prioritised when identifying methods and tools for quantification, and how these methods and tools could be applied in NRGI priority countries.

The first part of the questionnaire assessed the relative importance of the different types of non-fiscal impacts across NRGI priority countries.

The second part of the questionnaire gathered information about the governance and capacity in place to assess non-fiscal impacts in NRGI priority countries.

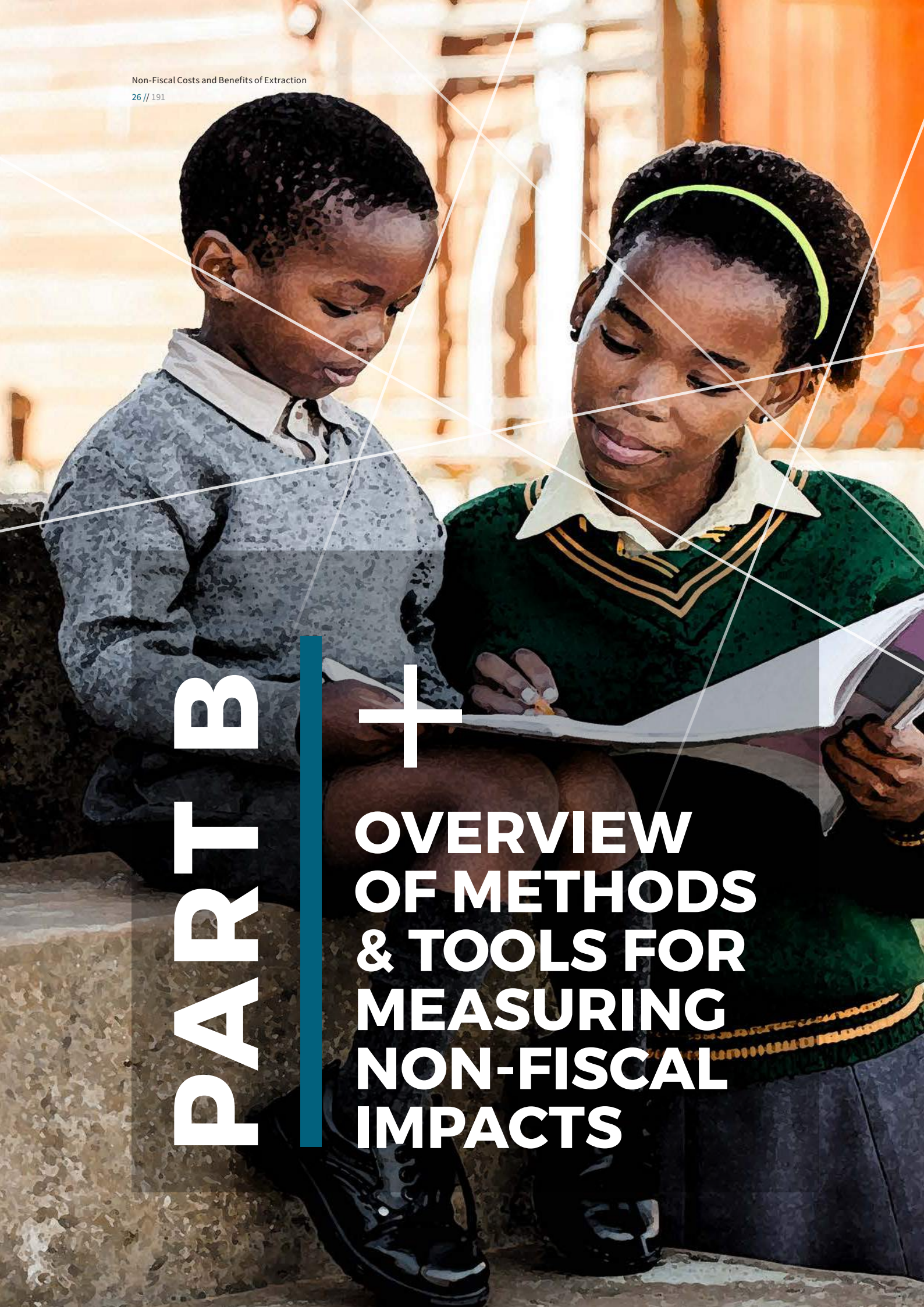
The questionnaire was completed for the NRGI Priority Countries that are in bold text in Figure A.5.

1 For instance, Search 1 returned about 243,000,000 results in English.

2 See Appendix D for a copy of the questionnaire

3 A larger sample size would be required to test quantitative questions with sufficient statistical power.

4 See Appendix D for a copy of the questionnaire.



PART B +

OVERVIEW OF METHODS & TOOLS FOR MEASURING NON-FISCAL IMPACTS

METHODS & TOOL SUMMARY

SECTION I

01. // Total number of tools and methods identified

The focus of the search was for methods and tools where at least summary-level information was available in the public domain.

A total of 73 tools and methods were identified through the search engine searches, stakeholder interviews and questionnaires.

As defined here, a 'method' is a general technique for assessing non-fiscal impacts, with prescribed principles, approaches or processes for data collection, analysis and reporting. Examples include Ecosystem Service Valuation, Ecological Footprint, Life Cycle Analysis and Input-Output Models.

A 'tool', by comparison, is a specific assessment instrument that typically operationalises a general method, and is sometimes subject to proprietary rights. Examples include the Integrated Biodiversity Assessment Tool (**IBAT**), the Local Ecological Footprinting Tool (**LEFT**), the IFC's Financial Valuation Tool, and PwC's Total Impact Measurement Management (**TIMM**).

Meta-data[1] recorded in the articles and tools databases was analysed to identify the frequency of tools and methods across the capitals, specific areas of impact, industries, levels of analysis and measurement types.

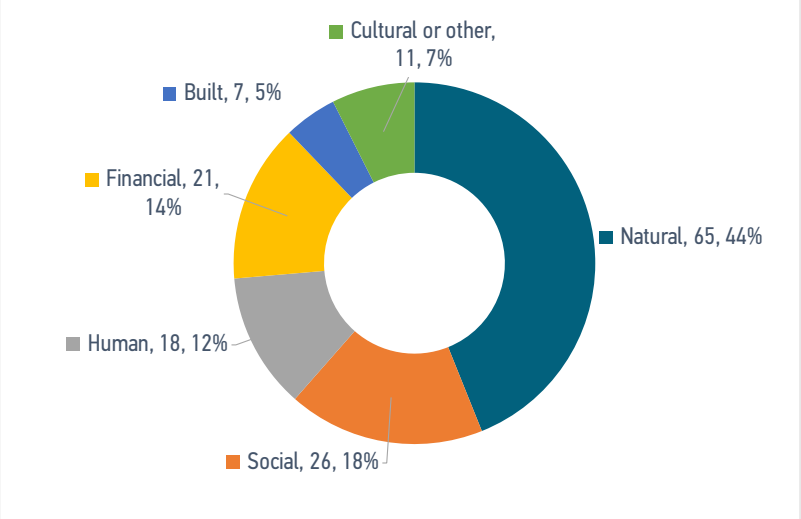


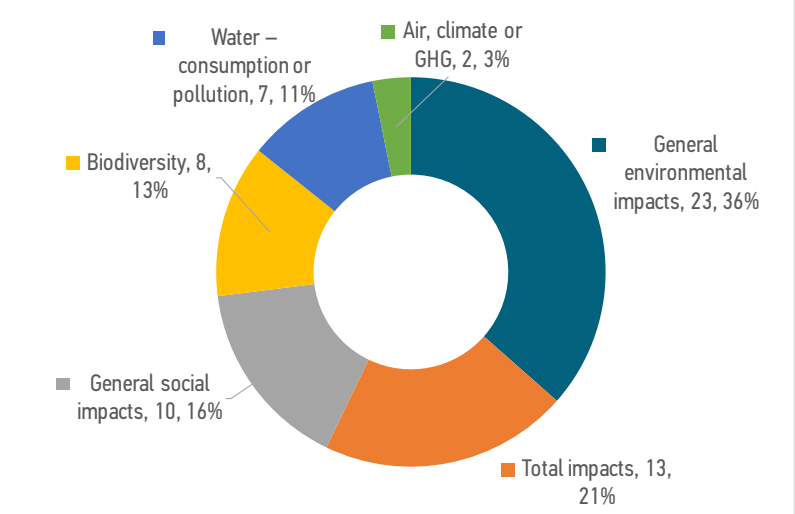
FIGURE B.1
TOOLS & METHODS X CAPITAL

02. // Most common capitals

Analysis of the tools database revealed that 65 tools (92%) and methods focused on natural capital (see Figure B.1).

This equates to 44% of the 'total capitals measured' (**TCM**) across all tools[2]. Social capital (23 tools, 37% of tools; 18% share of TCM) was the next most frequently occurring capital, followed by

> ***65 TOOLS AND METHODS, OR 92% OF THE TOTAL TOOLS AND METHODS IDENTIFIED IN THE STUDY, FOCUSED ON NATURAL CAPITAL.***



THE MOST COMMON IMPACT TYPE WAS GENERAL ENVIRONMENTAL IMPACTS, FOLLOWED BY TOTAL IMPACTS, GENERAL SOCIAL IMPACTS, BIODIVERSITY, WATER CONSUMPTION OR POLLUTION AND AIR, CLIMATE OR GHG.

FIGURE B.2
TOOLS & METHODS X IMPACT AREA

financial capital (21, 30%; 14%), human capital (18, 25%; 12%), cultural capital (11, 15%; 7%) and physical capital (7, 10%; 5%) and cultural capital.

Natural capital was also the most frequently occurring capital in the articles database (77%), followed multiple capitals (13%), social capital (9%), human capital (1%) and cultural capital (1%).

The bias towards tools and methods that quantify impacts to natural capital is not surprising, given that the field of environmental accounting has been around longer than social accounting, and arguably lends itself towards more quantitative assessments.

Generally speaking, tools that quantified impacts to other forms of capital such as human capital, cultural capital or physical capital measured these types of impacts within a general methodology to measure total impacts.

03. // Most common impact areas

A similar pattern was found when examining the types of impacts measured by the tools and methods. The categories of impacts utilised in this study were:

1. Air / climate/ greenhouse gas emissions.
2. Land use.
3. Biodiversity.
4. Waste.
5. Water – consumption or pollution.
6. General social impacts (i.e., multiple social impacts).
7. General environmental impacts (i.e., multiple environmental impacts).
8. Total impacts.

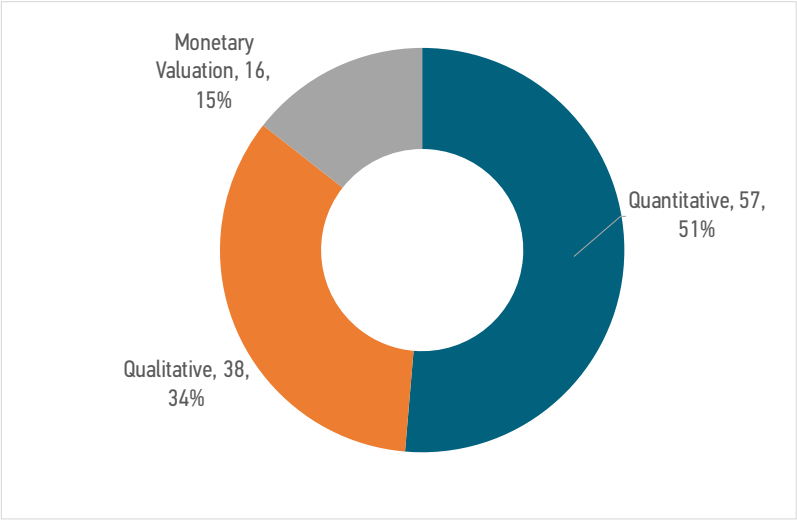


FIGURE B.3
TOOLS & METHODS X MEASUREMENT METHOD

As shown in Figure B.2, the most common impact type in the tools database was general environmental impacts (23 tools, 36%), followed by total impacts (13 tools, 21%), general social impacts (10 tools, 16%), biodiversity (8 tools, 13%), water consumption or pollution (7 tools, 11%), and air, climate or GHG (2 tools, 3%).

Similarly, the most common types of impacts studied in the articles database were general environmental impacts (54%), followed by total impacts (16%), air, climate or greenhouse gas emissions (10%), general social impacts (9%), biodiversity (7%) land use or depletion (3%) and water consumption or pollution (1%).

Interestingly, no tools were identified that only measure the impacts to land, or from waste; although both land and waste impacts are assessed by tools that also assess other forms of impacts.

04. // Measurement of value

Non-fiscal impacts can be recorded as either a measurement or a value.

A measurement is a technique used to determine the magnitude of a quantity. For example, an organisation can track individual metrics such as tonnes emitted of carbon dioxide equivalent (**CO2e**), or how many jobs have been created. Measurement is not always difficult, but can often be time-consuming.

Valuing an impact, on the other hand, refers to assigning a monetary value to a particular impact.

Monetising environmental impacts can be relatively simple or staggeringly complex. For example, translating a weight of toxic effluent into a financial value is relatively easy if the market or regulators have put a price on it. However, the financial implications of compromising wildlife habitat may be more difficult to grasp, a topic that is discussed in more detail in Part G of this report.

As shown in Figure B.3, the majority of tools and methods utilised quantitative (65, 52%) or qualitative (42 tools, 34%) measurement techniques to quantify non-fiscal impacts. Only 17 tools (14%) assign a monetary valuation to these tools, and of these most tools focus on general environmental impacts (11 of 17) or total impacts (4 of 11).

05. // Levels of analysis

Tools and methods can measure impacts at different 'levels of analysis'. Some tools, such as the Integrated Biodiversity Assessment Tool (**IBAT**), the Water Accounting Framework for the Minerals Industry, and SUSOP (Sustainable Operations), focus specifically on positive and negative impacts at the site, or operational, level.

Other tools and methods focus on the business operation or company as a whole, such as the Greenhouse Gas Protocol, Social Return on Investment (**SROI**), the Millennium Development Goals Scan (**MDG Scan**), the IFC Financial Valuation Tool, the Balanced Scorecard Approach, and PwC's Total Impact Measurement Management.

Still other tools and methodologies focus on the industry as a whole (for instance, Environmental Profit & Loss) or the specified product that is being extracted or manufactured (for instance, TruCost and Integral Biodiversity Impact Assessment System).

As shown in Figure B.4, the most common level of analysis was the company as a whole (26 tools, 42%), followed by the site or business operations (23 tools, 37%), various levels e.g., the company or site (11 tools, 18%) and the industry as a whole (2 tools, 3%).

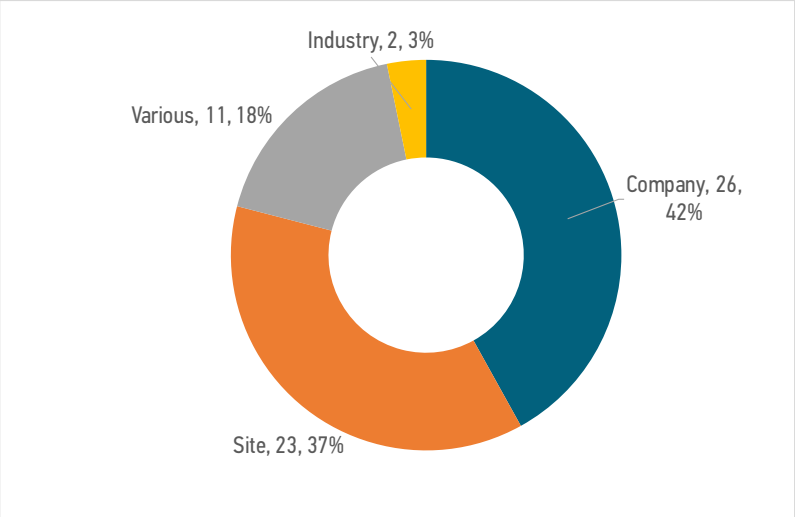


FIGURE B.4
TOOLS & METHODS X LEVEL OF ANALYSIS

06. //
Industry sectors

Finally, the industry of study was analysed from the results in the articles database.

The majority of articles and reports focused on non-fiscal measurement tools in the context of mining (37% of studies), all industries (24%) or natural resources in general (21%). Only 3% of studies were specifically in the context of oil and gas.

There are a number of possible reasons for this finding. First, it is possible that the business model of mining is viewed by those who write or commission studies—academics, multilaterals and donors—as being more disruptive to social and environmental indicators. Another possible explanation is that, anecdotally, there appears to be a greater number of initiatives and good practice frameworks for social and environmental performance in the mining sector compared to the oil and gas sector. It is also possible that the search methods employed in this study yielded search results that were biased towards mining, despite the attempts to include specific search-terms for the oil and gas industry.

Other industries studied included construction (6%), transportation (6%), and agriculture (6%).

1 In this context 'meta-data' refers to data that was collected to describe the articles and reports, such as the 'type of method or tool' reviewed, and the 'level of analysis' of the tool or method.

2 Each tool can measure multiple capitals. Total capitals measured is the total of all capitals measured across all tools.

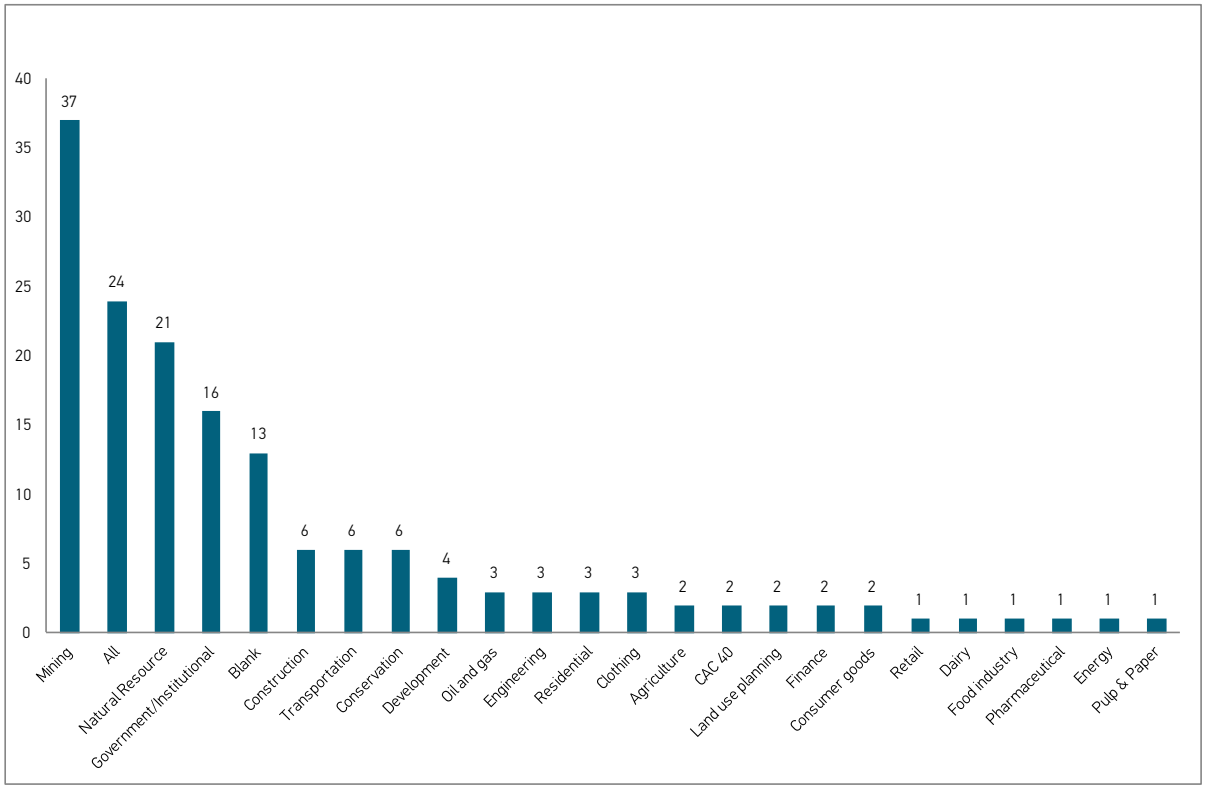


FIGURE B.5
ARTICLES & REPORTS X INDUSTRY

CIRCUMPLEX & KEY METHODS

SECTION 2

01. // Review of key tools

All tools reviewed in this report are contained in Appendix C, organised by impact areas. For each tool, the following information has been assessed:

- Intended client
- Level of analysis
- Projection or actual
- Type of impact
- Data inputs required
- Method of quantification
- Strengths & weaknesses
- Developer of tool
- Training available
- Use by extractive companies
- Adaptability of tool to extractives
- Cost of tool
- Comparability
- Complexity
- Website

02. // Ratings of tools

All tools were rated by popularity, quality and potential for application to the extractive sector to generate a measure of overall utility from 1 (worst) to 15 (best).

Criteria were rates as follows:

Popularity

- Tier 1 (Best) = Widely used and/or referenced
- Tier 2 (Average) = Used and referenced, but not widely
- Tier 3 (Below Average) = Not widely used or referenced

Quality

- Tier 1 (Best) = Quality of tool appears to be high, reputation of organisation appears to be high, maintenance of tool appears to be good.
- Tier 2 (Average) = Quality of tool appears to be average, reputation of organisation appears to be average, maintenance of tool appears to be average.
- Tier 3 (Below average) = Quality of tool appears to be low, reputation of organisation appears to be low, maintenance of tool appears to be low.

Potential for extractives

- Tier 1 (Best) = currently used by extractives OR could easily be applied to extractives;
- Tier 2 (Average) = could be applied to extractives but not widely used and/or easily applied
- Tier 3 (Below average) = Not suited for extractives and/or of questionable quality

Ratings were made subjectively based on evaluations from the lead author. These evaluations are intended to aid internal NRGI use only. If these evaluations were to be made public, it would be appropriate to put in place a panel rating system with peer-review.

03. // Key methods

As shown in Figure B.6 below, the most frequently identified methods were Input-Output Models (39%), Ecosystem Service Valuations (28%), Triple-Bottom Line Approaches (12%), Impact Analyses (7%), Footprinting methods (5%) and Life-Cycle Analysis (2%).

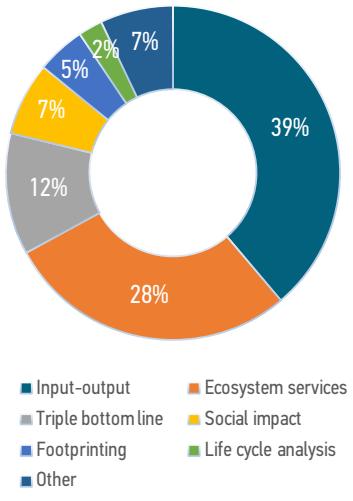


FIGURE B.6
KEY NON-FISCAL MEASUREMENT METHODS

Key methods are summarised in Figure B.7 and outlined from pages 35-45 of this report.

Ratings are included on a scale of 1 to 3 stars for the following criteria:

A. Ability to integrate different types of capitals.
B. Comparability across sectors.
C. Comparability across extractive projects.
D. Amenability to aggregation of multiple extractive projects.

04. // Non-fiscal tools and circumplex and summary tables

Key tools are visualised in the 'Non-Fiscal Tools & Methods Circumplex' in Figure B.7.

The purpose of the circumplex is to illustrate the relationship between capitals, impact areas, levels of analysis, intended client, measurement types and the rating system.

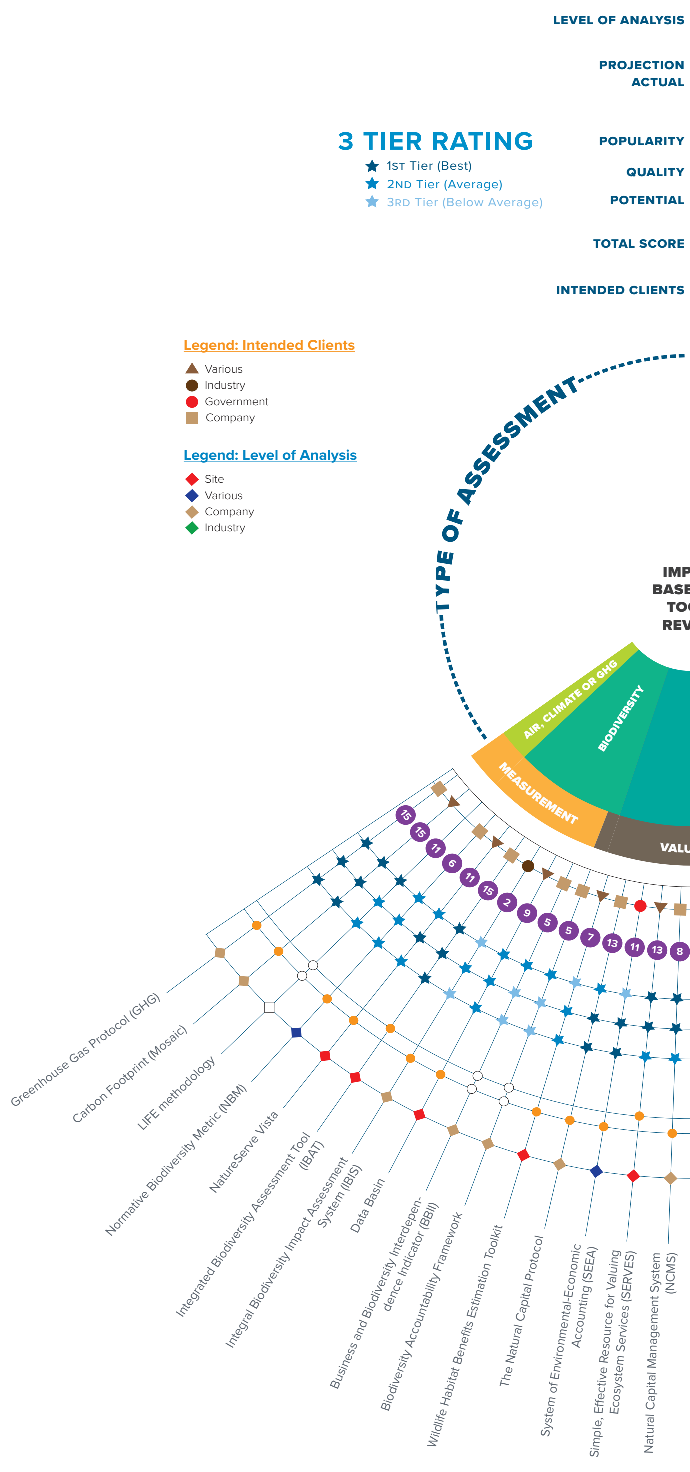
High-potential tools (rated 8-15) are shown on pages 34-39 of this report, and full reviews of each tool are included in Appendix C.

METHOD	OVERVIEW	A ABILITY TO INTEGRATE DIFFERENT IMPACTS	B COMPARABILITY ACROSS SECTORS	C COMPARABILITY ACROSS EXTRACTIVE PROJECTS	D AMENABLE TO AGGREGATION
Input-Output Assessment Overview	The Input-Output Model (IOM) is a quantitative economic method used to assess the inputs and outputs through an organisation, industry or economy.	●●	■■	★★	▮▮
Ecosystem Services Valuation	The ES Valuation process places values on various ES categories and then determines how these values will change as a result of planned changes, such as the construction of new buildings, or land razing to make way for the planting of new crops.	●	■■	★★★	▮▮
Tripple-bottom line	The Triple Bottom Line (TBL) method is an accounting framework that incorporates three dimensions of performance: social, environmental and financial.	●●●	■■	★★★	▮▮▮
Impact Assessment	Environmental Impact Assessment (EIA) is the process of assessing the likely environmental impacts (positive and negative) of a plan, policy, program, or a project. Social Impact Assessments (SIA), which are sometimes included within an EIA, focus on the social dimensions of change.	●●●	■	★	▮
Ecological Footprint	Ecological Footprint methods quantify the impacts of human activities measured in terms of the area of biologically productive land and water required to produce the goods consumed and to assimilate the wastes generated.	●	■■■	★★★	▮▮▮
Lifecycle Analysis	Life Cycle Assessment1 (LCA) is a method for the evaluation of the environmental aspects of a product or service system through all stages of its life cycle.	●	■	★★	▮

FIGURE B.7
SUMMARY OF NON-FISCAL MEASUREMENT METHODS

NON-FISCAL MEASUREMENT

METHODS & TOOLS CIRCUMPLEX



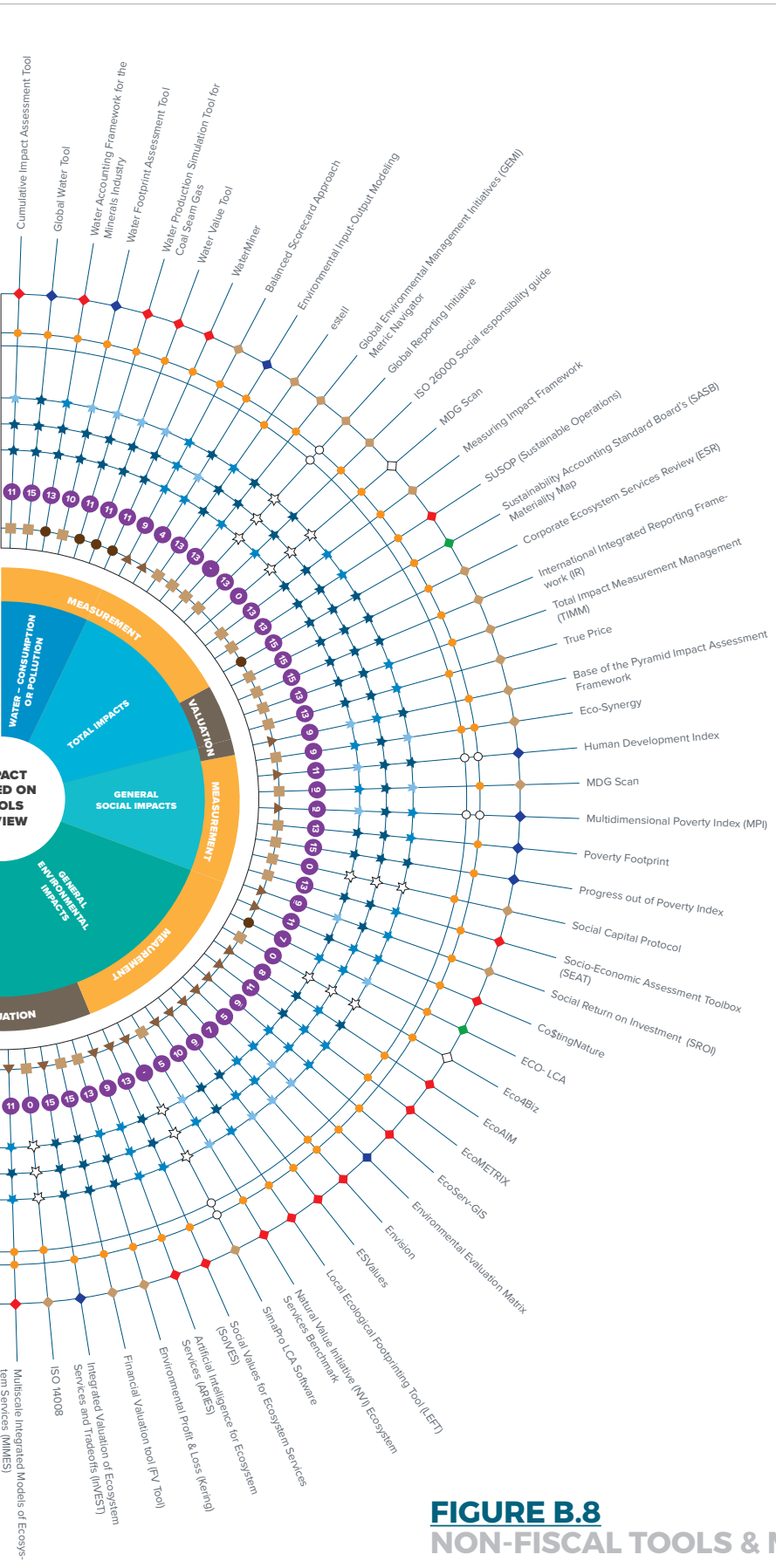


FIGURE B.8
NON-FISCAL TOOLS & METHODS CIRCUMPLEX

NON-FISCAL TOOLS SUMMARY

HIGH AND MEDIUM RANKED TOOLS ACROSS IMPACT AREAS

LEGEND

1. POTENTIAL

- MEDIUM (8-11)
- HIGH (12-15)

2. CAPITAL

- NATURAL
- SOCIAL
- CULTURAL
- HUMAN
- FINANCIAL
- PHYSICAL

3. INTENDED CLIENT

- COMPANY
- INDUSTRY
- VARIOUS
- NATIONAL GOVERNMENT

4. LEVEL OF ANALYSIS

- SITE
- COMPANY
- INDUSTRY
- VARIOUS

5. PROJECTION/ACTUAL

- PROJECTION
- ACTUAL
- PROJECTION OR ACTUAL

6.COMPLEXITY

- LOW
- MEDIUM
- HIGH

7. COST

- $ FREE
- $ EXPECTED COST
- ? UNKNOWN

8. COMPARABILITY

- LOW
- MEDIUM
- HIGH

9. TRAINING

- ✔ YES
- ✖ NO

10. ADAPTABILITY

- CAN BE USED
- IN USE / BEEN IN USE

11. GENDER SENSITIVE

- ✔ YES
- ✖ NO

12. MONETISED

- $ YES
- $ NO

13. DEVELOPER

Developer of the tool, as specified

14. METHOD

Input-Output Models
Ecosystem Service Valuations
Triple-Bottom Line
Impact Analysis
Footprinting
Life-Cycle Analysis
Methods

TOOLS	1 POTENTIAL	2 CAPITAL	3 CLIENTS	4 ANALYSIS	5 P/A	6 COMPLEXITY	7 COST	8 COMPARABILITY	9 TRAINING	10 ADAPTABILITY	11 GENDER	12 MONETISED	13 DEVELOPER	14 METHOD
AIR, CLIMATE OR GHG														
Greenhouse Gas Protocol (GHG)	15												World Resources Institute & WBCSD	Footprinting
Carbon Footprint (Mosaic)	12												Renewable Choice Energy	Footprinting
BIODIVERSITY														
Integrated Biodiversity Assessment Tool (IBAT)	15												United Nations and various	Ecosystem services Input-Output
NatureServe Vista	11												NatureServe	Ecosystem services Input-Output
LIFE methodology	11												LIFE Institute	Input-Output
Data Basin	9												Conservation Biology Institute	Ecosystem services Input-Output
WATER – CONSUMPTION OR POLLUTION														
Global water tool	15												WBCSD	Input-Output
Water Accounting Framework for the Minerals Industry	13												The Minerals Council of Australia	Input-Output

TOOLS	1 POTENTIAL	2 CAPITAL	3 CLIENTS	4 ANALYSIS	5 P/A	6 COMPLEXITY	7 COST	8 COMPARABILITY	9 TRAINING	10 ADAPTABILITY	11 GENDER	12 MONETISED	13 DEVELOPER	14 METHOD
WaterMiner	11					★★	$	●●	✖		✖	$	Centre for Water in the Minerals Industry	Input-Output
Water Value Tool	11					★★	?	●●	✖		✖	$	Centre for Water in the Minerals Industry	Input-Output
Water Production Simulation Tool for Coal Seam Gas	11					★★	?	●●	✖		✖	$	Klohn Crippen Berger Ltd	Input-Output
Cumulative Impacts Assessment Tool	11					★★	$	●●	✔		✔	$	Centre for Water in the Minerals Industry	Input-Output
Water Footprint Assessment Tool	10					★★ ★★ ★	$	●●●	✔		✖	$	Water Footprint Network	Input-Output
GENERAL SOCIAL IMPACTS														
Progress out of Poverty Index	15					★	$	●●	✔		✔	$	Grameen Foundation	Impact Analysis
Poverty Footprint	13					★★ ★★★	$	●●	✖		✔	$	OXFAM and United Nations Global Compact	Impact Analysis
Socio-Economic Assessment Toolbox (SEAT)	13					★★	$	●●	✖		✔	$	Anglo American	Impact Analysis
Human Development Index	11					★	$	●●●	✖		✔	$	United Nations Development Programme	Impact Analysis

TOOLS	1 POTENTIAL	2 CAPITAL	3 CLIENTS	4 ANALYSIS	5 P/A	6 COMPLEXITY	7 COST	8 COMPARABILITY	9 TRAINING	10 ADAPTABILITY	11 GENDER	12 MONETISED	13 DEVELOPER	14 METHOD
Base of the Pyramid Impact Assessment Framework	9						$	$	✓		✓	$	The William Davidson Institute (University Of Michigan)	Input-Output
Multidimensional Poverty Index (MPI)	9						$		✓		✓	$	Oxford Poverty & Human Development Initiative (OPHI) & United Nations Development Programme	Impact Analysis
GENERAL ENVIRONMENTAL IMPACTS														
Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)	15						$		✓		✗	$	Natural Capital Project	Ecosystem services Input-Output
Financial Valuation tool (FV Tool)	15						$		✗		✗	$	IFC's Infrastructure & Natural Resources Advisory Team	Triple bottom line
Social Values for Ecosystem Services (SolVES)	13						$		✓		✓	$	USGS / Geosciences and Environmental Change Science Center	Ecosystem services Input-Output
Environmental Profit & Loss (Kering)	13						$		✗		✗	$	Kering	Input-Output
EcoMETRIX	11						?		✗		✗	$	EcoMetrix Solutions Group	Ecosystem services Input-Output
Multiscale Integrated Models of Ecosystem Services (MIMES)	11						?		✓		✗	$	UVM / AFORDable futures LLC	Ecosystem services Input-Output

TOOLS	1 POTENTIAL	2 CAPITAL	3 CLIENTS	4 ANALYSIS	5 P/A	6 COMPLEXITY	7 COST	8 COMPARABILITY	9 TRAINING	10 ADAPTABILITY	11 GENDER	12 MONETISED	13 DEVELOPER	14 METHOD
System of Environmental-Economic Accounting (SEEA)	13						$					$	United Nations Department of Economic and Social Affairs	Ecosystem services Input-Output
Co$tingNature	11						$					$	King's College London, AMBIOTEK, UNEP-WCMC	Ecosystem services Input-Output
Local Ecological Footprinting Tool (LEFT)	10						$					$	Biodiversity Institute from the University of Oxford	Footprinting
EcoServ-GIS	9						$					$	EcoServ-GIS Steering Group	Ecosystem services Input-Output
Artificial Intelligence for Ecosystem Services (ARIES)	9						$					$	ARIES (International Network of Scientists)	Ecosystem services Input-Output
Natural Capital Management System (NCMS)	8						$					$	Climate Earth	Ecosystem services Input-Output
Eco - LCA	7						$					$	Ohio State University – Center for Resilience	Life-Cycle Analysis
TOTAL IMPACTS														
Corporate Ecosystem Services Review (ESR)	15						$					$	World Resources Institute	Ecosystem services Input-Output
Sustainability Accounting Standard Board's (SASB) Materiality Map	15						$					$	Sustainability Accounting Standards Board	Triple bottom line

TOOLS	1 POTENTIAL	2 CAPITAL	3 CLIENTS	4 ANALYSIS	5 P/A	6 COMPLEXITY	7 COST	8 COMPARABILITY	9 TRAINING	10 ADAPTABILITY	11 GENDER	12 MONETISED	13 DEVELOPER	14 METHOD
Social Return on Investment (SROI)	9						$		✓		✗	$	SROI Network International	Input-Output Triple bottom line
International Integrated Reporting Framework (IR)	15						$		✓		✓	$	The International Integrated Reporting Council (IIRC)	Triple bottom line
estell	13						?		✓		✗	$	Systain	Footprinting Input-Output
True Price	13						?		✓		✗	$	True Price	Impact Analysis Input-Output
Global Environmental Management Initiatives (GEMI) Metric Navigator	13						$		✗		✗	$	The Global Environmental Management Initiative's (GEMI)	Triple bottom line
Measuring Impact Framework	13						$		✗		✓	$	WBCSD, IFC	Triple bottom line
SUSOP (Sustainable Operations)	13						$		✗		✓	$	University of Queensland and other research and industry	Triple bottom line
Total Impact Measurement Management (TIMM)	13						?		✗		✓	$	Price Waterhouse Coopers (PWC)	Triple bottom line

INPUT-OUTPUT MODEL

FEATURED METHOD 1

SECTION 3

Input-Output Assessment Overview

The Input-Output Model (**IOM**) is a quantitative economic method used to assess the inputs and outputs through an organisation, industry or economy.

IOMs have historically been used to analyse the interdependencies between economic sectors; often to depict inter-industry relationships within an economy, showing how output from one industrial sector may become an input to another industrial sector[1]. IOMs have also been used to estimate the impacts of positive or negative economic shocks and ripple effects through an economy.[2]

At a company level, an IOM typically models the inputs and outputs required to produce an organisation's goods and services, including the interdependencies between organisational units.[3] IOMs also provide a method for assessing interdependencies between organisations: how organisations use products and services from other companies to produce their own products.

All numbers that match the inputs and outputs related to production and consumption are put into a matrix, which shows how the outputs can change when the inputs do; or in most cases, how profits can change when the demand and/or costs of all the inputs change.

IOMs can also be used to model non-financial inputs and outputs. For example, environmental resources such as water, land or air, can be modelled as inputs into the overall production model, or outputs that are impacted by the processes of production.

Calculating an Input-Output Model

The calculation of IOMs is based around an input-output table, or matrix. Input-Output tables include a series of rows and columns of data that quantify the supply chain for sectors of the economy, or units within an organisation.

Industries or organisational units are listed in the headers of each row and each column. The data in each column corresponds to the level of inputs used during production.

For instance, inputs in a mining scenario include capital items (e.g. trucks, diggers, process plant), environmental resources (e.g., land, water, air) and social resources (e.g., access to land, human capital). Outputs include the extracted resource (i.e., the product), environmental impacts (e.g., water discharges, emissions, land degradation), financial impacts (e.g., royalties and community investment funds) and social impacts (e.g., jobs, social conflict, resettlement).

> ***THE INPUT-OUTPUT MODEL (IOM) IS A QUANTITATIVE ECONOMIC METHOD USED TO ASSESS THE INPUTS AND OUTPUTS THROUGH AN ORGANISATION, INDUSTRY OR ECONOMY.***

There are a number of software packages that can be used to produce IOMs, including 'REAL I-O', produced by the University of Illinois[1]. The data required for input into the software packages is dependent on what impacts are being modelled.

The process for selecting the chosen inputs and outputs is guided by the specific impacts that are being assessed in the sector or organisation.

Application of Input-Output to Extractives

A number of existing tools that have been developed for or applied to the extractive sector are based on an input-output approach.

For instance, the Water Accounting Framework, developed by The University of Queensland's Sustainable Minerals Institute, provides a framework for defining and accounting for the various types of water inputs and outputs in the mining process. Surface water inputs include precipitation and runoff, rivers and creeks, and external water storages; whereas surface water outputs include discharge and environmental flows from the operation.

Other tools that draw from an input-output method include:

- Global water tool
- Water Accounting Framework for the Minerals Industry
- Water Footprint Assessment Tool
- WaterMiner
- Water Value Tool
- Water Production Simulation Tool for Coal Seam Gas
- Cumulative Impacts Assessment Tool
- Social Return on Investment (SROI)
- Environmental Profit & Loss (Kering)
- Environmental Input-Output Modelling

Advantages of IO for Extractives

- Can be applied at the site, enterprise or sector levels.
- The basic Input-Output calculations are relatively simple.
- Intuitive methodology with existing tools already developed, including tools specifically for the extractive sector.
- Puts emphasis on an organisation's activity and the corresponding effects it has on outputs, profits and environmental pollution.
- Used by the UN in the System of National Accounts and System of Environmental-Economic Accounting, allowing for international comparisons.

Disadvantages of IOM for Extractives

- IOMs often require extensive data, which often needs to be updated regularly as inputs and outputs change.
- The majority of IOMs focus on environmental resources and do not integrate social capital considerations.
- No extractive sector IOMs at the company or site levels that integrate impacts across all capitals.
- IOMs typically make general assumptions that companies/organisations produce only one product; in an extractives context this is sometimes the case.

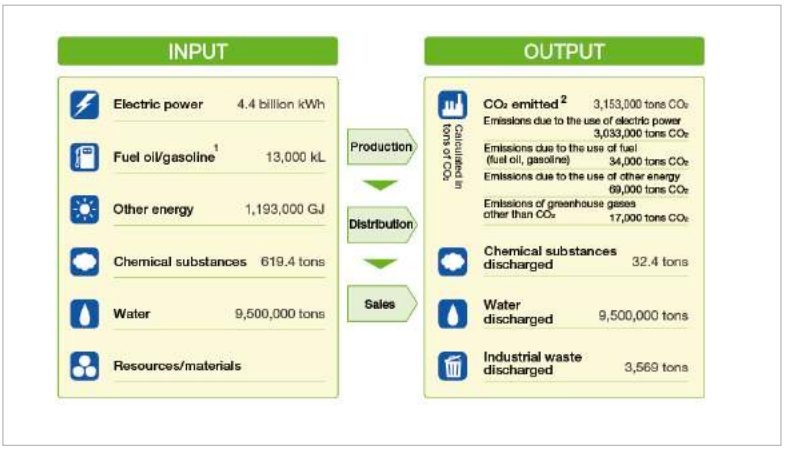


FIGURE B.8

INPUT-OUTPUT DIAGRAM TAIYO NIPPON SANSO GROUP

Source: Https://www.tn-sanso.co.jp/en/csr/reports/2013_06.html

1 Collins et al., 2007; Gay et al., 2005; Wiedmann et al., 2007.

2 Thijs Ten Raa, Input–output economics: theory and applications: featuring Asian economies, World Scientific, 2009

3 Clark, D. L. (1984). "Planning and the Real Origins of Input-Output Analysis". Journal of Contemporary Asia. 14 (4): 408–429.

4 Also see Conway-Schempf conducted some thorough research and created a detailed report on how a company/organisation can carry out its own Input-Output Study.

ECOSYSTEM SERVICES

FEATURED METHOD 2

Ecosystem Services Assessment Overview

Enterprises and citizens alike benefit in a multitude of ways from the ecosystems in the natural environment. These 'Ecosystem Services' (**ES**) can be grouped into four broad categories[1]:

- **Provisioning services** are the products obtained from ecosystems such as food, fresh water, wood, fiber, genetic resources and medicines.
- **Regulating services** are defined as the benefits obtained from the regulation of ecosystem processes such as climate regulation, natural hazard regulation, water purification and waste management, pollination or pest control.
- **Habitat services** highlight the importance of ecosystems to provide habitat for migratory species and to maintain the viability of gene-pools.
- **Cultural services** include non-material benefits that people obtain from ecosystems such as spiritual enrichment, intellectual development, recreation and aesthetic values.

Calculating Ecosystem Services

The ES Valuation process places values on various ES categories and then determines how these values will change as a result of planned changes, such as the construction of new buildings, or land razing to make way for the planting of new crops.

All ES Valuation approaches can be categorised into two general groupings – market values, which refer to all the out-of-pocket costs traded in formal markets (e.g., a monthly utility bill), and non-market values, which are typically more difficult to determine and calculate. Tools can be used to calculate ES values based on methods such as the travel cost method, the hedonic pricing method, the choice of modelling method, the contingent valuation method, the restoration cost method, the avoided cost method, the benefit transfer method, and the replacement cost method. The valuation methods used depend on the relevant ecosystem service types, the project being studied and available resources.

Application of ES to Extractives

Extractive projects, and more so mining projects, convert multifunctional landscapes that provide a myriad of ecosystem services, into monofunctional, mineral-provisioning landscapes[2]. As such the extractive sector presents unique challenges for evaluating

> ***ENTERPRISES AND CITIZENS ALIKE BENEFIT IN A MULTITUDE OF WAYS FROM THE ECOSYSTEMS IN THE NATURAL ENVIRONMENT.***

ecosystem services, including how to value underground impacts; the importance of rehabilitation and postclosure as parts of the extractive life cycle; the uncertainties associated with informal mining; and the manifest changes that most mines cause to the landscape.

One of the ecosystem services that is most affected by extractive projects is freshwater, such as water provisioning for agriculture, households and to support traditional livelihoods, water filtration, groundwater recharge, control of erosion and flood, and cultural services[3].

A recent exploratory study examined freshwater ecosystem services in the context of mining in Peru. The study highlighted the 'special challenges' for evaluating ecosystem service impacts within the mining context, including the importance of underground impacts; the importance of rehabilitation and postclosure as parts

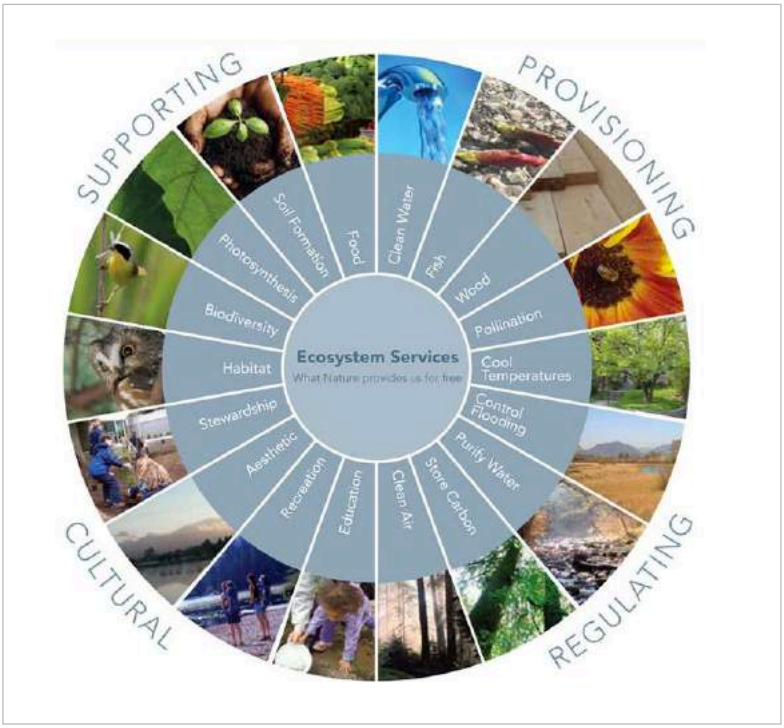


FIGURE B.9
ECOSYSTEM SERVICES CATEGORIES
Source: Http://www.metrovancouver.org/services/regional-planning/PublishingImages/EcosystemServices.jpg

of the mine life cycle; the uncertainties associated with informal mining; and the manifest changes that most mines cause to the landscape[4].

Another study examined the large-scale loss of ecosystem services from oil and gas projects across the North American Great Plains.[5] Ecosystem fragmentation and habitat loss from oil and gas projects was found to cause widespread loss of agricultural and grazing land, disrupting wildlife migration routes, altering wildlife behaviour and allowing for the establishment of invasive plant species.

Tools that draw from an ES method include:

»

» EcoMETRIX

» Integrated Biodiversity Assessment Tool (IBAT)

» Multiscale Integrated Models of Ecosystem Services (MIMES)

» Social Values for Ecosystem Services (SolVES)

» EcoServ-GIS

» NatureServe Vista

» Natural Capital Management System (NCMS)

» Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)

» System of Environmental-Economic Accounting (SEEA)

» Artificial Intelligence for Ecosystem Services (ARIES)

» Co$tingNature

» Data Basin

» Corporate Ecosystem Services Review (ESR)

Advantages of ES for Extractives

» Allows for valuations of environmental resources impacted by extraction using both forecasted (ex ante) and actual impacts.

» Comparing ecosystem service valuations before and after extractive projects can offer useful comparisons for decision-makers.

» Well-developed method with a growing body of resource and practice tools.

Disadvantages of ES for Extractives

» A complete ES Valuation is a long process, requiring many resources, which is why companies often focus on the ES areas that will be of the greatest help.

» Given that the focus is on ecosystem services, this method does not assess all types of positive and negative impacts from extraction.

» Thorough ES Valuations can also be costly, especially when information is not easily accessible.

» Study comparisons are not always feasible as researchers and practitioners often use different techniques to value various ESs.

1 Source: Http://biodiversity.europa.eu/topics/ecosystem-services

2 A.C.O. Neves, A.F. Barbieri, A.A. Pacheco, F. Resende, R.F. Braga, A.A. Azevedo, G.W. Fernandes. The human dimension in the Espinhaço Mountains: land conversion and ecosystem services. G.W. Fernandes (Ed.), Ecology and Conservation of Mountaintop Grasslands in Brazil, Springer International Publishing AG Switzerland, Cham (2016), pp. 501–530

3 Carpenter, S.R. et al. (2009) Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. Proc Natl Acad Sci USA 106:1305–1312.

4 Neil McIntyre, Natalia Bustamante, Ed Hauck, Bastian Manz and Bert de Bievre. (2014). Mining and River Ecosystem Services. Report for the International Mining for Development Centre.

5 Brady, A. et al. (2015). Ecosystem services lost to oil and gas in North America. Science 24 Apr 2015: Vol. 348, Issue 6233, pp. 401-402

TRIPLE BOTTOM LINE

FEATURED METHOD 3

Triple Bottom Line Overview

The Triple Bottom Line (**TBL**) method is an accounting framework that incorporates three dimensions of performance: social, environmental and financial. This approach differs from traditional reporting frameworks as it includes ecological (or environmental) and social measures. The TBL dimensions are also commonly called the 'three Ps': people, planet and profits.[1]

With the ratification of the United Nations and the International Council for Local Environmental Initiatives (**ICLEI**) TBL standard for urban and community accounting in early 2007, TBL became the dominant approach to public sector full cost accounting.[2]

More broadly, TBL can be thought of as a management approach that can be used when an enterprise sets its purpose and mission, and charts its strategic direction.

Calculating Triple Bottom Line

The 3Ps do not have a common unit of measurement. Some advocate monetizing all the dimensions of the TBL[3], including social and environmental performance. While this approach has the benefit of having a common monetary unit, not all social and environmental impacts lend themselves to monetisation. For instance, depending on the cultural context, it may not be appropriate to monetise impacts to cultural or social capital (see Case Study E1 and E2). Or it may be that sufficient data is not available to monetise environmental impacts.

An alternative approach for future development may be to calculate the TBL through a use of one or more indexes—composite measures used to aggregate and compare data across multiple indicators. In so doing, this approach eliminates the issue of incompatible units, as long as there is a universally accepted accounting method that allows for comparisons between entities.

An example of an index that compares a county versus the nation's performance for a variety of components is the Indiana Business Research Center's Innovation Index. The Innovation Index consists of five components, each containing various indicators that are combined to form a composite measure:

- Human Capital: 30%
- Economic Dynamics: 30%
- Productivity and Employment: 30%
- Economic Well-Being: 10%
- State Context (for reference only)

> ***THE TRIPLE BOTTOM LINE (TBL) METHOD IS AN ACCOUNTING FRAMEWORK THAT INCORPORATES THREE DIMENSIONS OF PERFORMANCE: SOCIAL, ENVIRONMENTAL AND FINANCIAL.***

There remains some subjectivity even when using an index, however. For example, how are the index components weighted? Would each "P" get equal weighting? What about the sub-components within each "P"? Do they each get equal weighting? Is the people category more important than the planet? Who decides?[4]

Application of TBL to Extractives

As a management approach and reporting framework, TBL has been extremely influential in the extractive sector. In fact, one could argue that the basic philosophy and tenets of TBL have been fundamental in shaping advances in environmental and social performance improvements across both the mining and oil and gas sectors over the last few decades.

The TBL approach is also inherent within the GRI framework, adopted by the vast majority of major extractive companies

Specific tools that draw from the TBL approach include:

- Social Return on Investment (SROI)
- Global Environmental Management Initiatives (GEMI) Metric Navigator
- Financial Valuation tool (FV Tool)
- Measuring Impact Framework
- Sustainability Accounting Standard Board's (SASB) Materiality Map
- International Integrated Reporting Framework (IR)
- SUSOP (Sustainable Operations)
- Total Impact Measurement Management (TIMM)

Advantages of TBL for Extractives

- The general TBL approach is already embedded within the management and reporting practices of many extractive companies (the effectiveness and limitations of the TBL approach not withstanding).
- Easily understood by diverse range of stakeholders through the index approach of using multiple measures.
- Can theoretically measure all non-fiscal impacts of extraction (and fiscal impacts).
- Can be used with other specialised methods and tools for specific impacts.

Disadvantages of TBL for Extractives

- There is no universal standard method for calculating the TBL.
- Has been criticised as reductive method that does not accurately measure ecological impacts (i.e., when TBL is not used in conjunction with other tools to measure specific impacts).
- There is often a disconnect between genuinely sustainable practice and the practice of TBL sustainability reporting in extractives companies—paradoxically, TBL has been criticised as reinforcing a 'business-as-usual' approach that produces greater levels of 'un-sustainability'[6]. The objection here is that, by not fundamentally transforming the structural characteristics of business or industries, TBL legitimises unsustainable practices.

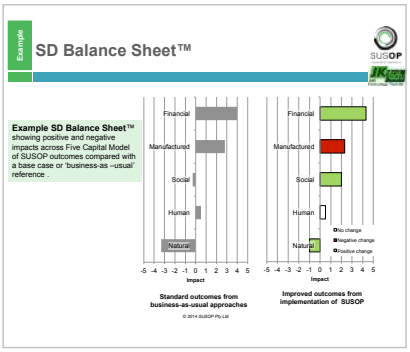


FIGURE B.10
SUSOP SD BALANCE SHEET

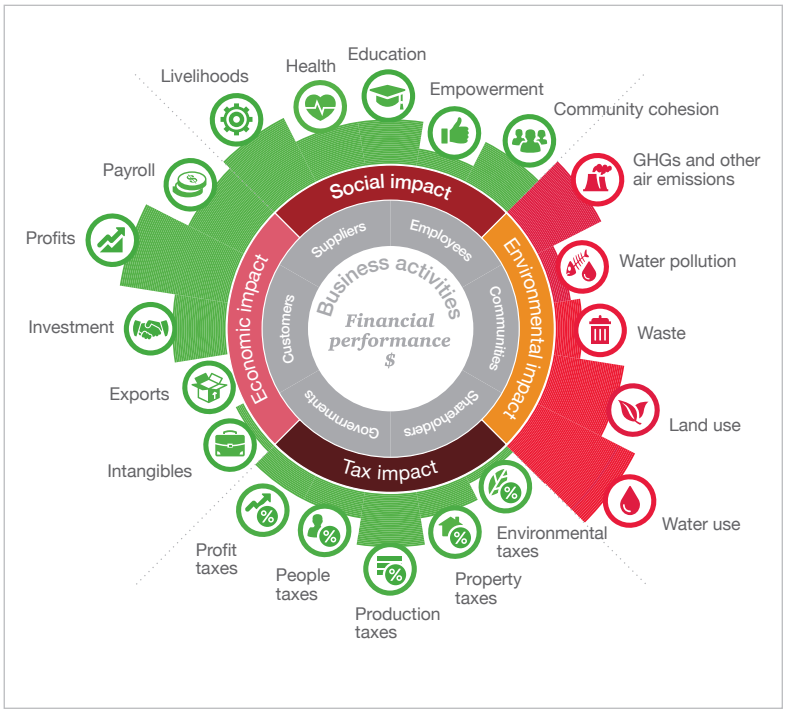


FIGURE B.11
PWC'S TOTAL IMPACT MEASUREMENT & MANAGEMENT (TIMM) FRAMEWORK
Source: Https://www.tn-sanso.co.jp/en/csr/reports/2013_06.html

1 "Triple Bottom Line". The Economist. November 17, 2009. Retrieved 14 August 2014.

2 Enhancing the role of industry through for example, private-public partnerships, May 2011. United Nations Environment Programme

3 See: Http://www.ibrc.indiana.edu/ibr/2011/spring/article2.html

4 Sridhar, K. & Jones, G. Asian J Bus Ethics (2013) 2: 91. doi:10.1007/s13520-012-0019-3

5 GRI is often criticised as a weak form of TBL, see for instance: Milne, M.J. & Gray, R. J Bus Ethics (2013) 118: 13. doi:10.1007/s10551-012-1543-8

6 See for instance Sridhar & Jones, 2012. Source: Https://link.springer.com/article/10.1007%2Fs13520-012-0019-3

IMPACT ASSESSMENTS

FEATURED METHOD 4

Impact Assessment Overview

Environmental Impact Assessment (**EIA**) is the process of assessing the likely environmental impacts (positive and negative) of a plan, policy, program, or a project. Social Impact Assessments (**SIA**), which are sometimes included within an EIA, focus on the social dimensions of change. When social impact assessments are conducted as part of an EIA, they are often referred to as 'ESIAs'.

The main purpose of ESIAs is to inform decision makers of the likely impacts of a proposal before a decision is made. ESIAs provide an opportunity to identify key issues and stakeholders early in the life of a project so that potentially adverse impacts can be addressed before final approval decisions are made.[1] Through the assessment of environmental and social impacts, ESIAs help to proactively anticipate, avoid, and when that is not possible, minimise and compensate for impacts on affected communities, workers and the environment.

Other types of impact assessments that may be included in an ESIA, or conducted separately, include health impact assessments, human rights impact assessment, and biodiversity impact assessments.

Despite a number of initiatives to promote integrated impact assessment[1], ESIAs still typically assess different biophysical elements (e.g., air, water, land, fauna and flora/ biodiversity), and socio-economic elements (e.g., demography, health, culture, and livelihoods), separately.

New regulatory and financial impact assessment standards require that ESIA systematically addresses impacts on ecosystem services, which by definition link people and their environment.[4] They include the Convention on Biological Diversity's voluntary guidelines on including biodiversity and ecosystem services in impact assessment[5], the Organisation for Economic Co-operation and Development's guidance on how to include ecosystem services in Strategic Environmental Assessments, and the oil and gas sector's checklists regarding ecosystem service dependencies and impacts[6]. However, these guidelines are voluntary and do not offer ESIA practitioners detailed instructions on how to incorporate ecosystem services throughout the ESIA process.[7]

> ***LIFE CYCLE ASSESSMENT[1] (LCA) IS A METHOD FOR THE EVALUATION OF THE ENVIRONMENTAL ASPECTS OF A PRODUCT OR SERVICE SYSTEM THROUGH ALL STAGES OF ITS LIFE CYCLE.***

Calculating Impact Assessments

ESIAs typically use both quantitative and qualitative research methods to describe the impacts under study.

There are a range of guidance notes offered for EIAs and SIAs from groups such as the International Association for Impact Assessment and peak extractive sector industry groups such as IPIECA and ICMM. These best practice frameworks typically outline key principles for assessment, such as: 'public participation at all stages of the process', 'transparency' and the 'precautionary principle', as well as key methodological approaches which vary widely depending on the type of impact assessment being conducted.

Stakeholder involvement in the ESIA process is increasingly recognised as important factor when seeking to improve the quality of the assessments themselves, and to help build community support for project decision-making.

The 2012 edition of IFC's Sustainability Framework includes Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. Performance Standard 1 establishes the importance of:

1. Integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects;
2. Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
3. The client's management of environmental and social performance throughout the life of the project.

Like other best practice guidelines, IFC Performance Standard 1 provides overall guidance for the ESIA process—for instance the importance of measuring trans-boundary and third party impacts; and considering gender, disability, and disadvantaged and vulnerable groups in the assessment process—however there is little detail provided on how these impacts should be measured (and in this sense the IFC Performance Standards are similar to the ISO standards).

Application of ES to Extractives

ESIAs are perhaps the most utilised method of measuring non-fiscal costs and benefits in the extractive sector. In almost all jurisdictions, extractive companies are required to conduct EIAs or ESIAs prior to project development, and some jurisdictions also require assessments prior to exploration. ESIA methods are also sometimes required as part of the ongoing monitoring of projects.

However, most countries do not have mandatory standards that specify requirements for measurement methodologies during ESIAs, beyond general requirements such as public consultation and disclosure requirements.

ESIAs enable regulators and other stakeholders to review predicted impacts and mitigation measures for an extractive project proposal, before it is finalised or approved. As such, the specific impacts highlighted or privileged by different ESIA approaches can lead to different social and environmental management plans.

ESIAs can be used as an overarching method to incorporate other methods and tools for non-fiscal measurement (for example the ecosystem service evaluation method and tools to measure specific impacts, such as the Water Accounting Framework). Given their prominence and influence during project evaluation, incorporating more effective measurement of non-fiscal impacts during the ESIA process is a lever for improving the governance and management of non-fiscal impacts in the extractive sector.

Part C provides more details on the ways in which governments utilise ESIAs in the extractive sector.

Advantages of ES for Extractives

- Widely used and accepted in the extractive sector by industry, government and other stakeholders.
- Allow for a wide range of impacts to be assessed using quantitative and qualitative methods.
- Ability to integrate with other tools and methods.
- Rich methods for quantitative and qualitative analyses of projected and actual impacts.

Disadvantages of ES for Extractives

- Typically do not quantify impacts across all capitals in a way that offers comparisons between impacts.
- Measurement methods are not standardised across ESIA methodologies.
- Typically no monetary or index value assigned to costs and benefits.

1 Brownlie, S. 2005. Guideline for involving biodiversity specialists in EIA processes: Edition 1. Source: Http:// www.capegateway.gov.za/Text/2005/10/deadp_biodiversity_guideline_june05_final.pdf

2 See Landsberg et al (2011). Ecosystem Services Review for Impact Assessment Introduction and Guide to Scoping. World Resource Institute Scoping Paper. 2011.

3 Franks, D. 2012. Social Impact Assessment of Resource Projects. Australian Aid

4 See: Http://pdf.wri.org/corporate_ecosystem_services_review.pdf

5 Slootweg, R., A. Kolhoff, R. Verheem, and R. Höft. 2006. Source: Http://www.cbd. int/doc/publications/imp-bio-eia-and-sea.pdf (last access:08/12/2011).

6 Global oil and gas industry association for environmental and social issues (IPIECA) and International Association of Oil and Gas Producers (OGP). 2011. Ecosystem services guidance: Biodiversity and ecosystem services guide and checklists. Available at: Http://www.ipieca.org/publication/ecosystemservices-guidance.

7 World Resources Institute (WRI). 2010. On-line survey of impact assessment practitioners regarding addressing ecosystem services in environmental assessments. Available on-line at: Http://docs.wri.org/share/eiasurvey (last access: 08/12/2011)

LIFE-CYCLE ANALYSIS

FEATURED METHOD 5

Life Cycle Assessment Overview

Life Cycle Assessment[1] (**LCA**) is a method for the evaluation of the environmental aspects of a product or service system through all stages of its life cycle[2].

LCA utilises a 'cradle-to-grave' approach where every unit process is tracked back to the raw materials and energy inputs, and forward to the disposal impacts. This approach provides a systematic way to evaluate benefits to society of particular policy choices, product preferences, and system improvements.

The first LCA was conducted by Coca-Cola in 1969 to explore which beverage container had the least harmful effect on the environment. Since the more recent formalisation of LCA by the Society of Environmental Toxicology and Chemistry (**SETAC**) in the early 1990s, the approach has been widely used in assessing the environmental impacts of various products and systems[3]. More recently, The International Organisation for Standardisation (**ISO**) has standardised the LCA framework within ISO standard 14040.

LCAs allow for the comparison of all potential environmental and social damages of a product or service, such as greenhouse gases, water pollution, habitat destruction, ozone depletion, and soil acidification. The results of LCAs help companies make better-informed choices as they consider the ways in which business and supplier activities impact natural capital.

According to the US Environmental Protection Agency, more than 30 different organizations have created their own software packages to carry out LCAs.[4]

To study links between society and the environment, a Material Flow Analysis[5] (**MFA**) can be used in conjunction with the LCA. MFA's measure and analyse the material flow through an industry or company and the effect on different ecosystems. The scope of the MFA can be on a national, regional, corporate or site level of analysis, or alternatively, it could also be the Life Cycle of a specific product. As a result, the MFA can be compared directly to the LCA.

Calculating a Life Cycle Assessment

The basic steps for a Lifecycle analysis include:[6]

» Goal definition and scoping: identifying the LCA's purpose and the expected products of the study, and determining the boundaries (what is and is not included in the study) and assumptions based upon the goal definition;

» Life-cycle inventory: quantifying the energy and raw material inputs and environmental releases associated with each stage of production;

» Impact analysis: assessing the impacts on human health and the environment associated with energy and raw material inputs and environmental releases quantified by the inventory;

» Improvement analysis: evaluating opportunities to reduce energy, material inputs, or environmental impacts at each stage of the product life-cycle.

The use of an LCA Calculator

> ***LIFE CYCLE ASSESSMENT[1] (LCA) IS A METHOD FOR THE EVALUATION OF THE ENVIRONMENTAL ASPECTS OF A PRODUCT OR SERVICE SYSTEM THROUGH ALL STAGES OF ITS LIFE CYCLE.***

helps to track and evaluate the process chronologically from the extraction of the raw materials to the disposal of the product once it can no longer be used, and also offers clearer outcomes on possible 'what if' scenarios[7]. The output of an LCA will depend on the inputs, but typically includes quantitative measurements such as total raw materials or energy used in an industrial process.

Application of LCAs to Extractives

Many studies have applied LCA approaches to both mining and oil and gas operations, as well as the industries as a whole.

For instance, LCAs have been used to study the environmental impacts of different beatification techniques for raw silica sand in Croatia[8], Greenhouse Gas Emissions from Canadian Oil Sands Production[10], beatification techniques; national life cycle inventory for base metals, and an integral life cycle model for the management of mining processes[11], and the economic and ecological feasibility of new and existing mining projects in the Polish mining industry[12].

Advantages of LCAs for Extractives

- The 'cradle-to-grave' life-cycle approach has potential to take more of an industrial ecology perspective to extractives by shifting focus to the entire production process (this is a particularly useful or vexing, depending on one's perspective).
- Can still be limited to an extractive project or process by specifying an appropriate functional unit (e.g., tons per hour)) and the product system.
- Helps extractive companies analyse external economic, political, social and technological factors.
- There are a variety of LCA software packages to choose from, including LICYMIN, a mining specific LCA package developed by Durucan et al[13].
- Although many LCAs do not include economic values, there are tools available that can combine the input-output analysis (for instance Life Cycle Costing[14]).
- Use of LCA methods would help to promote life cycle thinking among extractive sector professionals.

Disadvantages of LCAs for Extractives

- It is difficult to analyse a product/service from its extraction to its disposal.
- Most studies that apply LCA methods to extractives are academic in nature. There is significantly less utilisation of LCA methods by extractive companies and governments, perhaps indicating that companies do not view LCA methods as having practical utility; or perhaps there is a perception that lifecycle methods do not align with the immediate interests of managing environmental impacts at a project level. Alternatively, it could reflect a lack of external pressure from governments and financial institutions to bring life-cycle approaches to bare in the sector
- Not every LCA is calculated in the same way. Less uniformity makes it more difficult to compare results from two or more LCAs.
- Mining LCA studies have adopted some of the same impact categories as all other studies. However, various authors have recognised the fact that the standard impact categories (global warming, ozone depletion, human toxicity, fresh water aquatic ecotoxicity, acidification, and eutrophication potential impacts) are not enough to describe the environmental impacts of mining. Land-, water-, and energy-use impacts and resource depletion are some of the impacts that have been suggested as equally important in mining LCA.[15]

1 Also referred to as the Life Cycle Assessment.

2 See Http://www.unep.org/resourceefficiency/Consumption/StandardsandLabels/MeasuringSustainability/LifeCycleAssessment/tabid/101348/Default.aspx

3 (Basset-Mens et al. 2007; Battisti and Corrado 2005; Chaya and Gheewala 2007; Socolof et al. 2005)

4 See: www.epa.gov/nrmrl/lcaccess/resources.html

5 Also known as a Substance Flow Analysis

6 Tellus Institute, Source: Https://www.gdrc.org/sustdev/concepts/17-lca.html

7 For more specific information, visit: www.epa.gov/nrmrl/lcaccess/pdfs/600r06060.pdf

8 Grbeš, 2016. A Life Cycle Assessment of Silica Sand: Comparing

9 The Beneficiation Processes. Sustainability 2016, 8, 11; doi:10.3390/su8010011

10 Brandt, A. R. (2012). Variability and Uncertainty in Life Cycle Assessment Models for Greenhouse Gas Emissions from Canadian Oil Sands Production. Environ. Sci. Technol., 2012, 46 (2), pp 1253–1261

11 Nydia Suppena, b, , , Mario Carranzab, Mario Huertac, Mario A. Hernándezb

12 Góralczyk, M, Kulczycka, J. (2005). LCC application in the Polish mining industry. Management of Environmental Quality, 16.2 (2005): 119-129.

13 Durucan S, Korre A, Munoz-Melendez G (2006) Mining life cycle modelling: a cradle-to-gate approach to environmental management in the minerals industry. J Clean Prod 14:1057–1070

14 See for instance Guidelines for Lifecycle cost analysis. Stanford University, 2005.

15 Durucan et al. 2006; Mangena and Brent 2006; Spitzley and Tolle 2004)

ECOLOGICAL FOOTPRINT ASSESSMENT

FEATURED METHOD 6

Ecological Footprint Assessment Overview

The Ecological Footprint Assessment (**EFA**), also known as 'Eco-Footprint' and 'Environmental Footprint', measures human demand on nature[1].

EFA is a method of measuring the ecologically productive land types such as grazing land, crop-land, forest land, fishing grounds, uptake land, and built-up land that is needed to sustain human resource demands including food, water, energy, shelter, and the assimilation of waste products.[2]

Ecological Footprint approaches typically compare how much biologically productive area people, groups or industries use for their consumption, with how much biologically productive area is available (biocapacity). The Ecological Footprint Approach uses land as its main 'currency'. The impact of the Ecological Footprint is usually measured in global hectares or acres, and the indicator can be calculated for local, regional, national and/or global areas. In this way, EFA helps to monitor societies' progress towards minimum sustainability criteria (e.g., demand ≤ supply).

Since the initial EFA was defined in the 90s[3], a newer method, Footprint 2.0, has been developed by US non-profit organisation, Redefining Progress. Footprint 2.0 calculations are typically based on the Earth's entire surface in relation to its bio-capacity, with a percentage of the productive resources reserved for non-human species.

The Ecological Footprint Standards 2009, published by the Global Footprint Network[4], are designed to ensure that Footprint assessments are conducted and communicated in a way that is accurate and transparent, by providing standards and guidelines on issues such as use of source data, derivation of conversion factors, establishment of study boundaries, and communication of findings.

Originally developed as an indicator of environmental impacts of nations, individuals, or human populations, EFA is increasingly used as an indicator of organisational and corporate environmental performance and as an indicator of sustainability of products[5].

> ***THE ECOLOGICAL FOOTPRINT ASSESSMENT (EFA), ALSO KNOWN AS 'ECO-FOOTPRINT' AND 'ENVIRONMENTAL FOOTPRINT', MEASURES HUMAN DEMAND ON NATURE.***

Comprehensive national accounts based on the EF have been produced for several years now (see WWF, 2014, for example). These accounts show how far from long-term sustainability a country is in a particular year. They are based on the EF and on the water footprint.

Carbon footprinting, water footprinting, energy footprinting and biodiversity footprint methods are all derivative of the ecological footprint approach.

Calculating an Ecological Footprint

To determine the area of the ecological footprint for a given entity, land requirements for all categories of consumption and waste discharge must be summed. Data/information

needed for an organisation to calculate an EFA includes:

- Crop-land area;
- Grazing land area for animal products production;
- Forest area for wood and paper production;
- Ocean area for seafood production;
- Land area for infrastructure and housing;
- Forest area for carbon dioxide emissions absorption.

Application of EFAs to Extractives

EFAs have been undertaken to produce a baseline of consumption and emissions for mining companies; assess possible measures to reduce companies' footprint area; and determine steps required to implement such measures.[6]

For instance, in a study at a Raniganj coal mining belt in West Bengal, India, the extent of degradation of the soil and air qualities in the areas near the mine yielded an impact zone of 7.8 times the actual mining areas.[7]

The Water Accounting Framework, developed by The Sustainable Minerals Institute at The University of Queensland, is an example of a footprinting approach that has been applied extensively in the mining industry. Other examples of tools that employ a footprinting approach include Mosaic Carbon Footprinting, Estell and the Greenhouse Gas Protocol.

Advantages of EFA for Extractives

- The EFA has been in existence since the 90s and newer tools like the carbon and water footprints (including the IFC's Water Footprint Assessment) have used its methodology.
- It is universal, adaptable and easy to use, allowing individuals, businesses and governments to gauge their EFA. The EFA tool is also an excellent way of measuring and comparing footprints over time.
- EFA calculation results have one number that is usually defined in global hectares (gha) making them easily comparable.
- Produces data for comparing a company's impact with other multi-commodity companies and other companies operating in the same or similar geographies.
- It is an analysis that can be conducted at both macro and micro scales and is useful in linking impacts at site level to those at the scale of a nation state.
- It complements other sustainability calculations (economic and social).
- Could be used at a country-level to measure and model the footprints of various current/ potential mining projects in order to benchmark and compare impacts.

Disadvantages of EFA for Extractives

- The ecological footprint metric is not commonly reported by mining companies. This is partly due to onerous data requirements (usually inputs are required from a number of different sectors), and the subsequent disclosure of impacts. Because of the dominance of energy-related impacts in mining and processing, companies have tended to focus more on carbon footprinting.
- Does not account for all impacts across various capitals.
- Using EFA as a business strategy in isolation of a country strategy and global context provides limited value.
- Aggregating the calculation of the EFA into one number may be questionable in an extractive context, particularly if this one number does not encompass all impacts to natural capital.
- EFA calculations focus on the number of hectares that are needed to support human resource demands, therefore some locations could be valued higher than what they usually are, for example, a small productive agricultural crop-land area could be valued higher than an ancient native forest.
- Cannot cover all aspects of sustainability, neither all environmental concerns, especially those for which no regenerative capacity exists.

---

1 The Ecological Footprint concept was devised and calculated by Professor William Rees in collaboration with a PhD student, Mathis Wackernagel, in the 1990s as a dissertation project through the University of British Columbia in Vancouver, Canada

2 Rees, William E. (October 1992). "Ecological footprints and appropriated carrying capacity: what urban economics leaves out". Environment and Urbanisation. 4 (2): 121–130. doi:10.1177/095624789200400212.

3 Wackernagel's EFA Model

4 Source: Http://www.footprintnetwork.org/en/index.php/GFN/page/application_standards/

5 Weidmann and Barrett, 2010

6 D. Limpitlaw, A. Alsum, and D. Neale. Calculating ecological footprints for mining companies – an introduction to the methodology and an assessment of the benefits. Mining, Environment and Society Conference

7 Sinha, S., Chakraborty, S. & Goswami, S. Environ Dev Sustain (2016). doi:10.1007/s10668-016-9766-y

PART C

STANDARDISATION INITIATIVES

NATURAL CAPITAL PROTOCOL

STANDARDISATION INITIATIVE 1

The Natural Capital Coalition (**NCC**) is a partnership of prominent organisations from business, accountancy, science and academia, membership organisations, standard setting, finance, policy and conservation working to standardise approaches towards 'natural capital'.[1]

In July 2016, the NCC developed the Natural Capital Protocol to help measure and value the positive and negative impacts of business, as well as their resource dependency.

The official Endorsement Statement for the Protocol has been signed by prominent individuals and organisations, including those listed in Figure C.1. Figures C.2 and C.3 provide summary information on the protocol's method. Among them are the following companies who are in or work around the extractive sector: World Resources Institute, Shell, AECOM, Cardno, Deloitte, EY, GRI, World Bank, IFC, Fauna and Flora, Conservation International and The Nature Conservancy.

The Protocol is an overall framework to help organisations measure their natural capital impact.

The Protocol Framework covers four stages, "Why", "What", "How", and "What Next". Protocol Stages are further broken down into nine Steps, which contain specific questions to be answered when carrying out a natural capital assessment.

The first two sector guides for the protocol are focused on the apparel and food and beverage sectors. The Coalition has publicly stated that it welcomes dialogue with sector-specific initiatives interested in working towards developing additional guides for their sectors.

New sector guides are under development and the NCC is developing a Protocol Application Program to support businesses as they begin to measure, value and integrate natural capital considerations into their business decisions.

In 2017, the Natural Capital Coalition also plans to launch a special Toolkit to facilitate businesses and organisations to apply the protocol.

There are a growing number of businesses who are preparing to apply the Protocol and accompanying sector guides. These businesses cover a wide range of sectors and geographies.

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FIGURE C.1
NATURAL CAPITAL COALITION SIGNATORIES

1 This section relies heavily on information from: naturalcapitalcoalition.org

FIGURE C.2
NATURAL CAPITAL PROTOCOL METHOD

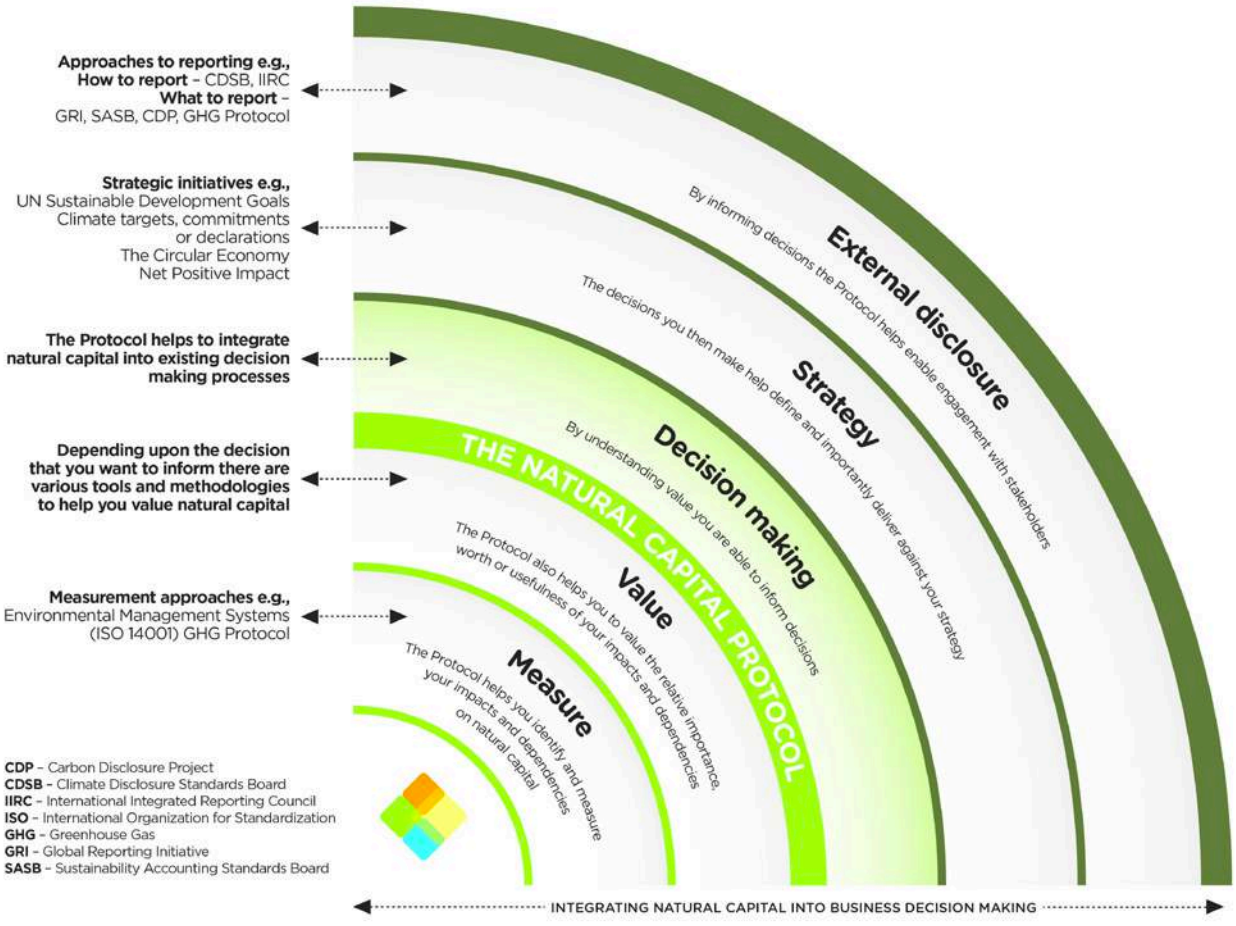

FIGURE C.3
NATURAL CAPITAL COALITION 'LANDSCAPE'

SOCIAL CAPITAL PROTOCL

STANDARDISATION INITIATIVE 2

In June 2015, the World Business Council for Sustainable Development (**WBCSD**) launched a 'Call for Collaboration', initiating the development of a Social Capital Protocol—'a harmonized approach for businesses to measure and value their interactions with society'.[1]

The vision for the Social Capital Protocol is that it will provide a critical part of the evolving business toolkit by bringing together the currently fragmented landscape of social measurement and valuation.
Alongside the Natural Capital Protocol, it will provide the universal processes, principles and tools needed by business to ensure social risks and opportunities are considered in corporate strategy and decision-making, and appropriately included in integrated reporting.

The steps in the Social Capital Protocol are:

1. Understand business relevance.
2. Design approach.
3. Conduct measurement.
4. Perform valuation.

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1 This section relies heavily on information from: Http://www.wbcsd.org/Clusters/Social-Impact/Social-Capital-Protocol

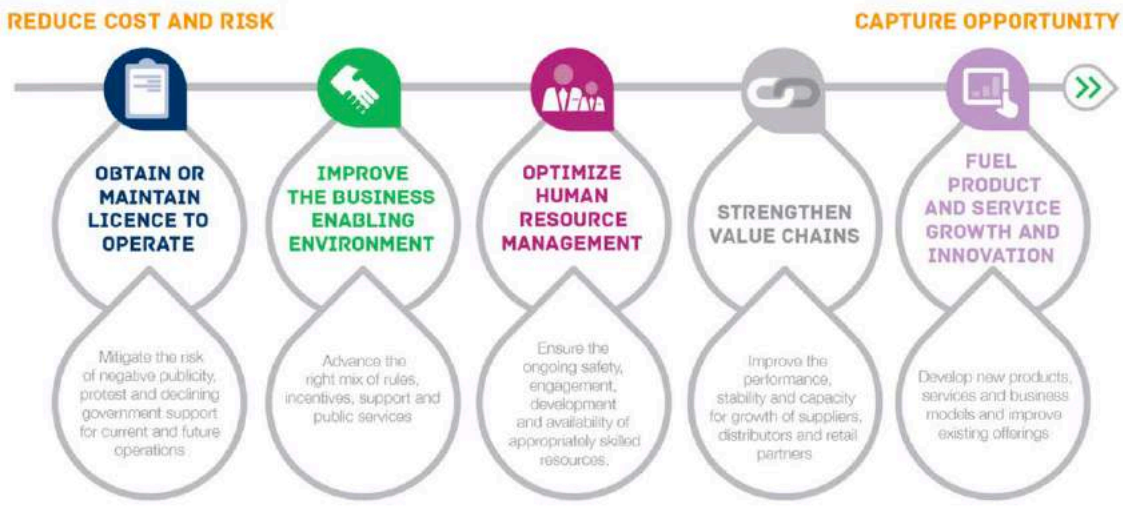

FIGURE C.4 SOCIAL CAPITAL PROTOCOL BUSINESS CASE'

ISO 14008 FORTHCOMING STANDARD

STANDARDISATION INITIATIVE 3

In September 2015, The International Organization for Standards (**ISO**) commenced a project to develop ISO 14008, a new standard on Monetary valuation of environmental impacts from specific emissions and use of natural resources.[1]

The primary aim of ISO14008 is to provide businesses, organisations and individuals with a common framework and terminology for monetary valuation of environmental impacts. Another goal of ISO 14008 is to encourage more companies and organisations to carry out formal monetary valuations or environmental impact assessments on their businesses.

ISO 14008 will not set out how an organisation determines the specific 'cost and benefits' associated with its organisational operation in an environmental management context, nor clarify why and how monetary valuation can be used and communicated as part of an existing environmental management approach or system. It is expected that these aspects could be covered in future ISO Environmental Management Standards. The feasibility of such additional standardisation in a wider Environmental Management System context has been highlighted during the preparation of the proposal for ISO 14008.

ISO standards require a license fee for access; they are not open source. The key components of the standard are still under-development. Given the nature of ISO standards, it is unlikely that ISO 14008 will provide specific advice on how to measure non-fiscal impacts in extractives (i.e., the standard will not advocate specific tools).

The proposed time plan is for the standard to be published in late 2018.

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1 This section relies heavily on information from: Https://committee.iso.org/sites/tc207sc1/home/projects/ongoing/iso-14008.html, Http://www.iso.org/iso/catalogue_detail.htm?csnumber=43243, Https://committee.iso.org/files/live/sites/tc207sc1/files/ISO%2014008%20FAQ%2022%20Feb%202016.pdf

International Organization for Standardization

SASB SUSTAINABILITY ACCOUNTING

STANDARDISATION INITIATIVE 4

The Sustainability Accounting Standards Board (**SASB**) is an independent non-profit organisation, whose mission is to develop and disseminate sustainability accounting standards that help public corporations disclose material, decision-useful information to investors. SASB has developed publicly available sustainability accounting standards for 79 industries in 11 sectors, including non-renewable resource which includes oil and gas and mining. SASB's integrated reporting is designed to help investors and the public compare financial and sustainability performance indicators between organisations.

The SASB Materiality Map is an interactive tool that identifies and compares disclosure topics across different industries and sectors. The map identifies sustainability issues or topics that are likely to be material for industries in a given sector. Non-renewables are included as a sector in the map and are further disaggregated by oil and gas (upstream, midstream, downstream), coal, iron and steel, construction materials and metals and mining. It could serve as a starting place for identifying impacts to be measured and valued.

SASB Standards identify sustainability topics at an industry level which may constitute material information—depending on a company's specific operating context—for a company within that industry. SASB Standards are intended to provide guidance to company management, which is ultimately responsible for determining which information is material and should therefore be included in its Form 10-K or 20-F and other periodic SEC filings as appropriate.

SASB Standards provide companies with standardized sustainability metrics designed to communicate performance on sustainability topics. When making disclosure on sustainability topics, companies can use SASB Standards to help ensure that disclosure is standardized, decision-useful, relevant, comparable, and complete. SASB Standards are intended to provide the basis for suitable criteria, defined by AT 101.23 -. 321 as having the following attributes:

1. Objectivity—Criteria should be free from bias.
2. Measurability—Criteria should permit reasonably consistent measurements, qualitative or quantitative, of subject matter.
3. Completeness—Criteria should be sufficiently complete so that those relevant factors that would alter a conclusion about subject matter are not omitted.
4. Relevance—Criteria should be relevant to the subject matter.

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1 This section relies heavily on information from: Https://www.sasb.org/

GRI SUSTAINABILITY REPORTING STANDARDS

STANDARDISATION INITIATIVE 5

The Global Reporting Initiative (**GRI**) Standards, which have been in effect since the late 1990s, are internationally recognised standards for sustainability reporting.

GRI sustainability reporting is carried out by companies and organizations of all types, sizes and sectors. Almost 80 percent of the largest 100 companies in 41 countries worldwide issuing corporate responsibility reports now use the GRI Sustainability Reporting Guidelines, according to a survey by KPMG[2].

The modular, interrelated GRI Standards are designed primarily to be used as a set, to prepare a sustainability report focused on material topics. The three universal Standards are used by every organization that prepares a sustainability report. An organization also chooses from the following topic-specific standards:

Economic standards:
- Economic Performance
- Market Presence
- Indirect Economic Impacts
- Procurement Practices
- Anti-corruption
- Anti-competitive Behavior

Environmental standards:
- Materials
- Energy
- Water
- Biodiversity
- Emissions
- Effluents and Waste
- Environmental Compliance
- Supplier Environmental. Assessment

Social standards:
- Employment
- Labor/Management Relations
- Occupational Health and Safety
- Training and Education
- Diversity and Equal Opportunity
- Non-discrimination
- Freedom of Association and Collective Bargaining
- Child Labor
- Forced or Compulsory Labor
- Security Practices
- Rights of Indigenous Peoples
- Human Rights Assessment
- Local Communities
- Supplier Social Assessment
- Public Policy
- Customer Health and Safety
- Marketing and Labeling
- Customer Privacy
- Socioeconomic Compliance

All GRI reports are filed in a database, which makes performance data more transparent, comparable and available.

At present, 35 countries have adopted the GRI standards, and GRI has been endorsed by international organisations such as the UN Working Group on Business and Human Rights, the OECD and the UN Global Compact.

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1 This section relies heavily on information from: Https://www.globalreporting.org/

INTERNATIONAL INTEGRATED REPORTING FRAMEWORK

STANDARDISATION INITIATIVE 5

<IR> is an integrated reporting framework that was released following consultation and testing by businesses and investors in all regions of the world, including the 140 businesses and investors from 26 countries that participated in the Pilot Programme.

The purpose of the Framework is to establish Guiding Principles and Content Elements that govern the overall content of an integrated report.

<IR> aims to:

- Improve the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital.
- Promote a more cohesive and efficient approach to corporate reporting that draws on different reporting strands and communicates the full range of factors that materially affect the ability of an organisation to create value over time.
- Enhance accountability and stewardship for the broad base of capitals (financial, manufactured, intellectual, human, social and relationship, and natural) and promote understanding of their interdependencies.
- Support integrated thinking, decision-making and actions that focus on the creation of value over the short, medium and long term.

The International Integrated Reporting Council (**IIRC**) is a global coalition of regulators, investors, companies, standard setters, the accounting profession and NGOs. The IIRC's mission is to establish integrated reporting and thinking within mainstream business practice as the norm in the public and private sectors.

The <IR> Training Programme aims to develop individuals' skills and build capacity for organizations to implement an Integrated Reporting process based on the International Integrated Reporting Framework. The IIRC has developed a model based on learning outcomes, which specifies levels of competence to be achieved through <IR> Training. The competence levels and related learning outcomes are outlined in the <IR> Competence Matrix.

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1 This section relies heavily on information from: Http://integratedreporting.org/

PART II

GOVERNMENT AND COMPANY APPROACHES

GOVERNMENT APPROACHES TO NON-FISCAL IMPACTS

SECTION I

01. // National Accounting Frameworks

There is widespread recognition that GDP and other measures of economic growth are inadequate when measuring the overall wealth and wellbeing of a nation.[1]

One prominent inquiry into the limits of GDP-based indicators was conducted in France by the Commission on the Measurement of Economic Performance and Social Progress (**CMEPSP**). The inquiry distinguished between the current well-being of a nation and whether this wellbeing can be sustained over time. According to CMEPSP, current wellbeing is based around both economic (e.g., income) and non-economic resources (e.g., what people do, how they feel, and the natural environment in which they live). Whether wellbeing can be sustained over time depends on whether stocks of capital that matter for peoples' lives—such as natural, physical, human and social capital—are passed on to future generations.[2]

With the increasing recognition of the need to account for national growth and wellbeing in a more holistic way, governments, multilateral organisations and academics have developed a range of methodologies to measure human development.

For instance, a number of frameworks have been developed to account for the social aspects of human development, including the Human Development Index (which also has economic indicators), the Gross National Happiness Index, and the Social Progress Index.[3] Although these frameworks have become relatively widespread (in particular the UNDP's HDI which is measured in 188 countries), they are typically adopted by countries as stand-alone measures of human development, with little integration into national accounting frameworks.

As a result, there is limited connection between these frameworks and the measurement of non-fiscal impacts in the extractives sector.

In contrast, the System of Environmental-Economic Accounting (SEEA) is being increasingly integrated into national accounting frameworks. SEEA contains the internationally agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics on the environment and its relationship with the economy.[4]

As described by Harris and Roach (2016), the SEEA considers four basic approaches to environmental accounting[5]:

1. Measuring the relationships between the environment and the economy. This approach seeks to quantify the ways various economic sectors are dependent on natural resources as well as the way the environment is affected by different economic activities.
2. Measuring environmental economic activities. This approach measures expenditures on environmental protection and the impact of

economic policies, such as taxes and subsidies, to reduce environmental damage.

3. Environmental asset accounts. This approach collects data on the levels of various types of natural capital, such as forests, minerals, and groundwater.
4. Adjusting existing accounting measures to account for natural capital degradation. This approach seeks to monetise the damages associated with the depletion of natural resources and environmental quality degradation, as well as identify defensive expenditures made in response to, or in order to avoid, environmental damages. This approach essentially takes existing national accounting measures and makes a monetary deduction to represent environmental damages.

> ***FOR THE MOST PART, THESE LEGISLATIVE PROVISIONS AND PRACTICE GUIDELINES TEND TO PROVIDE HIGH LEVEL GUIDANCE ON THE ESIA PROCESS, RATHER THAN SPECIFIC GUIDANCE ON MEASUREMENT METHODS OR TOOLS FOR ASSESSING, MEASURING, VALUING AND REPORTING NON-FISCAL IMPACTS IN THE EXTRACTIVE SECTOR.***

Despite the advances in measuring the social aspects of human development as well as environmental accounting frameworks, these measurement methodologies remain largely disconnected from the measurement of non-fiscal impacts in the extractives sector. For the frameworks measuring social aspects of human development, such as the HDI, the opportunity is to develop methods and tools that measure non-fiscal impacts in a way that is interoperable. For environmental accounting methods, in particular SEEA, the opportunity is to integrate site and sector measurements on material flows and impacts to ecosystem services with national accounts.

02 // National laws, regulations, and other contractual or legal requirements typically require EIAs/ESIAs in the extractive project approval process

Across the vast majority of jurisdictions—including all NRGI priority and limited engagement countries—extractive companies are required to conduct environmental impact assessments (**EIA**) or environmental and social impact assessments (**ESIA**) prior to development of an extractives project.[1] Some jurisdictions also require EIAs or ESIAs prior to exploration[2].

For instance:

- In Ghana, the 1994 Environmental Protection Agency Act created the Environmental Protection Agency, which regulates the undertaking of environmental impact assessments and establishes the mandate of national Environment Protection Inspectors.[8] Section 82 of the Petroleum Exploration & Production Act 2016[9] and Section 46 of the Minerals and Mining Act 2006[10] provide for EIAs in the extractive sector.
- In Nigeria, The Environmental Impact Assessment Act 1992 makes it mandatory to conduct an EIA for any proposed extractive project.[11]
- In Bolivia, Chile, and Peru, mining codes require mining developers to undertake EIAs and undergo inspection by representatives of the central government.[12]
- In Myanmar, although EIAs are common in the extractive sector, the legal framework for EIA is still being developed. In the Environmental Conservation Law of 2012, reference is made to EIAs and the Ministry of Environmental Conservation and Forestry issued an EIA procedure in December 2015.[13]
- In Indonesia, there has been a legal basis for EIA since 1982; detailed procedural requirements were first put in place in 1986; and further refined in 1993, and amended in 1999, 2001, 2006 and 2012.[15]

It should be noted, however, that the extent to which these provisions provide for socio-economic impacts to be assessed as part of the EIA process, or through a separate SIA, varies across countries.[16]

03. // Legislative provisions or guidance on ESIA process

One way in which governments shape the measurement and reporting of non-fiscal impacts is

CASE STUDY D1: NIGERIAN ENVIRONMENTAL IMPACT ASSESSMENT DECREE NO. 86 OF 1992

The EIA process in Nigeria follows the Nigerian Environmental Impact Assessment Decree No. 86 of 1992, which provides high level guidance on the EIA requirements and process. The provisions for minimum EIA requirements are as follows:

Oil rig in Nigerian delta

a. a description of the proposed activities;
b. a description of the potential affected environment including specific information necessary to identify and assess the environmental effects of the proposed activities;
c. a description of the practical activities, as appropriate;
d. an assessment of the likely or potential environmental impacts on the proposed activity and the alternatives, including the direct or indirect cumulative, short-term and tong-term effects:
e. an identification and description of measures available to mitigate adverse environmental impacts of proposed activity and assessment of those measures;
f. an indication of gaps in knowledge and uncertainly which may be encountered in computing the required information:
g. an indication of whether the environment of any other State, Local Government Area or areas outside Nigeria is likely to be affected by the proposed activity or its alternatives;
h. a brief and non technical summary of the information provided under paragraph (a) to (g) of this section..

CASE STUDY D2: NEW SOUTH WALES GUIDE FOR ASSESSING SOCIAL IMPACTS IN MINING COMMUNITIES

The NSW Department of Planning and Environment has released Draft guidelines for the Social Impact Assessment of State significant mining, petroleum production and extractive industry development. The University of Queensland's Centre for Social Responsibility in Mining assisted with development of the guideline.

The Environmental Planning and Assessment Act 1979 requires the social impacts of a State significant project to be assessed and considered as part of the development assessment process. However, unlike for economic and environmental impacts, the Government does not currently provide guidance on how this should be done. The draft guidelines aim to ensure that the social impacts of State significant resource projects are identified, assessed and dealt with in a transparent, consistent and robust manner. The overall aim is to minimise negative social impacts, maximise potential benefits and deliver better outcomes. The guidelines are designed to strengthen the quality of information and analysis available to decision-makers, and give communities a stronger voice in the assessment process.

The guidelines focus on the overall approach to social impact assessment rather than providing specific guidance for the measurement, quantification or valuation of non-fiscal impacts.

through legislative provisions and practice guidance on how EIAs and SIAs should be carried out by extractive companies. These provisions are typically found in acts or other legislative instruments; or in guidelines provided by environmental ministries, or ministries that regulate the extractives sector.

For the most part, these legislative provisions and practice guidelines provide high level guidance on the ESIA process, rather than specific guidance on measurement methods or tools for assessing, measuring, valuing and reporting non-fiscal impacts in the extractive sector.

For instance, the EIA process in Nigeria follows the Nigerian Environmental Impact Assessment Decree No. 86 of 1992, which provides high level guidance on the EIA requirements and process.[17] As can be seen in Case Study D1, the minimum provisions for EIA required by the Act are general in nature and do not provide specific guidance on how to measure, quantify or value non-fiscal impacts.

In Indonesia, the guidance for EIAs provided in the Environmental Protection and Management Law (2009) is equally general when it comes to the measurement of non-fiscal impacts in the EIA process. According to Section 25 of the Act, EIAs shall contain:[18]

- A study on the impact of the planned undertaking and / or activity
- An evaluation of the activities and or around the location of the planned activity
- Suggestions and inputs of the affected communities
- The estimated amount and significance of the impact that may occur if the planned activity is carried out
- A holistic evaluation of the impacts to determine the if the activity is environmentally feasible
- An EMP and a monitoring plan

In Columbia, the general methodology for the presentation of environmental studies, developed by the Ministry of the Environment and Sustainable Development, specifies that EIAs will include the following areas:[19]

- Physical (geology, hydrology, quality of air, water and soil, water,

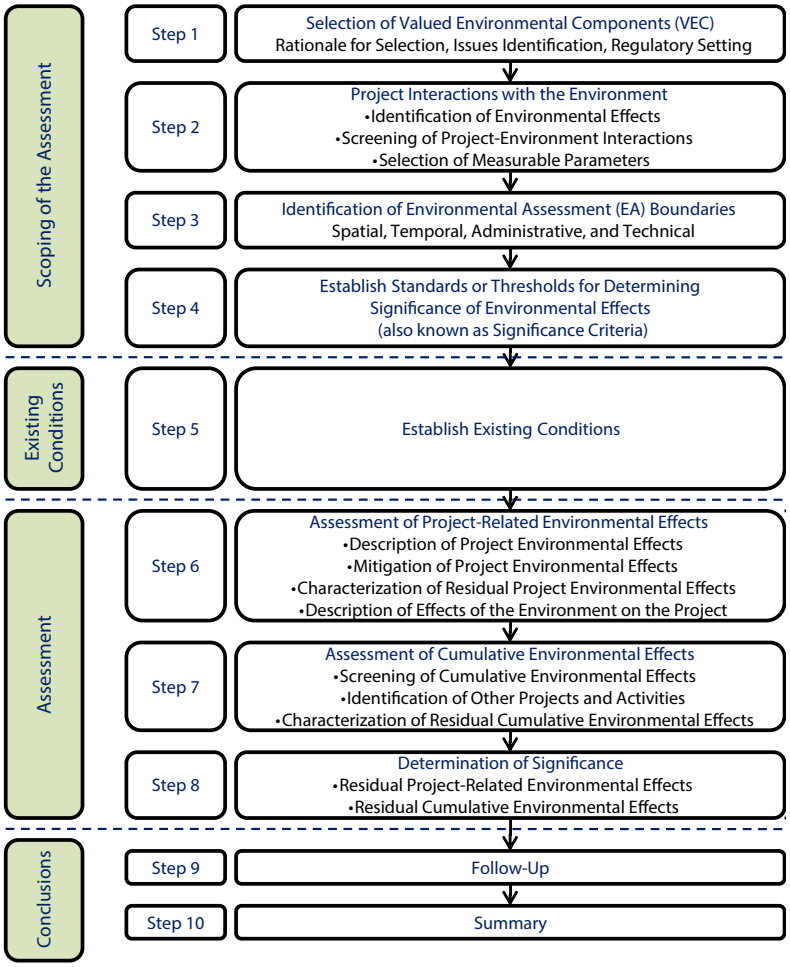


FIGURE D.1
SUMMARY OF STANTEC EIA METHODOLOGY

TERMS OF REFERENCE (TORS) FOR EIAS PROVIDE ADDITIONAL GUIDANCE FOR HOW NON-FISCAL IMPACTS SHOULD BE MEASURED AND REPORTED—OR AT LEAST PROVIDE THE OPPORTUNITY TO DO SO.

climate, noise)

- Biological (ecosystems, flora and fauna)
- Socio-economical
- Landscape
- Archaeological
- Environmental management plan
- Zoning of environmental management measures
- Monitoring Program
- Contingency plan
- Abandonment and final restoration plan

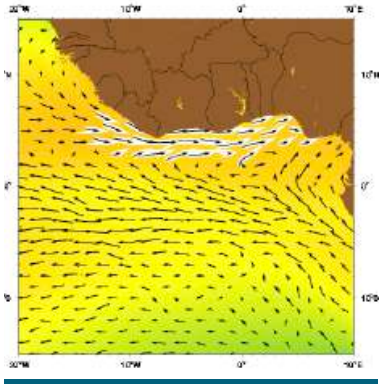
Quantitative and qualitative assessment criteria include the area of influence, magnitude, duration, resilience, reversibility, periodicity, type and possibility of occurrence of impacts. Economical evaluation of environmental impacts through a cost-benefit analysis is encouraged by the Ministry, although it has been difficult to source further information on what is expected or required.[20]

In Finland, the environmental impact assessment (EIA) procedure for mining projects is based on national legislation set out in the EIA Act (468/1994) (Appendix 2) and the EIA Decree (713/2006) (Appendix 3).[21] The guide is divided into two main parts— (1) the framework for the EIA procedure and the main phases and (2) key elements of the EIA procedure for mining projects—neither of which provide specific guidance on how to measure, quantify or value non-fiscal impacts.

In Tunisia, EIAs submitted to the Agence Nationale de Protection de l'Environnement (ANPE) must contain the following requirements:

- Project description
- Baseline data

CASE STUDY D3: SCOPING REPORT AND TERMS OF REFERENCE FOR THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY OF GHANA OIL SERVICES TERMINAL



Lonrho Ghana Ports Limited (Lonrho) signed a Memorandum of Agreement (MOU) with the government of Ghana in August of 2011 to develop, construct and manage an Exclusive Deepwater Petroleum and Hydrocarbon Logistics Base Port along the coast of the Western Region in Ghana.

Under the Ghanaian Environmental Assessment Regulations (1999), the construction and operation of a port requires a mandatory Environmental and Social Impact Assessment (ESIA). Lonrho commissioned Environmental Resources Management (ERM) in collaboration with ESL Consulting (ESL) and SRC Consulting (SRC) to undertake the ESIA for the port development.

This Scoping Report and the Terms of Reference for the ESIA was compiled by the ESIA team on behalf of Lonrho. The Scoping Report documents the scoping activities associated with the ESIA process and associated stakeholder consultation process. The resultant ToR for the ESIA included studies for a wide range of environmental and socio-economic impacts, including terrestrial soils and geology; surface water; geohydrology; terrestrial ecology; marine and intertidal ecology; marine water quality and sediment; noise; vibration; light; air quality; visual and landscape; fisheries; demographics; population; ethnicity language; vulnerable groups; education; socio-cultural institutions; leadership patterns; government administration; livelihoods ; employment; transport; social infrastructure and cultural sites; and community health.

In general, the ToR provides little detail on how these impacts would be quantified or valued in the ESIA.

- Analysis of impacts
- Justification for the project
- Mitigation measures
- Additional requirements may be specified in the individual ToR supplied by ANPE

In New South Wales in Australia, a recent guidance note has been published on how SIAs should be carried out as part of this development assessment (see Case Study D2). The guidance note includes general requirements and overarching principles; requirements for the pre-lodgement and application stages; and the assessment determination and post-approval stages of SIAs for mining projects.[22] The guidelines focus on the overall approach to social impact assessment rather than providing specific guidance for the measurement, quantification or valuation of non-fiscal impacts.

The Canadian government partnered with a consulting company, Stantec, to develop a framework to meet the combined requirements of the Canadian Environmental Assessment Act (CEAA) and the New Brunswick Environmental Impact Assessment Regulation (the "EIA Regulation").[23] These EIA methods are based on a structured approach that:

- Considers the mandatory and discretionary factors under Section 16 of CEAA;
- Considers all federal and provincial regulatory requirements for the assessment of
- Environmental effects as defined by CEAA, with specific consideration of the requirements
- The issues raised by the public, Aboriginal persons, NGOs, and other stakeholders
- During consultation and engagement activities conducted to date;
- Focuses on issues of greatest concern that arise from the above considerations; and
- Integrates engineering design and programs for mitigation and monitoring into a comprehensive
- Environmental planning and management process.

As shown in Figure D.1, a high level guidance framework is provided for the EIA process; however as with other provisions in Acts and guidelines in other jurisdictions, the Canadian Stantec methodology does not provide detailed guidance on how to measure, quantify or value non-fiscal impacts in the extractive sector.

04. // Terms of Reference for ESIAs

While there is generally a lack of specificity in the provisions for the measurement, quantification and valuation of non-fiscal impacts in environmental and extractive sector legislation and guidance, in some countries, the Terms of Reference (**ToRs**) for EIAs provide additional guidance for how non-fiscal impacts should be measured and reported—or at least provide the opportunity to do so.

Oftentimes, these terms of reference are written by the developer (i.e., the extractive company or their agent)and then reviewed by the relevant regulatory authority.

For instance, in Ghana, the Environmental Assessment Regulations (1999) specify that the developer must provide a scoping report and terms of reference for a full ESIA.[23] The provisions provided by the regulator for the ESIA scoping report and ToRs focus on general requirements only (e.g., 'any direct ecological changes resulting from such pollutant concentrations as they relate to communities, habitats, flora and fauna'; 'local economy'; 'direct or indirect employment generation;'). It is not surprising, therefore, that the scoping report for the Ghana Oil Services Terminal, which was written by the developer's consultants, does not provide specific details for how non-fiscal impacts will be quantified or valued[25]—see case Study D3 for further details.

In Mongolia, Terms of Reference are required for Detailed Environmental Impact Assessments under Article 4.6.3 (Title IV of Decree No. 2009/415).[26] Through the Mining Infrastructure Investment Support Project (MINIS) financed by the World Bank, the Government of Mongolia commissioned a Cumulative Impacts Assessment in the Tavan Tolgoi Coal Mine Region in Mongolia.[27] Types of impacts to be assessed included:

- Impacts on water resources (water use, quality, quantity)
- Impacts on biodiversity and wildlife
- Impacts on land use and soil?
- Loss of archaeological and cultural resources
- Impacts of mining wastes on environment
- Impacts on air quality
- Impacts on the livelihood of local communities and herders.
- Visual Impacts

No specific guidance was provided in the ToR on

CASE STUDY D4: EXTRACT FROM STANDARD TERMS OF REFERENCE FOR ESIAS FROM U.S ENVIRONMENTAL PROTECTION AGENCY'S COLLABORATION WITH PARTNERS TO THE CENTRAL AMERICA AND DOMINICAN REPUBLIC FREE TRADE AGREEMENT (CAFTA-DR)

5.4 Air and Climate

- 5.4.1 Climate and Meteorology
  - 5.4.1.1 Source of data (meteorological station(s) from which climatological data have been obtained)
  - 5.4.1.2 Temperature variations
  - 5.4.1.3 Relative humidity
  - 5.4.1.4 Solar radiation and evaporation rates
  - 5.4.1.5 Rainfall (total precipitation, rainfall intensity, and duration by month)
  - 5.4.1.6 Statistical analysis of the data
- 5.4.2 Wind rose (Wind direction and speed, 24 hourly data)
- 5.4.3 Air Quality Monitoring Data
  - 5.4.3.1 Source of data (locations of monitoring stations, both upwind and downwind, with direction and distance from the project)
  - 5.4.3.2 Constituents sampled (representatives of potential emissions from the project such as SPM, RSPM, SO2, NOX, CO, Heavy Metals in SPM [Fe, Mn, Pb] and fugitive dust)
  - 5.4.3.3 Air quality characterization

5.5 Noise and Vibration

The EIA shall include a noise level study that details:

- 5.5.1 Location of monitoring Stations
- 5.5.2 Daytime and night time noise levels (measured in decibels)
- 5.5.3 Inventory of existing noise sources

5.6 Vegetation/Flora

- 5.6.1 Vegetative mapping
- 5.6.1 Species and structure (abundance, density, etc.)

5.7 Fish and Wildlife/Fauna 5.7.1 Species (including status, i.e. endemic, migratory, exotic, endangered, threatened, keystone, etc.)

- 5.7.2 Breeding areas
- 5.7.3 Mating and brooding seasons
- 5.7.4 Migratory corridors (if applicable)

5.8 Ecosystems: Terrestrial, wetlands, aquatic, marine

5.9 Endangered species and habitats

5.10 Protected areas

5.11 Socio-Economic Conditions

- 5.11.1 Population (size, gender and age distribution)
- 5.11.2 Cultural characteristics (religion, ethnic composition, languages spoken, etc.)
- 5.11.3 Economic activities (employers, employment and incomes)
- 5.11.4 Tax base
- 5.11.5 Crime rates
- 5.11.6 Literacy rates
- 5.11.7 Community organizations
- 5.11.8 Public Health and Safety
  - 5.11.8.1 Level of emergency services and access to clinics, doctors, hospitals
  - 5.11.8.2 Diseases in the project area (including the sources of data and the methodology used to collect and analyze the data)
  - 5.11.8.3 Existing practice for assessment of occupational health
- 5.11.9 Skills, services and goods availability in the communities

methods for non-fiscal quantification or valuation.

In Tunisia, Agence Nationale de Protection de l'Environnement (ANPE) issues standard Terms of Reference for ESIAs; in some cases these require the developer to undertake a form of scoping[28]. The EIA submitted must contain the following requirements:

- Project description
- Baseline data
- Analysis of impacts
- Justification for the project
- Mitigation measures
- Additional requirements may be specified in the individual ToR supplied by ANPE

There are, however, no requirements for quantification of impacts in monetary or other unit terms for environmental and social impact assessments for extractive companies

Interestingly, there have been attempts by some regulatory bodies to standardise the ToRs they provide for ESIAs. For instance, in Queensland, Australia, the Environmental Protection Act sets the purpose of the ESIA process but does not prescribe the specific content requirements for ESIAs documentation.[25] The EP Act requires that Terms of Reference (TOR), setting out the content requirements of the ESIA, must be developed and approved by EHP for each ESIA under the EP Act.

In the past, EIA TORs were developed on a case-by-case basis. In 2013, in order to streamline and improve the effectiveness and efficiency of the ESIA process, the Department of Environment and Heritage Protection issued a generic draft TOR for resource project ESIAs under the Environmental Protection Act 1994. These new standard ToRs assist the development of project-specific ToRs that specify the minimum expectations for ESIAs.

To accompany the ToR, guidelines also clarify the types of information and level of detail required in an ESIA. The guideline is a compilation of relevant technical guidance material, arranged following the subject headings in the generic TOR. The guideline is intended for use as a companion to the generic TOR and to help EIS project proponents to anticipate and plan the investigative work needed to successfully prepare an EIS under the EP Act.

While these guidelines are quite extensive in outlining the types of impacts that should be assessed in the ESIA process, they are generally not prescriptive about the approach for measuring, quantifying or valuing impacts. Additional, more detailed resources are provided as 'useful references and guidelines'.[30]

An example of a regional initiative to develop standard ToRs and guidance materials is the U.S Environmental Protection Agency's collaboration with partners to the Central America and Dominican Republic Free Trade Agreement (CAFTA-DR). Through the collaboration, ESIA Technical Review Guidelines for three priority sectors have been developed: energy, mining and tourism. The guidelines aim to strengthen the EIA process for government officials, non-governmental organisations and the general public throughout the life of the projects. [32]

An extract from the ToRs is provided in Case Study 4. Although the standard ToRs represent a comprehensive list of the different types of impacts to be assessed through the ESIA process, no guidance on measurement, quantification or valuation is provided in the ToRs. In the accompanying Technical Review Guidelines for governments, however, rather detailed information is provided about how ESIAs should be evaluated against mining sector-specific performance standards for areas such as water discharge and effluent limits; discharge from waste rock; and air emission limits for the mining sector. This information is based on various environmental standards in place in the countries in CAFTA-DR partner countries.

05. // Specific Reporting Legislation

Although relatively uncommon, there are also examples of specific reporting legislation that requires reporting of non-fiscal impacts in the extractive sector, often in relation to local content performance.

For instance, South Africa introduced social and labour plans (SLP) in 2004 as a requirement of mining projects.[33] SLPs are prepared by the developer and submitted with an application for a mining right. They address human resources, career progression and local community development, and require extractive companies to report on social and labour targets, such as employment localisation and procurement, on an quarter basis..

The Nigerian Oil and Gas Industry Content Development Act 2010 requires oil and

gas companies to report on a number of local content performance areas including:

- Procurement
- Employment and training
- Number of new employees hired during the year, their place of residence at the time of hiring, and their
- Technology transfer initiatives and their results and
- Any other information required by the Board for the purposes of implementing the provisions of this Act.

06. // Overall, little guidance provided by governments on measurement, quantification or valuation of non-fiscal impacts

Overall, then, there is a general lack of legislative requirements or guidance from governments for the measurement, quantification or valuation of non-fiscal impacts in the extractive sector. Instead, the selection of measurement methodologies and tools is typically left to extractive companies and their consultants. This results in a multiplicity of approaches when measuring the actual or projected non-fiscal impacts of extractive projects across the various capitals.

Moreover, most ESIAs do not utilise a guiding methodology that allows for comparison of impacts across the capitals, making it difficult to compare costs and benefits within a single project. An additional challenge that arises from this lack of standardisation is comparing the non-fiscal impacts of extractive projects within or between countries.

To compound this situation, the multi-stakeholder governance process that is used to evaluate non-fiscal impacts in the approval and monitoring of extractive projects is almost always lacking in one or more key principles such as inclusivity, transparency, impartiality, rigour or accessibility.

As a result, extractive projects are rarely evaluated in a way that holistically assesses all material positive and negative impacts across the various forms of capital.

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1 It is important to note that this widespread recognition does not always translate into practice.

2 Source: http://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report

3 See: https://www.oecd.org/statistics/measuring-economic-social-progress/

4 Source: https://unstats.un.org/unsd/envaccounting/seea.asp

5 Harris, J., & Roach, B. (2016). Environmental and Natural Resource Economics. A contemporary Approach.

6 Countries reviewed included all NRGI Priority and limited engagement countries, as well as other jurisdictions in Asia, Latin America and Africa. Although not extractives specific, the following resource is particularly useful for an overview of EIA regulation and practices: http://www.eia.nl/en/countries

7 For instance, Greenland (source: https://www.govmin.gl/petroleum/environment/environmental-regulation), Australia (source: http://edont.org.au/factsheets/environmental-assessment-mining-activities/) and Norway (source: http://www.sciencedirect.com/science/article/pii/S019592558380047X).

8 See the Ghana 1994 Environmental Protection Agency Act, source: http://www.epa.gov.gh/ghanalex/acts/Acts/ENVIRONMENTAL%20PROTECTION%20AGENCY%20ACT%201994.pdf

9 See the Ghana 2016 Petroleum (Exploration & Production) Act, source: http://www.petrocom.gov.gh/assets/Petroleum(Exploration%20and%20Production)Act2016.pdf

10 See the Ghana Minerals and Mining Act, 2006, source: https://resourcegovernance.org/sites/default/files/Minerals%20and%20Mining%20Act%20703%20Ghana.pdf

11 Environmental Impact Assessment Decree, Source: http://www.nigeria-law.org/Environmental%20Impact%20Assessment%20Decree%20No.%2086%201992.htm

12 Source: http://www.jacmac.com.au/uploaded/PDFs/Globalaw_BASICS_OF_MINING_LAW_CDs_23022015.pdf

13 See also the mining country-wide impact assessment for Myanmar. Source: http://www.myanmar-responsiblebusiness.org/news/mining-swia-draft-for-comments.html

14 Source: http://www.aecen.org/sites/default/files/eia-procedures_en.pdf

15 http://www.eia.nl/en/countries/as/indonesia/eia

16 The regulatory and guidance standards provided in NSW, Australia is an example of good practice when requiring social and economic impact assessments prior to development (source: http://www.planning.nsw.gov.au/Policy-and-Legislation/Social-Impact-Assessment) and Canada. Also see the World Bank and ADB reviews of multilateral safeguard ssystems. See Https://consultations.worldbank.org/Data/hub/files/consultation-template/review-and-update-world-bank-safeguard-policies/en/phases/mdb_safeguard_comparison_main_report_and_annexes_may_2015.pdf and Https://www.adb.org/sites/default/files/publication/177564/2nd-country-safeguard-systems-workshop.pdf

17 Nigerian Environmental Impact Assessment Decree No. 86 , Source: http://www.nigeria-law.org/Environmental%20Impact%20Assessment%20Decree%20No.%2086%201992.htm

18 Source: http://www.eia.nl/en/countriestemp/as/indonesia/eia

19 Source: http://www.eia.nl/en/countries/sa/colombia/eia

20 It was difficult to find further information on economic valuation of extractive impacts in Columbia. This would perhaps be an area for follow-up with NRGI country staff.

21 Source: http://en.gtk.fi/export/sites/en/mineral_resources/EIA_guidelines_for_mining_projects_in_Finland_2015.pdf

22 Source: http://www.planning.nsw.gov.au/~/media/Files/DPE/Other/development-assessment-best-practice-guide-2017-03.ashx

23 Source: https://www.ceaa-acee.gc.ca/050/documents_staticpost/63169/93967/Sisson_EIA_July2013_

24 http://www.epa.gov.gh/ghanalex/acts/Acts/ENVIRONMENTAL%20ASSESSMENT%20REGULATION,1999.pdf

25 http://www.atuabofreeport.com/docs/Final-scoping-report-Lonrho%20(2).pdf

26 http://extwprlegs1.fao.org/docs/pdf/mon149652E.pdf

27 Source: http://storage.embersoft.mn/d1af1f/page/42/141121%20TOR%20for%20Cumulative%20Impact%20Assessment%20TavanTolgoi%20ENG_ApMWDVGX0UKnbrS.pdf

28 http://siteresources.worldbank.org/EXTMETAP/Resources/EIACR-Tunisia.pdf

29 http://extwprlegs1.fao.org/docs/pdf/gha78169.pdf

30 https://www.ehp.qld.gov.au/management/impact-assessment/eis-processes/eis-tor-support-guidelines.html

31 Source: https://www.unece.org/fileadmin/DAM/env/eia/documents/WG13_may2010/Mongolia_Law_on_EIA.pdf

32 https://www.epa.gov/international-cooperation/technical-review-guidelines-environmental-impact-assessments-tourism

33 SADME 2006, Franks et al. 2009.

34 http://www.eisourcebook.org/cms/January%202016/Nigerian%20Oil%20and%20Gas%20Industry%20Content%20Development%20Act%202010.pdf

COMPANY APPROACHES TO NON-FISCAL IMPACTS

SECTION 2

01. // Extractive companies sign up to voluntary codes that impact social and environmental performance

In addition to the mandatory regulations that apply to the extractive sector in each operating jurisdiction, extractive companies also adhere to a range of voluntary standards and codes that impact the way in which they measure, manage and report on the non-fiscal impacts of their operations.

These voluntary guidelines, codes, standards and initiatives—which often exceed regulatory requirements in host countries—include:

- ISO 14001 for Environmental Management Systems.
- The ICMM's 10 Principles for Sustainable Development.
- The OECD's Guidelines for Multinational Enterprises.
- The UN Global Compact.
- IFC Performance Standards.
- The UN Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises.
- The UN Principles for Responsible Investment.
- The ILO Tripartite Declaration.
- The Global Sullivan Principles.
- The Global Reporting Initiative.

There are a number of criticisms of the proliferation of voluntary standards in the extractive sector, including the obvious fact that failure to adhere to a voluntary standard does not typically result in any punitive actions from host governments or through market mechanisms.[2] Another critique asserts that companies primarily adopt voluntary initiatives as a means of improving their reputation.[3]

Interestingly, however, there are a number of recent cases of civil legal proceedings being brought against transnational mining companies where these voluntary standards are being used to establish a case for negligence in environmental performance[3].

02. // Global capital markets also influence the non-fiscal practices of extractive companies

Extractive companies are also expected to demonstrate to global capital markets and financial institutions that they are managing their social and environmental risks. Investors recognise that managing social and environmental risks is necessary for maintaining long-term market value, and frameworks such as GRI, <IR>, SASB and the Dow Jones Sustainability Index can help investors make more informed decisions about the risk profile presented by the sustainability practices of extractive companies.

In addition, extractive

companies seeking financing from the World Bank, or commercial banks that have adopted the Equator Principles, must comply with these environmental and social requirements, which include broad commitments to disclosing social and environmental risks and reporting social and environmental impacts.[8]

Canadian mining companies in the Mining Association of Canada are also required to participate in the Towards Sustainable Mining (TSM) initiative. The TSM includes guiding principles and standards for tailings management, greenhouse gas and energy management, aboriginal and community outreach, crisis management, water and mining, biodiversity conservation, and mine closure[5].

03. // Extractive companies assess non-fiscal impacts during the ESIA process

In addition to voluntary and market-driven measurement and reporting, as outlined in the section on the Impact Assessment methodology on pages 48-49 of this report, ESIAs are perhaps the most utilised method of measuring non-fiscal costs and benefits in the extractive sector. In almost all jurisdictions, extractive companies are required to conduct EIAs or ESIAs prior to project development, and some jurisdictions also require assessments prior to exploration. ESIA methods are also sometimes required as

CASE STUDY D3: IPIECA OIL AND GAS INDUSTRY GUIDANCE ON VOLUNTARY SUSTAINABILITY REPORTING

The measurement and reporting of greenhouse gas (GHG) emissions is becoming widespread across industries and countries as society attempts to reduce GHG emissions. Approaches to both measuring and reporting GHGs must deal with complexity, uncertainty and differing options for estimation and aggregation.

Reporting on climate change is increasingly expected to go beyond GHGs to cover many other aspects of a company's climate-related positions and actions. IPIECA helps the industry address these reporting issues by providing guidance and industry reporting standards.

The oil and gas industry has been an early adopter of methodologies to account for and report greenhouse gas emissions, developing the first sector guidance back in 2004 (IPIECA corporate GHG guidelines 2004). Understanding the sources and quantity of emissions is crucial to enable the industry to tackle the most significant emission sources.

IPIECA has created a reporting framework for oil and gas companies to publicly disclose the GHG emission impacts of their operations. A number of IPIECA members are now moving beyond just GHG emissions reporting and piloting IPIECA's climate change reporting framework.

"IPIECA HAS CREATED A REPORTING FRAMEWORK FOR OIL AND GAS COMPANIES TO PUBLICLY DISCLOSE THE GHG EMISSION IMPACTS OF THEIR OPERATIONS."

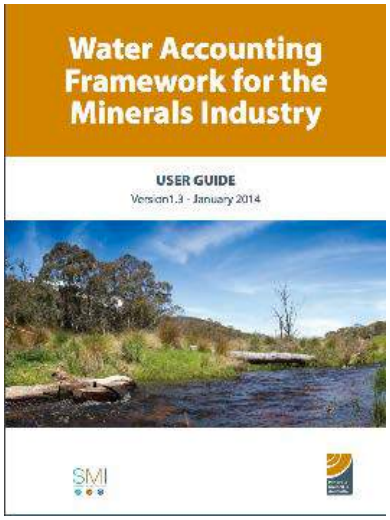
CASE STUDY D4: MINERALS COUNCIL OF AUSTRALIA'S WATER ACCOUNTING FRAMEWORK

Many minerals operations and companies have water accounting systems in place to measure, monitor and report water use. However these systems are often not consistent across companies or even operations. This can make understanding industry water use by company or region and cross-sectoral comparisons difficult.

The Minerals Council of Australia in conjunction with the Sustainable Minerals Institute of the University of Queensland, have developed a Water Accounting Framework for the Minerals Industry.

Minerals Council of Australia member companies have endorsed two phases of framework adoption which include:

- Alignment of company water metrics and definitions consistent with the Framework's Input Output Model
- Alignment of company water quality descriptors consistent with the Water Accounting Framework (currently under adoption)



To support the implementation of the Water Accounting Framework, a number of guidance tools have been developed to assist minerals industry users in applying the framework. These include:

- Water Accounting Framework User Guide.
- Input-Output MS Excel Template (MS Excel 2003 compatible);
- MCA Member Adoption Explanatory Note; and
- Water Accounting Framework - Frequently Asked Questions

part of the ongoing monitoring of projects.

However, most countries do not have mandatory standards that specify requirements for measurement methodologies during ESIAs, beyond general requirements such as public consultation and disclosure requirements.

ESIAs enable regulators and other stakeholders to review predicted impacts and mitigation measures for an extractive project proposal, before it is finalised or approved. As such, the specific impacts highlighted or privileged by different ESIA approaches can lead to different social and environmental management plans.

ESIAs can be used as an overarching method to incorporate other methods and tools for non-fiscal measurement (for example the ecosystem service evaluation method and tools to measure specific impacts, such as the Water Accounting Framework). Given their prominence and influence during project evaluation, incorporating more effective measurement of non-fiscal impacts during the ESIA process is a lever for improving the governance and management of non-fiscal impacts in the extractive sector.

04. // Extractive companies also measure social and environmental impacts as part of internal monitoring and management systems

In addition to voluntary and market-driven measurement and reporting, and the measurement of non-fiscal

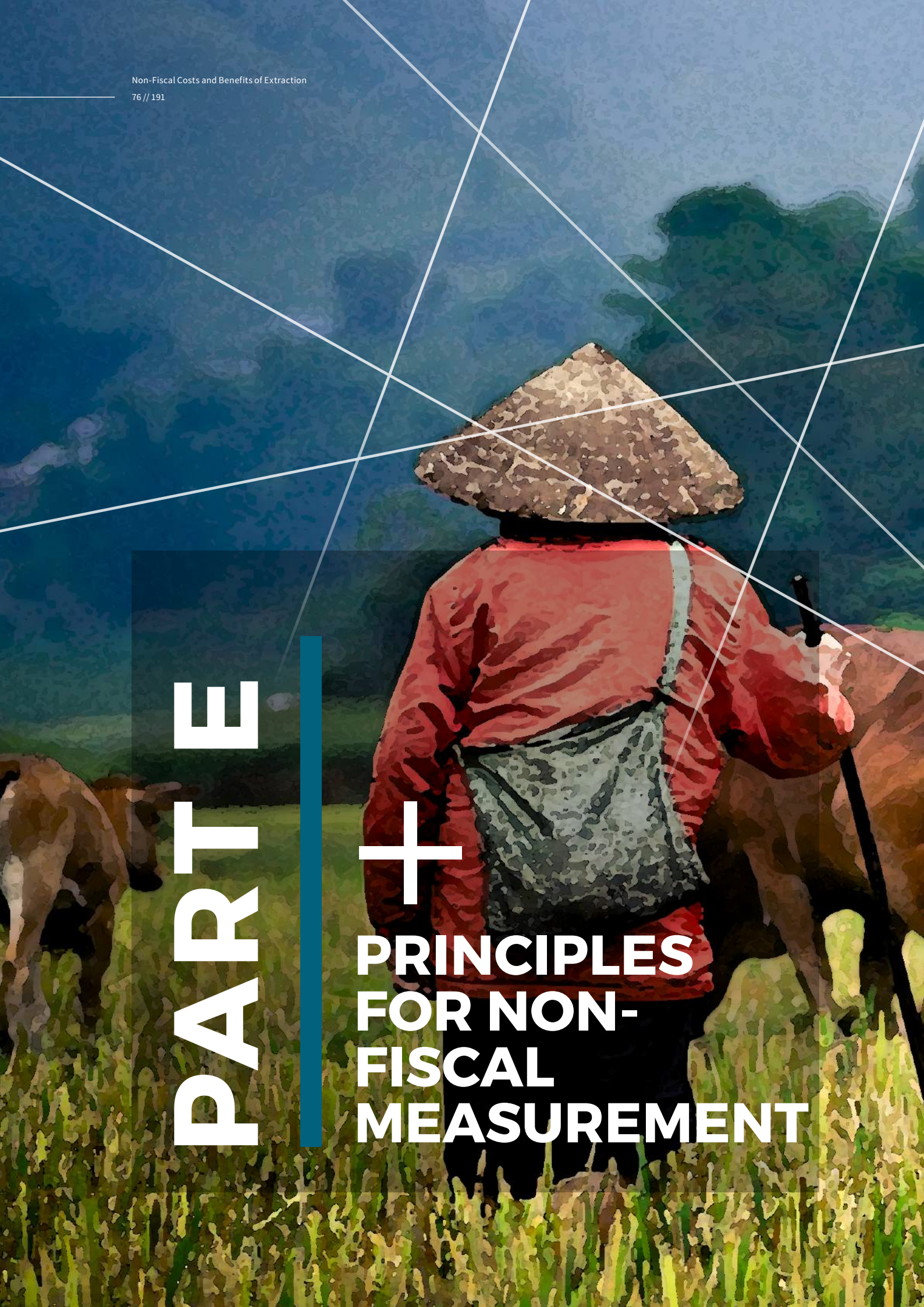
impacts required through the ESIA process, extractive companies also carry out a range of measurement activities when monitoring the ongoing environmental and social impacts of their projects, and may or may not report the results of this monitoring.

There is a wide range of variability in the methods used by extractive companies to measure the ongoing impacts of their operations. For instance, on Lihir Island in Papua New Guinea, Newcrest Mining carries out an extensive program to monitor the social and economic impacts of the Lihir Gold mine. Longitudinal data on epidemiological health impacts, population and genealogy, law and order, education outcomes, and economic benefits are collected. The data from this program is reported on a quarterly basis to landowners, community groups and three levels of government. The vast majority of extractive projects do not have an advanced socio-economic monitoring program, however.

Extractive projects also measure and monitor a wide range of environmental impacts, including acid mine drainage impacts to land and water source; emissions from processing; erosion and impacts to the landscape; impacts from tailings disposal facilities; loss of biodiversity; and contamination of soil, groundwater and surface water by chemicals from extractive processes.

Example of initiatives to standardise environmental measurement and monitoring are provided in Case Study D3 and D4. It is also worth noting the International Council on Mining and Metal's Mining Contribution Index, which synthesises into a single number the significance of the mining and metals sector's contribution to over 180 national economies. Although the index is largely made up of fiscal revenues, the index also contains information on employment in the sector.[6]

Despite these efforts, there is wide variability in the methodologies used by extractive companies to measure non-fiscal costs and benefits in their monitoring programs. Moreover, the results of these monitoring programs are not always publicly disclosed or reported.



PART E

+ PRINCIPLES FOR NON-FISCAL MEASUREMENT

WHO

SHOULD BE INVOLVED WHEN MEASURING THE NON-FISCAL IMPACTS OF EXTRACTION?

Based on the stakeholder interviews, questionnaires and a scan of the extant literature, the following principles for integrating non-fiscal measurement into the governance of the extractive sector were developed.

PRINCIPLE 01. // Inclusive multi-stakeholder governance is key

First, multi-stakeholder governance is vital when measuring, valuing or assessing non-fiscal impacts in the extractive sector.

Fiscal forecasts and models are based on a wide range of assumptions, such as those relating to commodity prices, foreign exchange rates, final resource reserves and various costs and productivity assumption. The same is true for non-fiscal impacts, except the assumptions that underlie non-fiscal considerations are arguably more subjective than their fiscal counterparts—different people, in different places, will place different values, on different things, at different times.

For instance, one stakeholder group may value financial revenues over negative impacts to the aesthetic qualities of landscapes; or one ecosystem service such as water (which may be comparatively scarce) over another such as land (which may be comparatively plentiful). These subjective judgements depend largely upon the views and needs of stakeholders[1], and can be particularly challenging when assessing the value of ecosystem services and other capitals that have no market value[2]. In these situations, multi-stakeholder governance helps to explore different perspectives and perceptions about values and trade-offs at different scales.

Moreover, even if in some areas it is possible to value an impact with great accuracy, that value may not be credible if it is only advanced by a single party. Therefore, even if multi-stakeholder governance fails to resolve different views on the value or measurement of an impact, it serves as a valuable platform for different parties to understand different methods of measurement.

Further, once costs and benefits around a project have been determined, there is usually the need to consider trade-offs between capitals; mitigation or compensation measures; and the distribution of benefits.

For example, in many cases, an increase in one ecosystem service, such as food production, can negatively affect the provision of other ecosystem services, such as drinking water quality[3].

Another classic trade-off is often faced between jobs and environmental damage. Such trade-offs may be deliberate and intentional, but in many cases they are unintentional, resulting from a lack of knowledge or understanding of the interactions between ecosystem services, impacts or capitals. On other occasions, trade-offs result from systematic misrepresentations within economic processes or public discourses.[4]

Multi-stakeholder governance can help to 'level the playing field' in the political economy of compensation and benefit allocation between stakeholders, a process which is often 'captured' by social and political elites. For this reason, it is important that lower-power and marginalised groups are represented in the measurement and evaluation process, so that more socially embedded and open valuation assessments can be conducted.[5]

The approach best-suited for multi-stakeholder governance will vary across contexts. Key principles include inclusivity, transparency and due process.

For all of these reasons, multi-stakeholder serves as a foundational platform for the measurement and evaluation of non-fiscal measurement throughout the *Natural Resource Charter Decision Chain*.

PRINCIPLE 02. // Inter-disciplinary teams are necessary from the start.

Second, inter-disciplinary teams are necessary from the start of the measurement process.

iii. principles for measurement

Based on the stakeholder interviews, questionnaires and a scan of the extant literature, the following principles for integrating non-fiscal measurement into the governance of the extractive sector were developed.

WHO

» **Principle 1: Inclusive multi-stakeholder governance is key.**

Different people, in different places, will place different values, on different things, at different times. Multi-stakeholder governance—with an inclusive representation of local, regional and national interests—is a foundational platform to promote shared understanding of non-fiscal measurement throughout the *Natural Resource Charter Decision Chain*.

» **Principle 2: Interdisciplinary teams are necessary from the start.**

Appropriate interdisciplinary expertise for non-fiscal costs and impacts should be accessible to all stakeholders. With the input of interdisciplinary teams of environmental scientists, economists, anthropologists, town planners, geologists, engineers, metallurgists and people with other diverse backgrounds, a wide range of data sources can be accessed to improve the validity and reliability of non-fiscal measurements and valuation methods.

WHEN

» **Principle 3: The quantification of non-fiscal impacts should begin before the project is approved & continue for the life of the project.**

Non-fiscal impacts should be modelled as key inputs when deciding whether to extract. Measurement should continue over time as impacts shift from the hypothetical to the actual—from things that can be modelled, to things that can be measured. Modelling and measurement should also follow the extractives project life-cycle of pre-feasibility, feasibility, construction, commissioning, operation, decommissioning and post-closure.

HOW

» **Principle 4: Use a simple guiding methodology with specialised tools.**

Measuring the non-fiscal impacts of extraction can be relatively simple or staggeringly complex. It is important to select a guiding methodology that models net impacts in a way that can be understood by a diverse range or stakeholders. This guiding methodology can be supplemented with specialised tools that measure the specific impacts of the project.

WHAT

» **Principle 5: Account for impacts across all capitals, project scenarios, scales and times.**

Multiple project plans and scenarios should be modelled in a way that maximises net value creation and minimises net risk across all capitals. The 'null' case of not proceeding with the project should also be considered, as should the cumulative impacts that emerge over time and, where possible, across multiple industrial activities and geographies. Assessment should be spatially and temporally explicit at scales meaningful for policy formation or project evaluation, acknowledging that both ecological functioning and economic values are context, space and time specific. Only then can an informed decision be made on whether or not to extract, as well as the mitigation and control strategies that are required to mitigate or offset the non-fiscal costs of extraction.

CASE STUDY E1: THE POLITICAL ECONOMY OF ASSIGNING COSTS AND BENEFITS

When it comes to negative impacts it is not uncommon for a company to find a way of directly compensating those affected. It is not the same, however, for those who might benefit from a project even though on the surface they might have virtually nothing to do with it—for instance, a Ministry of Education or Health, who might be able to provide better services, or spend less money, because of the contributions made by an extractives project.

It is on this point – the allocation of costs and benefits – that tools for measurement run up against some of their greatest barriers. If, for example, huge benefits accrue to a stakeholder that has to make little investment in the project, measurement itself will not guarantee or compel that stakeholder to ensure that those benefits are redistributed in way that helps those who are disadvantaged by the project. The power of different tools of measurement are in this regard, only as good as the legislation, regulation and planning regimes that allow for costs and benefits to be distributed or assigned more broadly.

The most common manifestation of this problem is the central government revenue authority that receives large sums of tax and royalties, but which provides no additional funding to local public services to address negative impacts. To continue from the example above, a public health authority might save $100,000 because of services and support provided as part of a project, but it is difficult to find governance structures that might redirect those savings to a local property owner who has suffered a significant loss of amenity.

Table 1 provides an example in which the costs and benefits of a particular course of action are shown across different stakeholder groups. In this example the course of action is strongly beneficial overall – the value of the total benefits is more than twice that of the total costs. However, if costs and benefits cannot be redistributed in a way that addresses the net loss of $10m for the 'Residents Group', the project is unlikely to go ahead if this group has right of veto. This is of course a highly simplified example, and there are obvious problems with it - the company is a single entity able to easily measure the costs or benefits on its bottom line, whereas the community is a diverse collection of individuals with different budgets and budget assumptions. This can be problematic in private developments that will often lack the ability to compel a redistribution of costs and benefits. The problem is much easier to address, however, in public infrastructure projects where government can compel value capture to assist funding – e.g. additional rates on properties that increase in value due to their proximity to new public transport.

GROUP	COST	BENEFIT
Residents Group	$15m	$5m
All residents	$2m	$20m
Company	$10m	$20m
Local Government	$1m	$20m
Central Government	$0m	$5m
TOTAL	**$28m**	**$70m**

FIGURE E.1 EXTRACTIVE PROJECTS IMPACTS TO FINANCIAL CAPITAL

With the input of interdisciplinary teams of environmental scientists, economists, anthropologists, town planners, geologists, engineers, metallurgists and people with other diverse backgrounds, a wide range of data sources can be accessed to improve the validity and reliability of non-fiscal measurements and valuation methods.

It is not uncommon, for example, for developments to be associated with a diverse range of impacts relating to environmental, economic, psychological, anthropological, geological and geo-spatial concerns, to name a few.

When assessments of projects are conducted within limited domains of knowledge (for instance financial and technical), they are necessarily reductionist in their presentation of potential value creation and risks.

For instance, in the authors experience, a failure to incorporate interdisciplinary teams in the modelling of project costs and impacts generally results in a 'value-creation' approach being adopted when assessing the profitability of the project, whereas a 'risk-management' lens is adopted when considering other forms of capital such as social and environmental impacts. Two non-fiscal measurement tools that help to counteract this tendency are the SUSOP methodology from The University of Queensland's Sustainable Minerals Institute, and potentially PwC's Total Impact Measurement Management if it can be usefully applied to extractives.

Beyond generating better access to data, inter-disciplinary teams also have a better chance of determining attribution; that is, whether a change is the result of factors related to the project.

WHEN

SHOULD THE NON-FISCAL IMPACTS OF EXTRACTION BE MEASURED?

PRINCIPLE 03. //
The quantification of non-fiscal impacts should begin before the project is approved and continue for the life of the project.

Third, the quantification of non-fiscal impacts should begin before the project is approved and continue for the life of the project.

More specifically, measurement should follow the extraction project life-cycle of pre-feasibility, feasibility, construction, commissioning, operation, decommissioning and post-closure.

As extractive projects progress through these stages, a number of factors will impact the accuracy of non-fiscal measurements.

For example, the assumptions and perceptions that underlie non-fiscal measurements change over time as more information and experience becomes available. When projects are first announced, costs and benefits tend to be exaggerated—'we're going to be rich' or 'our environment is doomed'.

One of the reasons for this is that, in the early stages of projects, proponents have the greatest tendency to oversell a project, and opponents the greatest tendency to overstate the costs.

Measurement values will also vary over time as they move from the hypothetical to the actual—from things that can be modelled, to things that can be measured. They will also vary as different technologies and techniques become available that allow for greater mitigation at lower costs.

Finally, measurement over time is crucial because, while it is common for costs and benefits to be quantified during the lifetime of a project, inter-generational impacts after the end of a project are less frequently modelled, measured and addressed,

even in the economic realm. For example, an extractive resource might sustain a certain level of employment for a certain period of time. These employment benefits are likely to dissipate over time unless, for instance, the project leaves a legacy of trained and employable human capital, or surplus financial dividends are saved or invested into alternative sources of income and wealth.

HOW

SHOULD THE NON-FISCAL IMPACTS OF EXTRACTION BE MEASURED?

PRINCIPLE 04. //
Use a simple guiding methodology with specialised tools for specific impacts.

Fourth, measuring the non-fiscal impacts of extraction can be relatively simple or staggeringly complex.

It is therefore important to select a guiding methodology that models net impacts in a way that can be understood by a diverse range or stakeholders.

Guiding methodologies that meet the following criteria should be considered:

- Can be integrated with the governance and management of non-fiscal impacts (i.e., is practical).
- Evaluates material costs and benefits across all capitals.
- Ability to integrates with specialised methods and tools to measure specific impacts.
- Accommodates both monetary and non-monetary measurements.
- Can be understood by a diverse range of stakeholders.
- Utilises visual means to represent non-fiscal measurements.

Although there is no methodology that adequately meets all of these criteria, methods or tools that most closely fit include:

- SUSOP.
- Total Impact Measurement and Management (TIMM).
- Some Triple Bottom Line methods.
- Some Ecosystem Services methods.

Guiding methodologies can be supplemented with specialised tools that measure the specific impacts of the project—for instance tools that measure impacts to water, land or air.

WHAT

NON-FISCAL IMPACTS SHOULD BE MEASURED IN THE EXTRACTIVE SECTOR?

PRINCIPLE 05. //
Account for impacts across all capitals, project scenarios, scales and times.

The final principle is that non-fiscal measurements should account for impacts across all capitals, project scenarios, scales and times. Only then can an informed decision be made on whether or not to extract, as well as the mitigation and control strategies that are required to mitigate or offset non-fiscal costs of extraction.

Set 'materiality' criteria

There are, however, some limitations to the level of measurement that might be practical or desirable in any given context.

For a range of reasons—chiefly resources and the availability of data—it may not be practical to focus on detailed measurement or forecasts of all impacts across all capitals. When determining which impacts to measure and at what level of detail, countries, companies and communities should think across all forms of capital, and set a materiality criteria for measurement and forecasting non-fiscal impacts.

Materiality criteria may differ across different forms of capital, and may need to be either quantitative (for instance, a financial value) or qualitative (for instance, agreement among stakeholders that the impact is significant).

Model and measure all capitals - even those that 'should not be measured'

One response to the idea of measuring non-fiscal impacts is to declare that they shouldn't be measured, or that they can't be measured.

There are a certainly a number of reasons to be cautious about the approach to measuring non-fiscal impacts. For instance, as briefly outlined in case study E1, there is a debate in environmental conservation literature and practice on whether nature should be valued in monetary terms.

Although there are limits to measuring all non-fiscal impacts in monetary or even quantifiable terms, measurement, even if it is non-monetised measurement (for instance the use of indexes, qualitative measurements or visual representations), at least allows a conversation around the relative value of non-fiscal impacts.

This is even the case with impacts that might be considered intangible or esoteric – e.g. spiritual or cultural values, or where change or loss is permanent – e.g. a hill becomes a hole. An example here is Alaia rock on Lihir Island, the most significant spiritual and cultural place in all of New Ireland Province in Papua New Guinea, which happens to have billions of dollars of gold under it (see Case Study E3).

In such cases it may be that measurement can only be made in the sense of something being broadly positive or broadly negative, instead of in financial terms. This kind of qualitative assessment can still facilitate conversations about the value of things and remedies or offsets that themselves can be given a value. The key here is to consider impacts that can be enhanced and threatened across the various capitals, not just across the project as a whole. For example, it may not be acceptable to address a cultural loss with an economic gain, but it may be acceptable to address a cultural loss with a cultural gain—see for instance case study E2.

The final argument in favour of measuring that which cannot or should not be monetised, is that the absence of measurement can push a development to the extremes – i.e. it will go ahead in its complete current form, or it will not go ahead at all. Both propositions might be risky for all parties. Measurement, even if it is non-monetised measurement (for instance the use of indexes, qualitative measurements or visual representations), at least allows a conversation around the relative value of non-fiscal impacts.

CASE STUDY E2: MAURI-OMETER IN NEW ZEALAND

In the New Zealand context, a 'Mauri-ometer' approach might show that a project is 'mauri mate' (dead, deceased or destroyed) when it comes to cultural impacts. In such cases it is likely that it will not be possible to quantify the loss any more precisely that (see Figure E1).

At the same time, it might then be possible to place a much more precise and monetised value on ensuring that another cultural value shifts from being 'mauri heke' (falling, descending) to being 'mauri ora' (alive, safe, well). That could be enhancing local knowledge or protecting mahinga kai (food and other resources and the areas from which they are collected). Such a process does not suggest an acceptance of the total loss of something of cultural or spiritual value, but it does accept that things can be enhanced as well as threatened.

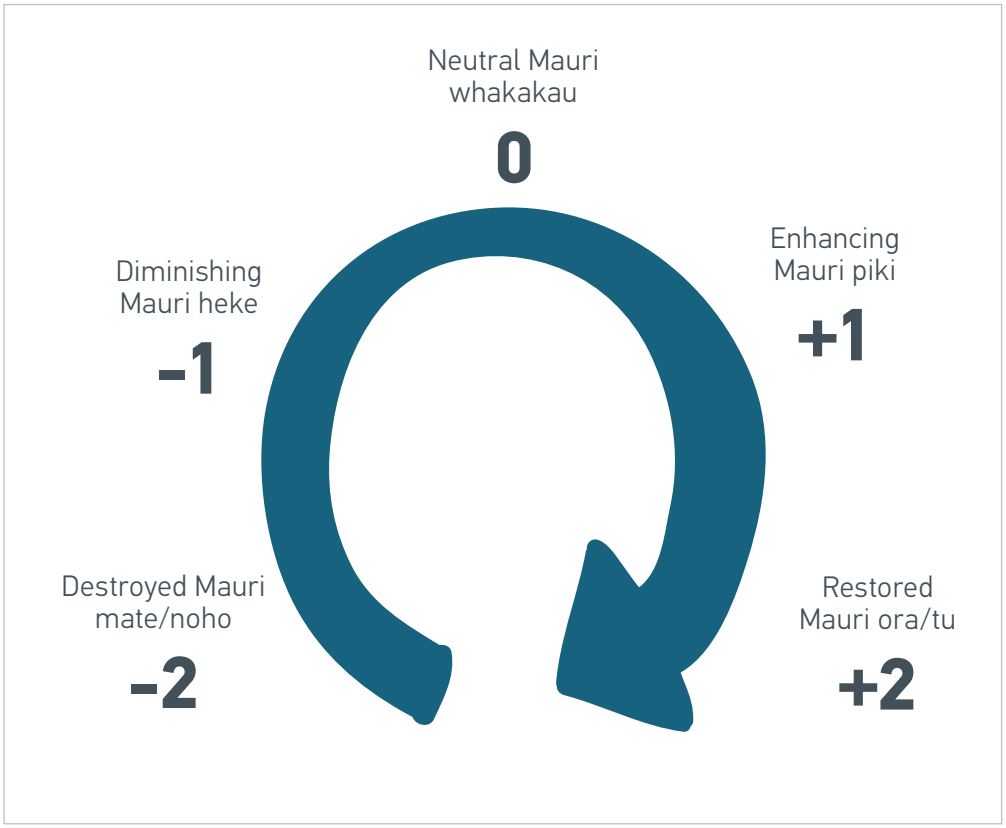


FIGURE E2 MAURI-OMETER

Model and measure multiple project scenarios

Multiple project plans and scenarios should be modelled in a way that maximises value creation and minimises risk across all capitals.

The 'null' case of not proceeding with the project should also be considered. While varying degrees of effort tend to go into measuring the various impacts of extractive projects, a common failing is not considering the "null case" alongside such an assessment – i.e. what is the impact of doing nothing or of carrying out a competing but mutually exclusive development? This requires the measurement of existing baseline conditions, as well as projected conditions.
Beyond guarding against either irrational enthusiasm or irrational pessimism around projects, the projects themselves might enhance or threaten a long-term trend towards recovery or decline. Perhaps the most difficult outcome of measuring all options is a situation in which both the proposed project and the status quo show long-term negative impacts. In these circumstances, a new mine might, for example, still leave a community less well off in the long-term but it might delay or soften the decline of the null case.

CASE STUDY E3: HOW DO YOU MEASURE THE VALUE OF ALAIA ROCK ON LIHIR ISLAND IN PAPUA NEW GUINEA?

Alaia rock is in the middle of Newcrest Mining Limited's Special Mining Lease on Lihir Island in New Ireland, Papua New Guinea. In Lihirian cosmology and culture, Alaia rock is the place where the dead go to access the afterlife and as such is the most significant cultural and sacred site on the island and arguably in all of New Ireland Province.

As it happens, there are also significant gold reserves underneath Alaia rock, most likely in the billions of dollars. Under the Integrated Benefits Agreement for the Lihir project. Alaia rock is currently excluded from Newcrest mining reserves. The decision to exclude the Alaia rock from the mining zone was made through an inclusive process where clans and sub-clans across the island discussed the preservation of Alaia rock. These meeting took place during the initial meetings conducted for negotiation of the compensation and benefits package for the mining project. Despite the agreement not to mine the Alaia rock, the immediate area surrounding the rock has undergone significant transformation as a result of mining operations, which began in 2000, as shown in the pictures to the top right and below.

> ***IN LIHIRIAN COSMOLOGY AND CULTURE, ALAIA ROCK IS THE PLACE WHERE THE DEAD GO TO ACCESS THE AFTERLIFE AND AS SUCH IS THE MOST SIGNIFICANT CULTURAL AND SACRED SITE ON THE ISLAND AND ARGUABLY IN ALL OF NEW IRELAND PROVINCE.***

CASE STUDY E4: THE DEBATE ABOUT WHETHER OR NOT TO VALUE NATURE

There is a debate in environmental conservation literature and practice on whether nature should be valued in monetary terms. Arguments for the valuation of nature include:

- Valuation will lead to environmental protection—by incorporating environmental costs into national accounts figures and cost and benefit analyses, more notice will be taken of the environment.
- When you are talking to the people who are really in the business of destroying the environment, you have to use concepts that will allow them to begin to understand what we're saying.
- No explicit value may result in a 'zero value' being applied.

Arguments against the valuation of natural capital include:

- By focusing on policy measures that leave the existing market unchanged, environmental issues will continue to play second fiddle to economic interests. Valuing ecosystem services strengthens the position of those who have the power to define ES, i.e. formally educated experts or powerful individuals with their own (economic) interests. Issues to do with social equity and the fair treatment of competing social groups are often ignored (Wilson and Howarth, 2002)
- Practical concerns, such as 'methods are imprecise and flawed' or 'methods are systematically under-estimate full value'. In other words, a science of ecosystem services that captures or measures economic production or value in "final biophysical units" lies beyond our human potential.

> ***WITHIN THIS FRAMEWORK OF GENERAL ACCEPTANCE OF THE 'MARKET', THE ISSUES OF 'CAPITALIST DEVELOPMENT' AND 'ECOLOGICAL SUSTAINABILITY' HAVE TENDED TO CONGEAL AROUND THE THEME OF ENVIRONMENTAL COSTS AND HOW BEST TO REDUCE THESE. THE SOCIAL RELATIONS OF THE MARKET ITSELF ARE NOT BROUGHT INTO QUESTION; THE SOLUTION IS NOT SEEN AS INVOLVING A MAJOR SOCIAL TRANSFORMATION OR RADICAL ECONOMIC RESTRUCTURING).'"***
>
> *White, 1992, p55*

> ***'WHEN YOU ARE TALKING TO THE PEOPLE WHO ARE REALLY IN THE BUSINESS OF DESTROYING THE ENVIRONMENT, YOU HAVE TO USE CONCEPTS THAT WILL ALLOW THEM TO BEGIN TO UNDERSTAND WHAT WE'RE SAYING'***
>
> *Lohmann 1991, p. 194)*

PART F+

AVENUES FOR NRGI ENGAGEMENT

IMMEDIATE NEXT STEPS

SECTION I

With the field of non-fiscal measurement still emerging—and given the lack of awareness and integration of methods and tools in the governance of the extractive sector—there is a need to:

1. Bring together key actors working on initiatives for the measurement of non-fiscal impacts to review their application to the extractive sector.
2. Strengthen governance practice around the measurement and management of non-fiscal impacts.
3. Develop a "fit-for-purpose" guiding methodology for the way that non-fiscal impacts are measured and evaluated in the decision-making process for the extractive sector.
4. Educate and 'capacitise' a broad range of stakeholders on how to more effectively measure and evaluate the non-fiscal costs and benefits of extractive projects

By leveraging existing networks and programmes, NRGI is well-positioned to play a leading role in any or all of these objectives. To this end, the following pathways provide NRGI opportunities for partnership, thought leadership and practice. Immediate opportunities for NRGI next steps include:

Open Tools Platform

Online database of tools with a "decision-tree" interface.

NRGI could lead the development of an open platform for non-fiscal measurement tools in the extractives sector, where:

- Providers can upload information on their methods/tools (through a moderated process).
- Governments/companies/CSOs can access information and case studies on methods/tools through a decision-tree approach.
- Other functions like a materiality map that helps stakeholders assess whether non-fiscal impacts should be quantified might be provided.

In the development of the platform, there is a potential to partner with standardisation initiatives such as the Natural Capital Protocol. Once the platform has been developed, NRGI could consider its strategic promotion in NRGI countries and regions.

The prototype that has been developed for the open tools platform can be accessed here: https://share.proto.io/8TG4JN/

Regional / country versions of report

Regional / country versions of this report in collaboration with partners

Taking this report as a starting point, there is an opportunity to work with partner organisations to prepare shorter region/country-focused versions of the report.

Region/country reports might focus on:

- Describing the governance process that guides the decision to extract and how non-fiscal impacts are monitored.
- Identifying where non-fiscal costs and benefits measurement fits into existing governance & management frameworks.
- Highlighting contextually relevant measurement tools based on regional/country priorities and governance
- Case study approach to model tools.

Country/region work would inform the governance and management of non-fiscal impacts, including potential legal reforms. Immediate opportunities for collaboration and publication have been identified in the Philippines and Latin America.

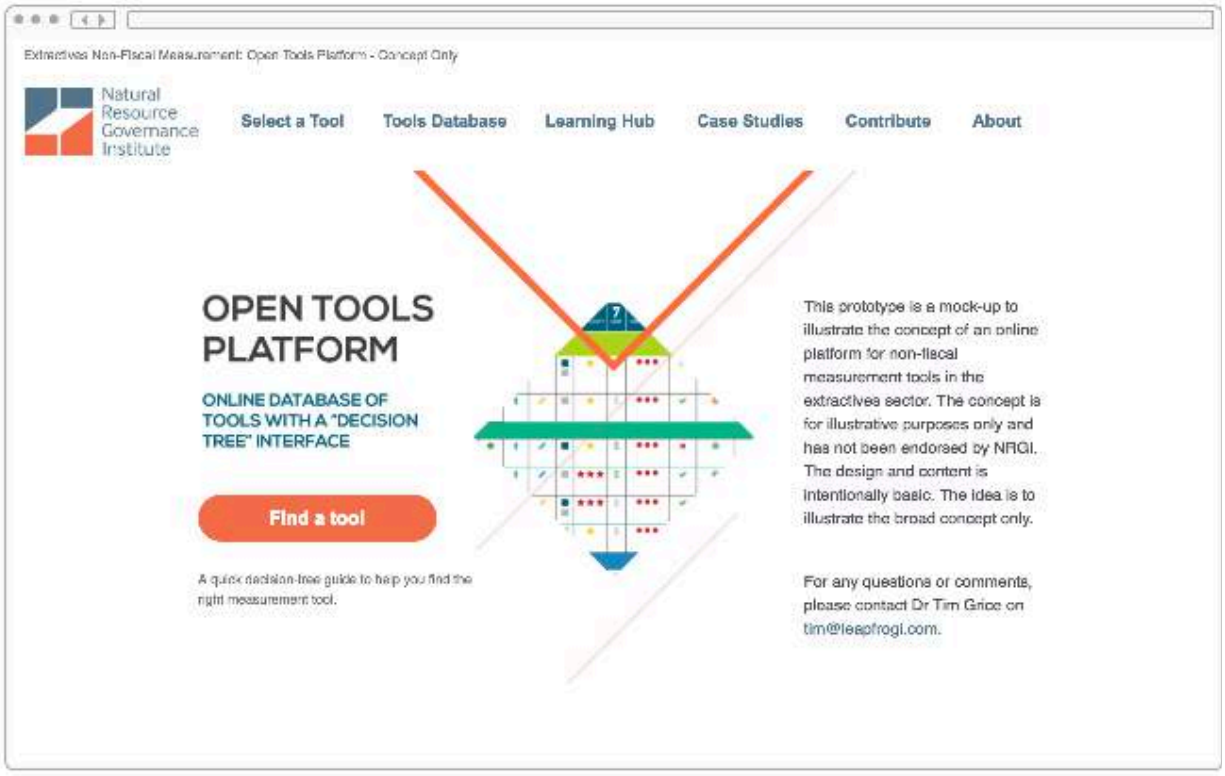


FIGURE F1
EXTRACT FROM PROTOTYPE OF ONLINE TOOLS DATABASE

NRGI's fiscal modeling work

Incorporating other capitals into NRGI's fiscal modelling work

NRGI could also consider developing a trial methodology to incorporate non-fiscal measurement tools into NRGI's fiscal modeling work. With a more holistic approach to financial modelling, NRGI could incorporate the non-fiscal impacts of projects at the decision stage, which would in turn inform non-fiscal management and mitigation measures.

It is suggested that NRGI develop a trial 'total fiscal modeling' methodology using a pilot study approach, where an overarching method integrates impacts across capitals, with specialised tools utilised for specific impacts.

It is also suggested that a materiality threshold for non-fiscal impacts is set relatively high, with an option to use an index and/or qualitative measurements for any impacts that are considered too difficult to assess for the pilot study.

Any pilot study should be treated as a 'learning exercise' and a training exercise for stakeholders, rather than an official input into a regulatory process.

NRGI's macro modeling work

Incorporating non-fiscal costs and benefits into NRGI's macro modelling work

Relatedly, there is the potential to incorporate non-fiscal costs and benefits into NRGI's macro-modeling work.

For example, NRGI has carried out historical analyses that model the costs and benefits of decades of extraction in a country (e.g., gold mining in Ghana; copper in Peru; or oil production and gas flaring in Nigeria). The most significant non-fiscal costs and benefits could be included in these models (i.e., the materiality threshold would be set high).

Non-fiscal costs and benefits that could be assessed in monetary terms include ecosystem services valuations for impacts to land, water and air, and net monetary assessments for employment and procurement data.

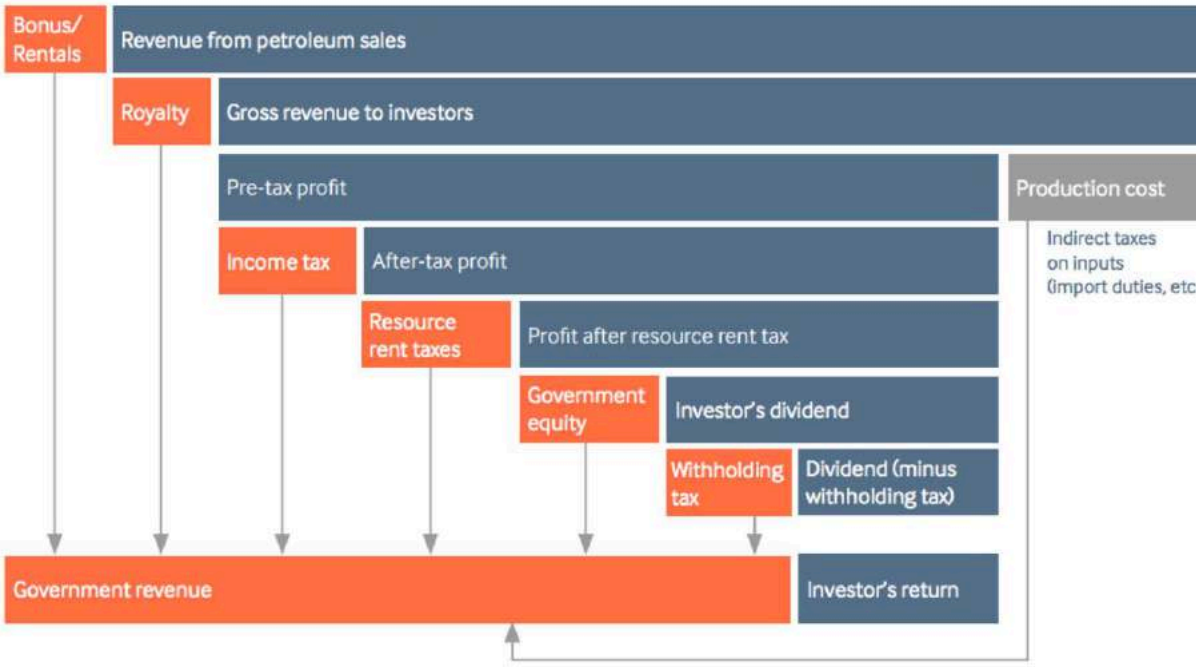


FIGURE F2
EXISTING BASIS FOR NRGI FISCAL MODELLING

Training modules

Developing a training module for use in NRGI's regional knowledge hub courses, Reversing the Resource Curse Course (CEU Course) and executive course in oil, gas and mining governance (BSG course).

NRGI could also consider developing a standard training methodology on the governance and measurement of non-fiscal impacts.

Content could be delivered through stand-alone training workshops, or as part of existing training programs. For instance, training could be utilised through CEU, BSG and hubs as a general overview, with information on the most appropriate resources for going deeper.

Modules topics may include:

- Governance of non-fiscal impacts
- Legislative frameworks
- Incorporating non-fiscal impacts when deciding whether to extract
- Mitigation, management and monitoring throughout the project life-cycle
- Measurement in EIAs and SIAs
- Standardisation initiatives
- Key methods and tools
- Case study approaches.

Curriculum could be linked to existing NRGI models and programmes, in particular the The Natural Resource Charter and Natural Resource Charter Decision Chain.

Natural Resource Charter Decision Chain

Integrating a capitals approach into the Natural Resource Charter Decision Chain

Finally, NRGI could work towards including a non-financial capitals approach in the framing of issues across the decision chain.

Non-fiscal governance and measurement can inform most if not all precepts in the decision change, including domestic foundations for resource governance (Precepts 1 and 2).

Non-fiscal cost-benefit analysis (NFCBA) could form an essential element of Precepts 3 (exploration and license allocation), 4 (taxation) and 5 (local effects).

MEDIUM-TERM NEXT STEPS

SECTION I

Immediate next steps could be supported by the following medium-term strategies:

Cultivate Strategic Partnerships

First, strategic partnerships with one or more of the following initiatives or groups may provide opportunities to leverage knowledge and resources:

- Natural Capital Protocol and Social Capital Protocol.
- Natural Capital Project and Natural Value Initiative.
- Principles for Responsible Investment, supported by The United Nations.
- The Sustainable Minerals Institute - SUSOP.
- ETH Zurich consortium - Resource Impact Dashboard (RID).
- SASB - Sustainability Accounting Standards Board.
- United Nations - System of Environmental-Economic Accounting (SEEA).
- World Business Council for Sustainable Development - The Social Capital Protocol.
- The Sustainable Minerals Institute - Sustainable Operations.
- SASB - Sustainability Accounting Standards Board.
- World Bank - Wealth Accounting and the Valuation of Ecosystem Services (WAVES).
- United Nations - System of Environmental-Economic Accounting (SEEA).

Pilot projects - NRGI priority countries

Second, to further assess how NRGI may incorporate non-fiscal measurement and governance methodologies into existing programmes, it would be instructive to pilot measurement methods in one or more NRGI Priority Country.

During the consultation process for this report, the teams from NRGI country offices expressed a willingness to support the piloting of non-fiscal measurement methods and tools.

If NRGI proceed with a pilot study, the following steps are suggested:

- Select a country based on stakeholder willingness to engage with non-fiscal considerations.
- Trial an overarching method that can integrate impacts across capitals, with specialised tools utilised for specific impacts.
- Select a methodology that assesses impacts across all of the capitals.
- Do not seek to monetise all impacts—use an index and/or qualitative measurements for any impacts that are considered too difficult to assess for the pilot study.
- Involve a broad range of stakeholders in the project, including government, community and CSO representatives.
- Treat the results of the exercise as a 'learning exercise', rather than an official input into the regulatory process.
- Use the opportunity as a training exercise for stakeholders.
- Document experience and lessons-learned.

NRGI Non-Fiscal Thought Leadership

Third, given the surprisingly low levels of knowledge of tools and methods that measure non-fiscal impacts in the extractive sector—even among those who work in extractives—NRGI could also consider helping to promote the importance of measuring non-fiscal impacts by contributing to knowledge of the field.

This could include further developing this preliminary research and report for a public audience, or other outputs such as multimedia content and social media campaigns.

Depending on the goals of the knowledge creation and

dissemination pieces, it may make sense to partner with one or more key partners to co-brand materials.

Non-Fiscal Symposium

Fourth, a related option is for NRGI to host a symposium on non-fiscal measurement in extractives, bringing together the key stakeholders working in this field.

While there is various work that is being undertaken in this area, it tends to be very broad (e.g., Natural Capital Protocol) or very narrow (e.g., tools for specific impacts e.g., water, air) in it's focus.

The purpose of the symposium would be to discuss the state of the field and chart a way forward to galvanise efforts to improve non-fiscal measurement in the extractive sector. There does not appear to be any other group catalysing efforts around non-fiscal measurement in extractives in this way. To get the most out of the symposium, a facilitated process should be used that gathers information from participants in the pre-work stage; uses the time in the symposium proper for key discussions; and has key actions for post-symposium outcomes.

NRGI Non-Fiscal Methodology

Finally, and potentially drawing from one or all of the strategic partnerships, pilot studies, thought leadership materials, curriculum and symposium, NRGI could develop a standardised methodology for measuring non-fiscal cost and benefits in the extractive sector. Understanding the non-fiscal costs and benefits of extraction is key to both the decision to extract and pursuing local benefits while offsetting environmental and social costs of extraction projects.

According to Precept 1 of the Natural Resource Charter:

"Opening up a country or a specific region within the country to exploration and extraction may not always be the best course of action. Negative impacts may outweigh the overall positive impact on the region home to production and the country more broadly."

According to Precept 5:

"Resource projects can incur significant environmental and social costs that are often borne disproportionately by those in the vicinity of the extraction. However, extractive projects also have the potential to generate benefits for local communities through employment and the demand for goods and services, at least while operations continue.

Yet at present, there is no methodology that systematically integrates non-fiscal tools and methods into the broader governance process of the extractive sector. Moreover, existing generic methodologies do not tend to provide a way to integrate non-fiscal impacts across all forms of capital impacted by extractive projects—including the impacts that are more difficult to measure and quantify.

NRGI is strategically positioned to develop an extractive-sector methodology that helps governments, companies and stakeholders better assess and manage the non-fiscal costs and benefits of extractive projects. NRGI already has the capacity to undertake financial modelling to forecast extractive revenues as the basis for technical assistance to governments, capacity building for interested stakeholders and advocacy. With an extractive-sector non-fiscal methodology, NRGI could advise countries and stakeholders on how to estimate overall costs and benefits of extraction is limited.

Development of the extractive sector methodology would require a mix of skills and expertise, including subject matter experts in environmental impact assessment and accounting, social impact assessments and measurement, resource economics, sustainability reporting and extractives governance. Depending on the partnership model used to develop the methodology, NRGI could outsource some of these roles to alliance partners or third parties.

Should NRGI wish to consider the development of an overarching methodology that is fit-for-purpose for the extractive sector, the following principles are suggested:

- Develop an overarching method that can integrate costs and benefits across all capitals, with specialised tools utilised for specific impacts.
- Do not seek to monetise all impacts—use an index, qualitative measurement or visual representation for any impacts that do not lend themselves to valuation.
- Partner with one or more existing standardisation initiatives.
- Link to existing NRGI models and programmes, including *The Natural Resource Charter* and *Natural Resource Charter Decision Chain*.
- Develop the NRGI approach based on action-learning methodology with governments, extractive companies, CSOs and affected communities.

PART C +

APPENDIX A: SPANISH, MANDARIN & FRENCH SPEAKING COUNTRIES

SPANISH SPEAKING COUNTRIES

SECTION I

01. // Search Trends and Themes

From the articles and resources identified in the Spanish searches, industry reports contained the greatest level of information on how tools and methods were devised, as well as how they were used in the field—including benefits and drawbacks encountered. As expected, most of the industry practitioner literature on the measurements of social and environmental impacts was from Latin American countries whose economies heavily depend on extractive projects, such as Peru, Chile, and Colombia.

Academic reports were all focused on environmental assessments, in locations including Spain and Colombia.

The vast majority of government resources accessed did not specify how companies were to measure or address social and environmental impacts; only mentioning the need for an EIA and SIA. One government document sourced and used in the analysis was from the Peruvian Department of the Environment, and centered around the integrated diagnosis of territory (**DIT**), a tool that utilises a technical instrument that integrates and analyses the information generated in specialised targeted studies and EIAs.

Most of the tools and methods had an environmental focus, and most social tools included environmental assessment.

Prominent environmental tools and methods had a strong emphasis on information and communication technologies (**ICTs**) and the use of Geographic Information System (**GIS**) mapping to identify environmental impacts (mostly before and after comparisons) . These include the Integrated Biodiversity Assessment Tool (**IBAT**), as well as the Integrated Environmental-Economic Accounting framework, used by the Colombian government. The main purpose of these tools was to monetise natural capital in order to project future company spending and to obtain accurate information on natural habitats for future management .

Prominent tools and methods to document social impacts were mostly based on best practice guidelines published by multilaterals and CSOs, such as the UN Millennium Development Goals, IFC, ICMM, and NGOs like Oxfam or Amnesty International .

Two prominent company-based tools were Social Return on Investment (**SROI**) and Social-Economic Assessment Toolbox (**SEAT**), mostly focused on extractive industries. SROI was the most popular tool when assessing social impacts; most of the articles positioned SROI as a robust and preferred methodology. SEAT, devised by Anglo American, is designed to identify and manage the social and environmental impact of the company throughout the life of the project. The poverty footprint method was also used to map the people, environment and economy of a specific area to define local concerns.

02. // Practice Trends and Themes

Government Practice

Government resources on the tools and measurements for environmental and social impacts of projects were, for the most part, vague, and did

CASE STUDY 1: ANGLOGOLD ASHANTI'S VOLUNTARY COMPLIANCE WITH INTERNATIONAL CODES IN COLOMBIA

AngloGold Ashanti the La Colosa gold mine near Cajamarca in Colombia. In addition to its regulatory obligations, AngloGold Ashanti is a voluntary signatory to:

- United Nations Global Compact (UNGC)
- International Council on Mining and Metals (ICMM)
- Responsible Jewellery Council (RJC)
- Global Reporting Initiative (GRI)
- Extractive Industries Transparency Initiative (EITI)
- International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold (Cyanide Code)
- Voluntary Principles on Human Rights

The majority of these voluntary guidelines focus more on social and environmental management practices more so than non-fiscal measurement per se. An exception to this is he "International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold" (Cyanide Code) was developed by a multi-stakeholder Steering Committee under the guidance of the United Nations Environmental Program (UNEP) and the then-International Council on Metals and the Environment (ICME). The Cyanide Code is a voluntary initiative for the gold and silver mining industries and the producers and transporters of the cyanide used in gold and silver mining. It is intended to complement an operation's existing regulatory requirements. In addition to specifying management and control practices for cyanide, the code also specifies measurement and reporting protocols.[1]

1AngloGold Ashanti. 2016. Politica ambiental y de comunidades. Available at: Http://www.anglogoldashanti.com.co/Sostenibilidad/Paginas/sostenibilidad-social.aspx

AngloGold Ashanti the La Colosa gold mine near Cajamarca in Colombi

not provide specific guidance to industry on how to measure non-fiscal impacts.

Generally speaking, regulations in Latin American countries specify the requirement for SIAs and EIAs to be conducted in the approval process for extractive projects. However, specific tools and methods are not prescribed, and there is no specific guidance on how impacts should be measured.

The Peruvian and Chilean government, being two of the most prominent extractive countries in Latin America, have information about extractive industries in the country throughout their governmental websites. However, the information contained on the measurement of non-fiscal impacts is very general, stating multiple times that the project should be "in the best interest of the country", but giving no detail on how to measure extractive-induced environmental and social impacts.

Company Practice

Companies' engagement with social and environmental tools varied depending on the size of the company. Not surprisingly, large companies operating in Latin America, such as Anglo American and Rio Tinto, tend to follow international guidelines when measuring social and environmental impacts, or internal performance standards that have been modelled on international best practice.

For instance, Anglo American utilises the SEAT tool throughout their operations in Chile, with the goal of moving from a more reactive and philanthropic focus to a more effective interaction with impacted communities based around investment plans (CSR InnoLabs, 2013). Large companies throughout Latin America are following this trend, dealing directly with communities and following international best practice guidelines, which, in most cases, go above and beyond governmental requirements. It is important to note that this move towards corporate social responsibility practices should not be confused with rigour or standardisation of measuring non-fiscal impacts.

Small and medium sized companies, on the other hand, are less advanced with CSR or measurement practices, and thus would be the largest beneficiaries of government led tools and methods.

NGO Practice

Despite their focus on advocacy and rights-based approaches to extraction, NGOs do not tend to provide specific guidance or support on the measurement of social and environmental impacts across Latin America. The most complete and detailed information on how to manage social and environmental impacts are found in the ICMM and IFC guidelines, which cover resettlement, indigenous peoples and other social performance challenges that mining companies encounter when operating in remote locales (ICMM, 2016). Most of the NGOs operating in Spanish speaking countries follow ICMM and IFC guiding principles. Again, however, these guidelines are often best-practice guidelines for managing non-fiscal impacts rather than specific measurement methodologies.

Collahuasi open pit copper mine

Alternative view of Collahuasi open pit copper mine

CASE STUDY 2: COLLAHUASI VERIFYING THEIR CARBON FOOTPRINT IN CHILE

Collahuasi is an open pit copper mine owned by AngloAmerican and Xstrata, operating since 1999 in the Tarapaca region of Chile.

Collahuasi Mine is the only mine in Chile verifying their carbon footprint, providing monthly reports to stakeholders, communities, and government. The company follows greenhouse gases (GHG)s generated at the organizational level according to the ISO 14064 standard, and the GHG Protocol, in its Corporate Accounting and Reporting Standard (ECCR). The CO2 footprint of their products follows the British Standards Institution (BSI) PAS 2050 standard, which enables quantification of GHG emissions of an individual product throughout its life cycle (from the raw material, through all stages of production and reaching distribution, use and disposal / recycling). (Collahuasi, 2015).

COLLAHUASI MINE IS THE ONLY MINE IN CHILE VERIFYING THEIR CARBON FOOTPRINT, PROVIDING MONTHLY REPORTS TO STAKEHOLDERS, COMMUNITIES, AND GOVERNMENT.

03. // Contacts for NRGI to pursue

1. National Business Association of Colombia – Association Nacional de Empresarios de Colombia (ANDI)

Http://www.andi.com.co/vmpe/Paginas/CONTACTENOS.aspx

Ms Olga Lucia Mejía Lurduy
Head of Legal and Regulatory Affairs – Extractives Division
Email: omejia@andi.com.co

Mejia Lurduy works at the National Business Association of Colombia – Extractives Division, the most important business chamber in the country. This organisation represents and brings together the most prominent and largest companies – including mining and oil & gas. They act as a united front when lobbing for socio-economic, political and/or environmental regulations within their industry.

Another contact at ANDI is Mr Eduardo Alfonso Chaparro Ávila (Executive Director of Mining Chamber at ANDI). E-mail: (echaparro@andi.com.co).

2. Universidad del Pacifico, Peru – Pacifico University, Peru

Dr Cynthia Sanborn
Vice Chancellor of Research at Pacifico University
sanborn_ca@up.edu.pe

Dr Sanborn is a very distinguished academic in Latin America (MA and PhD from Harvard University). Her areas of expertise are corporate social responsibility, extractive industries, and politics. She has a wealth of academic and practical knowledge on socio-environmental governmental regulations imposed on extractive companies (in Peru and Latin America), best practice scenarios, and socio-economic conflicts near extractive projects. Dr Sanborn has led the EITI initiative in Peru, was head of the Social Sciences and Politics Department at Pacifico University, and has participated (many times as lead investigator) in diverse international projects with a focus on mining impacts, including Ford Foundation funded projects. Dr Sanborn is also an expert on Chinese extractive companies operating in Latin America, having recently published a book on the subject titled: Puentes sobre el Pacífico: Latinoamérica y Asia en el nuevo siglo (2015).

3. Centro de Excelencia en Mineria, Chile – Mining Excellency Centre, Chile

Dr. Roberto Parra
Director
rparra@udec.cl

The Mining Excellency Centre is an international center of excellence that resulted from a partnership between the University of Queensland (Australia), through its Sustainable Minerals Institute (SMI) and the University of Concepción, with the support of the Corfo's international excellence funding. Its objective is to improve productivity and minimize the environmental impact of Chilean mining operations by creating a collaborative global knowledge force that contributes to the development of advanced human capital and deliver innovative applied research results through an effective technology transfer to the mining ecosystem.

4. Departamento de Energia y Minas, Colombia – Department of Mines and Energy, Colombia

Mr. Carlos Andrés Cante Puentes
menergia@minminas.gov.co

The Ministry of Mines and Energy is the national public entity of the upper level central executive, whose responsibility is to manage the country's non-renewable natural resources ensuring its best and greatest use.

5. Defensoria del Pueblo Colombiano – Colombian Ombudsman

Mr Carlos Alfonso Negret Mosquera
0011 57 314 40 00 Exts: 2315 – 2316

The Ombudsman's Office is the institution of the Colombian State responsible for promoting the human rights of the inhabitants of the national territory, within the framework of the democratic, participative and pluralist society. The office also plays a conflcit resolution role between communities and companies.

CASE STUDY 3 – THE MINING CANON, PERU

Maras salt mines, Sacred Valley, Cusco, Peru

In Peru, the royalties collected from extractive projects are placed in a fund, known in Peru as the Mining Canon. These royalties are used towards developmental needs (Ministerio de Economia y Finanzas, 2013). The Canon Minero distributes mining royalties to the regions where most mining activity occurs. By law, the resources of the Canon Minero should be devoted to public investment to improve the living conditions of the local population. However, the law prevents the application of mining royalties for operating expenses, such as wages. Instead, they can only be used to finance or co-finance infrastructure projects. Use of mining royalties for social programmes, such as education or health programs, is prohibited.

In recent years, local governments have been unable to effectively spend the funds that they have received. For example, in 2011, 12 regional governments spent less than 60% of their allocation of mining canon resources. One of these cases, Puno, spent 33% of its newly acquired wealth (Calfucura, 2012). This has led to academics, communities living near extractive projects, and various governmental personnel to question the effectiveness of distributing royalties to regional governments who do not have the resources to utilise these funds.

CASE STUDY 4 – RIO TINTO'S LAND ACCESS AND RESETTLEMENT STRATEGY, PERU

Rio Tinto Minera Peru's La Granja Project in Cajamarca

As part of the project development review for Rio Tinto Minera Peru's La Granja Project in Cajamarca, a risk management approach was used to understand community concerns and challenges related to a potential resettlement, as well as business risks and challenges related to land acquisition and its impact on mine development.

The company's resettlement planning team utilised satellite photos, land-use planning maps, demographic data and other secondary sources to inform its analysis. The team also used criteria common in forestry management to characterize soil types and crops to estimate the value of agricultural land when resettling families. The results of the social and technical assessments were integrated and reviewed jointly with resettlement families, resulting in a robust method to identify land access risks (Flynn and Vergara, 2015).

FRENCH SPEAKING COUNTRIES

SECTION I

01. // Search Trends and Themes

From the articles and resources identified in the French search, there were two broad types of academic articles that focused on measuring non-fiscal impacts.

The first type of academic article tended to focus on the theoretical aspects of social and environmental measurement (in particular environmental accounting), without referring to a specific tool. A second common type of academic article critiqued existing tools and concepts. This second type of article was recorded as part of the review.

Practitioner articles focused more on practical or case study applications of existing tools as well as newly developed tools.

An interesting trend was that a significant number of web pages – blogs or online newspapers – argued against the monetisation of environmental services, e.g. the article from terraeco[1] (these non-technical articles were not recorded in the review).

Overall, the search results for environmental tools were based around two main topics.

First, there was a focus on natural resources (both ecological and abiotic resources), which quantified the wealth of a country or the impact of an industry (though mostly country level). Articles here tended to focus on the World Bank's Wealth Accounting and the Valuation of Ecosystem Services (WAVES) framework, which has been applied in a number of African countries (at country level).

Second, there was a focus on the Life Cycle Analysis method (quantitative rather than monetary) to quantify all environmental impacts, although there was a particular focus on greenhouse gas accounting, often with the Bilan Carbone tool. The main framework for LCA was the ISO standard 14040[2] and the main database used for Life Cycle Inventory data was Ecoinvent. LCA research focused on improvements to the methodology, in particular the quality of the data, but also the theoretical framework (e.g., defining impact categories). Some research was also dedicated to incorporating social impacts into the LCA framework to create quantifiable social impact categories.

While environmental impact studies tended to focus one aspect of environmental sustainability (e.g. biodiversity, or GHG emissions), social impact studies tended to be dealt with together as a whole.

The search returned only a few results on the extractive industry (even when explicitly mentioning mining and extraction in the search terms). When the extractive industry was considered in an article, it was often as part of quantifying the value

1 Http://www.terraeco.net/Donner-un-prix-a-la-nature-c-est,47076.html

2 Https://halshs.archives-ouvertes.fr/halshs-00543116/document, Http://search.proquest.com/docview/900501345?pq-origsite=gscholar, Http://journees3r.fr/IMG/pdf/2007_01_environnement_04_Roger.pdf

of a country's total natural resources (notably in Africa, with the World Bank method). Several articles (both practitioners and academics) criticised the lack of a common set of indicators, pointing out that practitioners are free to develop their own tools (e.g. AREVA and Stering). For instance, around 200 different models and tools exist to assess social impacts; 70 tools exist only to quantify the performance of buildings.[3]

The 2002 French New Economic Regulations law makes it compulsory for listed French companies to report on their environmental and social impacts, but does not specify any tool to do so.[4]

EIAs and SIAs, were commonly found in search results, both from practitioners and academics, especially when the term "measure" was used in the search. However, there was a wide range of methodologies and measurement approaches used in quantifying impacts in EIAs, making it difficult to compare different types of impacts within an EIA, or across EIAs.

02. // Practice Trends and Themes

Government Practice

There are several examples of governments using the World Bank method to estimate the value of the national natural resources, e.g. New Caledonia[5] and Madagascar[6] , and examples of French-speaking African countries measuring carbon emissions under the

3 Http://www.planbatimentdurable.fr/IMG/pdf/Cerqual_Etude_valeurverteFR.pdf

4 Http://www.cairn.info/revue-comptabilite-controle-audit-2010-1-page-53.html

5 Http://www.afd.fr/jahia/webdav/site/afd/shared/PUBLICATIONS/RECHERCHE/Scientifiques/Documents-de-travail/082-document-travail.pdf

6 Https://www.wavespartnership.org/sites/waves/files/kc/A4-Indicateurs%20macro%2020p-FINALE.pdf

Production diagram of Moho Nord in the Republic of the Congo.

Inauguration of Moho Nord: the largest oil project ever undertaken in the Republic of the Congo

CASE STUDY 1: ENVIRONMENTAL INDICATORS AT TOTAL

The French oil and gas group Total is ISO 14001 certified and has developed an environmental management system (EMS) for all of its sites.

As part of its EMS, Total has developed a set of 20 indicators to measure its environmental performance[1].

These indicators are divided into seven categories: air emissions, water impacts, waste, loss of containment, accidental hydrocarbon spills, oil spill preparedness and raw material loss rate.

Each indicator is measured in all ISO 14001 certified sites and aggregated into one figure for each year. Total has also developed a set of 8 health and safety indicators for its employees.[2]

1 Http://www.sustainable-performance.total.com/en/indicators/environmental-indicators

2 Http://www.sustainable-performance.total.com/fr/indicateurs/indicateurs-securite-et-sante

CASE STUDY 2: RIO TINTO'S BIODIVERSITY STRATEGY

Rio Tinto's report on its biodiversity strategy provides details on a case study at one of its mine sites, QIT Madagascar Minerals (QMM).[1] The "planning tool for actions in favour of biodiversity" (PAB) was developed in partnership with Fauna & Flora International (FFI), and tested on four of Rio Tinto's sites: Rössing in Namibia, Palabora in South Africa, QIT Madagascar Minerals (QMM) in Madagascar and Corumbá in Brazil. Madagascar's case study is the most advanced. Since 2004, a pilot programme for biodiversity offset has been developed, with the support of the Business and Biodiversity Offsets Programme, a collaboration of more than 80 leading organizations and individuals including companies, financial institutions, government agencies and civil society organizations. As part of this programme, the "net positive impact" (NPI) is evaluated quantitatively in terms of gain or loss of "Quality Hectares" over the mine's life. Rio Tinto Iron Ore Atlantic is also involved in an exploration project in Guinea. In a recent ICMM report, Rio Tinto outlines its commitment to biodiversity management for this project; it is unclear whether the NPI framework will be used, although the ICMM report mentions that an initial biodiversity action plan has been developed in partnership with Conservation International.[2]

Production diagram of Moho Nord in the Republic of the Congo.

QIT Madagascar Minerals

1 Http://www.riotinto.com/documents/ReportsPublications/RTBidoversitystrategyfinal.pdf

2 Http://www.icmm.com/website/publications/pdfs/13.pdf

'Caborone Declaration'[7] .

The Canadian government has developed a tool to assess environmental and social impacts related to oil and gas exploration[8] .

Concrete examples of a government requiring an extractive company to quantify its non-fiscal impacts using a specific methodology, tool or approach are difficult to source. From the results of the web search, it appeared that governments were more focused on indicators to measure things at the national or regional level, and sometimes at the sector level (e.g. agriculture or mining). The French Ministry of Ecology and Sustainable Development for example developed macro-indicators to measure the progress and success of the "Green Economy" in France (e.g. measuring investments for power savings initiatives). Another example is the Canadian government's attempts to introduce natural capital considerations in productivity calculations.

NGO Practice

Like in Latin America, despite their focus on advocacy and rights-based approaches to extraction, NGOs do not tend to provide specific guidance or support on the measurement of social and environmental

7 Http://www.mjs.gov.mg/wp-content/uploads/2015/09/Rapport-de-mission-35%C3%A8me-Sommet-ordinaire-de-la-SADC-10-18-ao%C3%BBt-2015-Gaborone-Botswana.pdf

8 Https://www.aadnc-aandc.gc.ca/fra/1100100036632/1100100036636

impacts in French-speaking countries.

In the search results, there were more examples of not-for-profit organisations (e.g., ORÉE or Network for Business Sustainability) providing advice to companies on ways to quantify their environmental and social impacts than examples of governments. A number of consultancy companies are also providing their services to extractive companies to assess their environmental and social impacts (e.g. McKinsey, (IM) PROVE, Bio Intelligence Services, Alphare).

03. // Contacts for NRGI to pursue

1. French Environment and Energy Management Agency

Website: www.ademe.fr
Contact form: Http://www.ademe.fr/en/node/13144
Possible contact person: Sandrine Lacombe, co-authoring report on key industry trends and indicator results Http://www.ademe.fr/sites/default/files/assets/documents/ademe-entreprise2016-web.pdf

ADEME is the French Environment and Energy Management Agency, equivalent to other governmental environmental protection agencies. It often acts as a facilitator for companies or other governmental agencies to improve their environmental performance. For example, the ADEME is providing tools (e.g. Bilan Carbone) for local governments to measure their greenhouse gas emissions[9]. ADEME also supports consultants such as Alphare and Bio Intelligence Services[10] that have expertise

9 Http://www.developpement-durable.gouv.fr/IMG/pdf/note_bilan.pdf

10 Source: Http://beoa.free.fr/docs/ACV_Bois_Dom.pdf

CASE STUDY 3: EVOLUTION OF THE MINING CODE IN GUINEA

The Simandou mine project, Guinea

Guinea is a resource-rich country with significant reserves of bauxite, gold, diamond, iron ore and nickel. The country's first Mining Code came out in 1995. With a liberalisation approach to minerals policy, this Code stimulated the mining industry's development. While environmental and social impact assessments have been made compulsory since 1989, there have been four major pollution events between 2004 and 2010.[1] As a response to these issues, a new Mining Code came out in 2011, helping the State to improve the regulation of mineral resource extraction. On the environmental side, the new Code creates conservation areas where mining activities are excluded, and restrictions in the use of some hazardous chemicals. The new Act does not, however, provide guidance for the measurement, quantification or reporting of non-fiscal impacts.

1 Http://www.sifee.org/static/uploaded/Files/resources/actes-des-colloques/lome/session-3-3/SOW_TEXTE.pdf

WHILE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS HAVE BEEN MADE COMPULSORY SINCE 1989, THERE HAVE BEEN FOUR MAJOR POLLUTION EVENTS BETWEEN 2004 AND 2010OF A PRODUCT OR SERVICE SYSTEM THROUGH ALL STAGES OF ITS LIFE CYCLE.

in Life Cycle Analysis and Bilan Carbone. ADEME therefore has the potential to impact legislation related to non-fiscal measurement in France, which may in turn impact the measurement practices of French companies (even those operating in jurisdictions outside of France).

2. Network for Business Sustainability

Website: Http://nbs.net/
Email: info@nbs.net
Possible contact person: Dr Pamela Kaval
Http://nbs.net/knowledge/business-case/impacts/systematic-review/

NBS is a not-for-profit organisation from Canada that brings together academics and practitioners who are interested in business and sustainability. NBS provides guidance for companies on tools to use to quantify their environmental impact.

In their report[11], NBS advocates the Global Reporting Initiative as a holistic tool, and supports the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). Other methods also mentioned in the report are Life cycle analysis, Global footprint network, and Ecosystemvaluation.org. NBS would be a key non-governmental stakeholder for its focus countries Canada, Chile and South Africa.

3. Quantis International

Website: Http://www.quantis-intl.com/en
Email: info@quantis-intl.com
Possible contact person: Yves Loerincik, co-founder of Quantis
Previously named Life Cycle Systems, this consultancy company originated from a group of researchers from Switzerland (Polytechnical School of Lausanne). Quantis provides life cycle analyses and ecological footprint assessments based on ISO 14040 standard. It participates in ISO workshops (carbone footprint and eco-design), and collaborates with ADEME/AFNOR (on product labelling), and WRI and WBCSD (on new standards).

4. Ecoinvent

Website and contact form: Http://www.ecoinvent.org/about/contact/contact.html
Email: support@ecoinvent.org
Possible contact person: Guillaume Bourgault, Project Manager, ecoinvent
bourgault@ecoinvent.org

Ecoinvent is the largest and most used database for life cycle inventories, providing the basis for almost all Life Cycle Analyses. Open-access, it is a significant source of data to quantify environmental impacts related to a product or an activity. Coupled with the ISO 14040 LCA standardised methodology, collaboration with Ecoinvent would provide access to a systemic and holistic tool for quantifying environmental impacts. However, this database may suffer from data gaps when it comes to the extractive industry, due to the difficulty of standardising the unique character of mine sites, as well as the lack of standardised reporting of non-fiscal impacts in the sector.

11 Source: Http://nbs.net/wp-content/uploads/Impact_ExecRep_FR110718.pdf

CASE STUDY 4: ENVIRONMENTAL PRODUCTION IN THE DEMOCRATIC REPUBLIC OF CONGO

The Democratic Republic of Congo (DRC) has large reserves of copper and cobalt.[1] EIAs are compulsory in the DRC, under the environmental protection law n° 003/91 April 23rd 1991.[2] This law is not part of the country's Mining Code but applies to all industrial sectors.

The Mining Code provides guidance on obligations specific to the mining industry, such as the health and safety of staff and local populations, protection of water resources, site rehabilitation. Additionally, the code specifies that projects taking place in areas occupied by indigenous populations must carry out a social impact assessment. However, there are no specific guidelines on the quantification or reporting of non-fiscal impacts for extractive companies.

Kipoi Mine is a copper mine in Katanga Province of the Democratic Republic of the Congo

1 www.memoireonline.com/11/08/1624/Le-principe-de-prevention-et-letude-dimpact-sur-lenvironnement-dans-le-projet-dexploitation-mini.html

2 Http://www.lexology.com/library/detail.aspx?g=8392b09d-f6ff-486e-b07f-2087bcfdd2f9

CASE STUDY 5: SUSTAINABILITY INDICATORS IN QUEBEC

In Quebec, the Ministry of Energy and Natural Resources (MERN) has developed a set of 13 sustainability indicators for the mining industry.[1]

Énergie et Ressources naturelles Québec

The set of indicators contains three economic, six environmental and four social indicators. Environmental indicators include greenhouse gas emissions, electricity and fuel consumption, the state of rehabilitation, land use, proven and probable reserves, and extraction rates of metallic minerals. Social indicators include employment rates, occupational injuries, age, gender and qualification of employees, and work stoppages.

This "scoreboard approach" is considered in line with the EU's « GDP & Beyond » initiative[2], the World Bank sustainability indicators[3], and the OECD's wellbeing indicators[4].

1 Source: Https://mern.gouv.qc.ca/publications/mines/Tableau_bord_IDD.pdf

2 Source: www.beyond-gdp.eu

3 Source: Http://data.worldbank.org/sites/default/files/wdi-2014-frontmatter.pdf

4 Source: Http://ec.europa.eu/environment/beyond_gdp/background_en.html

MANDARIN SPEAKING COUNTRIES

SECTION I

01. // Search Trends and Themes

A systematic search in the language of Mandarin was conducted using three search engines: Google, Google Scholar and Baidu (one of the biggest search engines in China, widely used by people from different industries). The key search terms were translated from the English search in a way that maximised meaning in Mandarin. The keywords in Mandarin were as follows:

- Search term 1: 测量OR评估OR方法AND开采OR提炼OR采矿OR矿业OR油和天然气OR油和煤气AND生物多样性OR环境OR生态系统OR空气OR大气OR水OR温室气体
- Search term 2: 测量OR评估OR方法AND企业OR机构OR工业OR制造业OR行业AND生物多样性OR环境OR生态系统OR空气OR大气OR水OR温室气体
- Search term 3: 测量OR评估OR方法AND开采OR提炼OR采矿OR矿业OR油和天然气OR油和煤气AND社会OR工作OR就业OR冲突OR文化OR习俗OR社区OR管理
- Search term 4: 测量OR评估OR方法AND企业OR机构OR工业OR制造业OR行业AND社会OR工作OR就业OR冲突OR文化OR习俗OR社区OR管理

For the above four searches in Mandarin, there were some positive results for the measurement of natural capital, but very little information about the measurement of social capital.

Based on informal discussions that the Mandarin research assistant held with academic researchers[1], there are likely two main reasons for this. First, there was a general perception that state legislation is weak when it comes to the assessment and reporting of social impacts for extractive projects. Second, accessibility of information may also inhibit attempts to identify information on both the environmental and social impacts of Chinese extractive projects (e.g., there is limited access to some Chinese web pages from outside the country).

In Google, there were many search results, but most were news media, with no real information regarding tools or methods used to evaluate non-fiscal impacts in extractives. For example, the search returned news media articles regarding mining companies undertaking environmental impact assessments to safeguard local ecosystems before/after mining operations, however there was no detailed information on the process used for EIAs readily available.

Based on the results from the Google Scholar and Baidu search, most articles focused on mining and extraction methods, with environmental and ecosystem protection also addressed in a number of Mandarin articles. In Baidu, some of the articles reviewed tools and methods from other countries, such as Finland, with a view towards identifying lessons learned that can be applied in the Chinese context.

Company annual reports or sustainability reports mention that the assessment of social capital and natural capital is an important part of their operations, but there was generally no information about how this assessment were

CASE STUDY 1: TECHNICAL GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT CONSTRUCTION PROJECT

Law of the People's Republic of China on Appraising of Environment was carried out in September 2003. The Law was developed to encourage sustainable development and preventing any negative environmental impacts due to any planning and construction programs. Law normally provides information quite generally because it is the framework of how the industry could comply.

The Ministry of Environmental Protection of the People's Republic of China implemented the Technical Guidelines for Environmental Impact Assessment Construction Project of Coal Development in January 2012. The Guidelines provide principles, contents, methods and technical requirements for undertaking EIA of coal mining projects and processing projects in China. Air, surface water, underground water, noise and ecology is required to be measured and assessed to meet the requirements.

CASE STUDY 2: ANSTEEL MINING COMPANY

ANSTEEL Mining company is a state-owned company. It has the most reserve of resources, the largest scale of operation, the latest technology and processing method in China. Using the West Anshan Iron Ore Mineral Processing Project as an example. The project locates in Anshan Town, Anshan, Liaoning Province. It is an underground iron ore mining site using the filling mining method for its operation, which could protect the surface ecological environment. For a full application of EIA, the major process includes:

- Mining company submits EIA request to relevant organisation
- The organisation develops EIA plan
- Investigation and evaluation
- Impacts analysis and assessment

undertaken and what tools have been used.

The Chinese National Development and Reform Commission (NDRC) published greenhouse gas calculation methods and guidelines for different industries including coal mining, oil and gas, transportation, fluorine chemical industry and other industries. NDRC is the central commission of developing new projects and reforming existing projects. The Commission also supervise and manage these projects.

Other key themes from the Mandarin search included:

- Environmental Impact Assessment, which is a requirement for extractive projects in China, is the method generally used to evaluate natural capital.
- Information is not fully accessible online: some Chinese websites are not accessible in Australia (maybe IP issue).
- Many research articles or reports have been translated from other languages into Mandarin, so people in China can learn from others.
- The GHG Protocol is the only tool that was identified through the Mandarin search which is used internationally.

1. China University of Mining and Technology (academic)

Website: http://eng.cumt.edu.cn/
Contact: Prof Gui FU
Email: fugui66@126.com

Founded in 1909, China University of Mining and Technology (CUMT) is one of the key national universities directly under the administration of the China's Ministry of Education. It is also listed in the national "211 Project" and "985 Innovation Platform for Advantageous Disciplines", which is a government program designed to support and develop top institutions of higher education in China. As a distinctive multi-disciplinary research-oriented top university with a history of over 100 years, CUMT has been playing an important leading role in the coal energy industry and the provincial economic and social development as well. Meanwhile, as one of the first batch of universities qualified to confer doctoral and master degrees, CUMT has its own Graduate School.

2. Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection of the People's Republic of China (NGOs, academic)

Website:
http://www.nies.org/ (Chinese version)
http://english.nies.org/about/about.asp (English version)

The Nanjing Institute of Environmental Sciences is a national scientific research institution directly affiliated to the Ministry of Environmental Protection.

The research fields of NIES cover ecological protection and restoration, nature and biodiversity conservation, rural environment management, ecological effects of toxic and hazardous chemicals and pollution control, soil pollution prevention, ecological protection of watersheds and water pollution prevention, which includes twenty-one research divisions.

3. National Development and Reform Commission (government stakeholders)

Website: http://en.ndrc.gov.cn/

The National Development and Reform Commission has the following functions:

- formulate and implement strategies of national economic and social development, annual plans, medium and long-term development plans; to coordinate economic and social development; to carry out research and analysis on domestic and international economic situation; to put forward targets and policies concerning the development of the national economy, the regulation of the overall price level and the optimization of major economic structures, and to make recommendations on the employment of various economic instruments and policies; to submit the plan for national economic and social development to the National People's Congress on behalf of the State Council.
- monitor macroeconomic and social development trend and provide forecast, warning and information guidance; to study important issues concerning macroeconomic performance, aggregate balance, national economic security and overall industrial security and put forward policy recommendations on macroeconomic management; to coordinate and address major issues in economic operation and adjust economic performance; to take charge in organizing the emergent dispatch and coordinating the transport of important goods and materials.

4. Ministry of Land and Resources of the People's Republic of China (government stakeholders)

Website: http://www.mlr.gov.cn/mlrenglish/
- Address: No. 64 Funei Street 100812 Beijng,China
- Tel: 86-10-66558407/08/20

The Ministry of Land and Resources is responsible for the planning, administration, protection and rational utilization of such natural resources as land , mineral and marine resources in the People's Republic of China.

5. China International Mining Group (NGOs)

Website: www.cimg.org.cn (this is the official website, but can't be opened)
http://www.chinacsrmap.org/Org_Show_EN.asp?ID=1227 (introduction of the organisation)

Email: contact@chinacsrmap.org

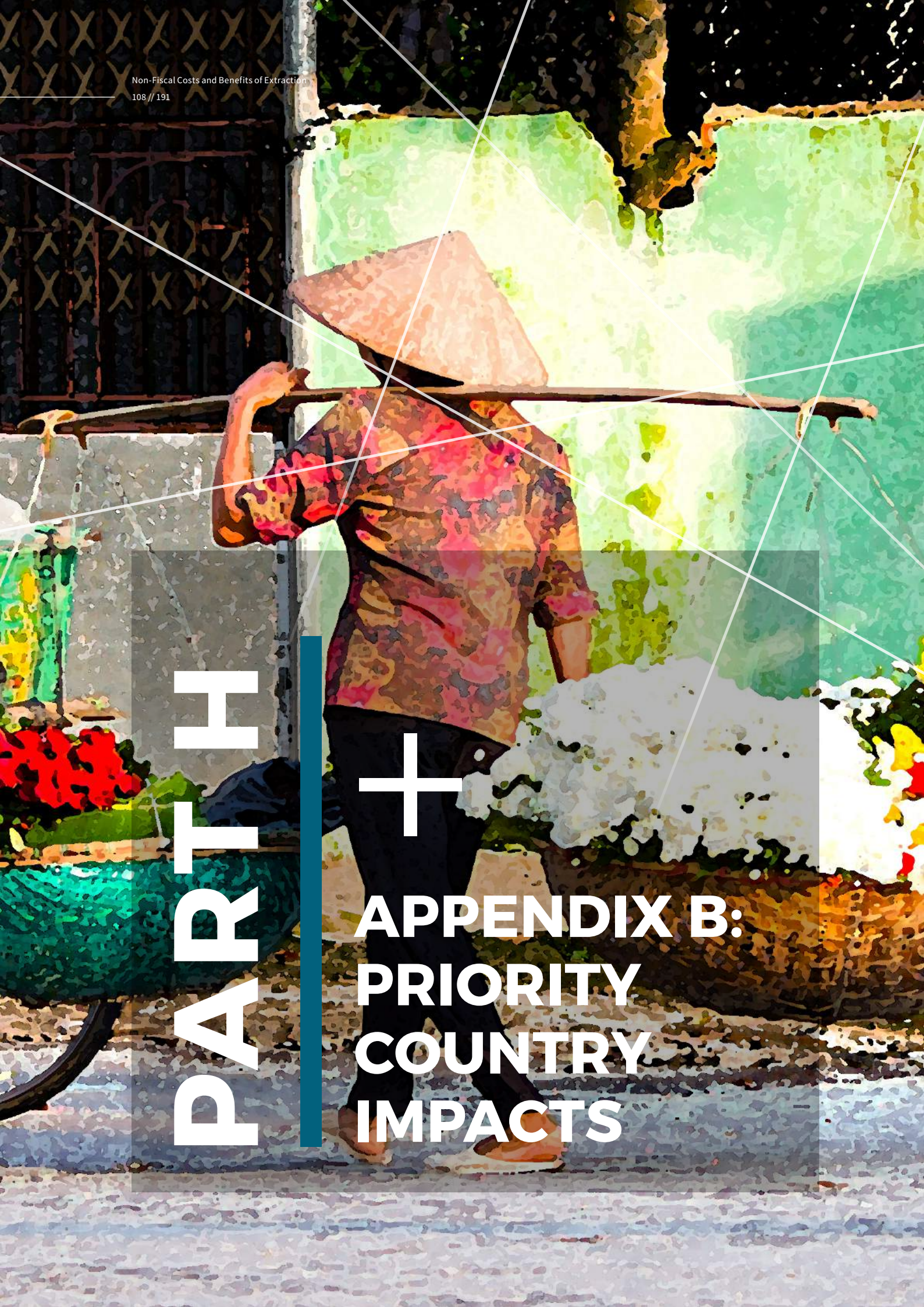
A forum for International mining and service companies plus individuals with interests in creating sustainable business opportunities in China's mining industry.
The CIMG aims to promote sustainable investment and best business practice in the mining sector through sharing non-competitive information and addressing

issues of common concern to potential mining investors in China by providing channels for dialogue with the relevant authorities.

The CIMG is an official industry-working group of the China-Australia Chamber of Commerce in Beijing (AustCham Beijing). The CIMG is supported by the Australian Embassy in Beijing, British Embassy in Beijing, British Chamber of Commerce in Beijing, Canadian Embassy in Beijing, the CCBC, DIFID and South African Business Council.

1 China International Mining Group is a forum for International mining and service companies plus individuals with interests in creating sustainable business opportunities in China's mining industry. The CIMG aims to promote sustainable investment and best business practice in the mining sector through sharing non-competitive information and addressing issues of common concern to potential mining investors in China by providing channels for dialogue with the relevant authorities.

2 Http://www.sdein.gov.cn/zwgk/spq/jsxml_1442/201511/W020151127347431649448.pdf Road,Xuzhou,Jiangsu,221116,P.R.China



PART H

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APPENDIX B: PRIORITY COUNTRY IMPACTS

PRIORITY COUNTRY IMPACTS

SECTION I

Questionnaires were completed by NRGI country staff to identify:

1. Which non-fiscal impacts that should be prioritised when identifying tools and methods.
2. What level of stakeholder capacity exists to assess, review and comprehend non-fiscal impacts in NRGI priority countries.

01. // Impacts of Extractive Projects Across Capitals

NRGI country teams were asked to rate the extent to which they thought extractive projects in their priority country will result in positive or negative impacts across the capitals measured in this project.

As shown in Figure F.1 below, net positive impacts were expected from extractive projects across financial capital, physical capital and human capital indicators, whereas net negative impacts were expected for natural capital, political capital, social capital and cultural and spiritual capital indicators.

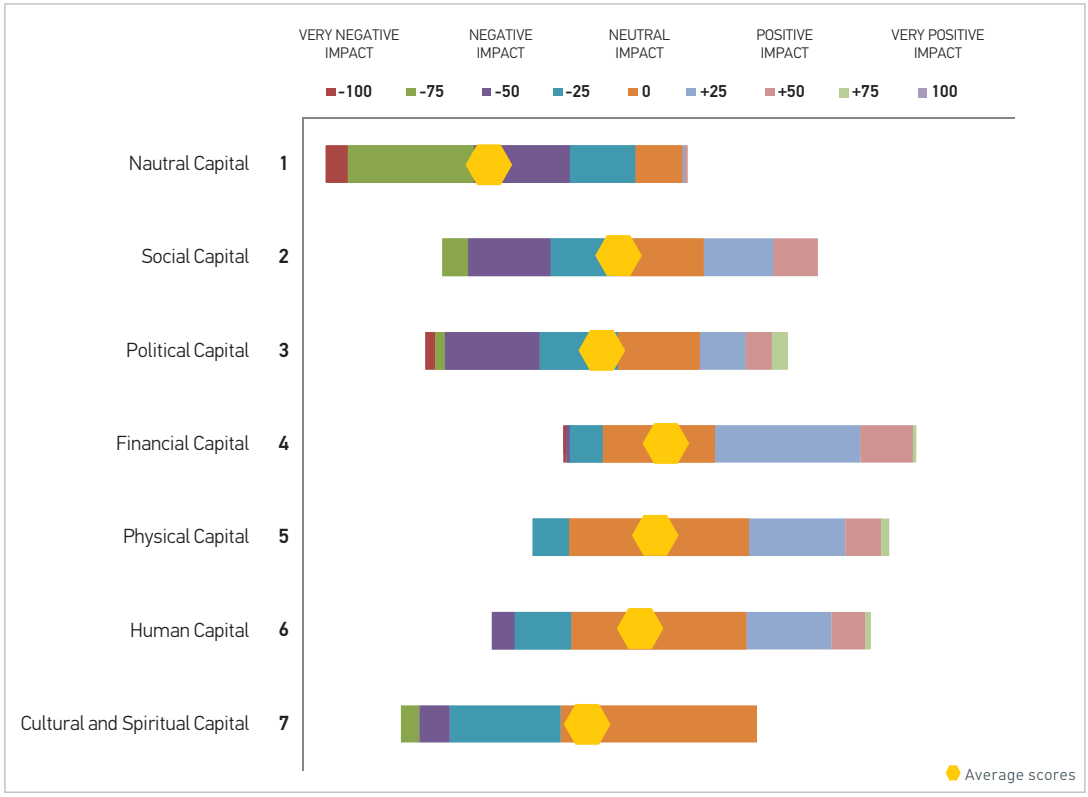


FIGURE F.1 EXTRACTIVE PROJECTS LIKELY IMPACT ACROSS CAPITALS

02. // Natural Capital

Natural capital is the stocks and flows of environmentally-provided assets such as soil, agricultural resources, mineral reserves, air, water, wetlands and all living things.

There were relatively few differences between mean scores for natural capital impacts, which were seen as exclusively negative across all NRGI priority countries (see Figure F.2).

The impacts to water were rated slightly more negatively than other forms of impacts. The impacts on future generations were also rated particularly negatively.

03. // Social Capital

Social capital is the social networks and trust; social rules, norms and obligations; and the reciprocity arrangements embedded in social relations and social structures.

As shown in Figure F.3, some variability was observed across social capital impacts, with 'civil engagement and contribution to community life', and 'leadership structures and stakeholder groups' viewed as neutral if not potentially positive.

Trust and goodwill, in comparison, was seen as likely to be negatively impacted by extractive projects.

The variability observed across the expected impacts to social capital underscores the need for nuanced measurement and valuation methods.

04. // Political Capital

Similar variability was observed in the perceived impacts to political capital.

Political capital is the existence and effective functioning of society's governance mechanisms, including the governance institutions themselves, as well as the standards, rules and regulations they apply.

Governance practices around transparency were expected to be positively impacted by the extractive sector, with relatively neutral impacts expected for 'capacity of state agencies', 'governance frameworks for the extractive sector and citizen voice (see Figure F.4).

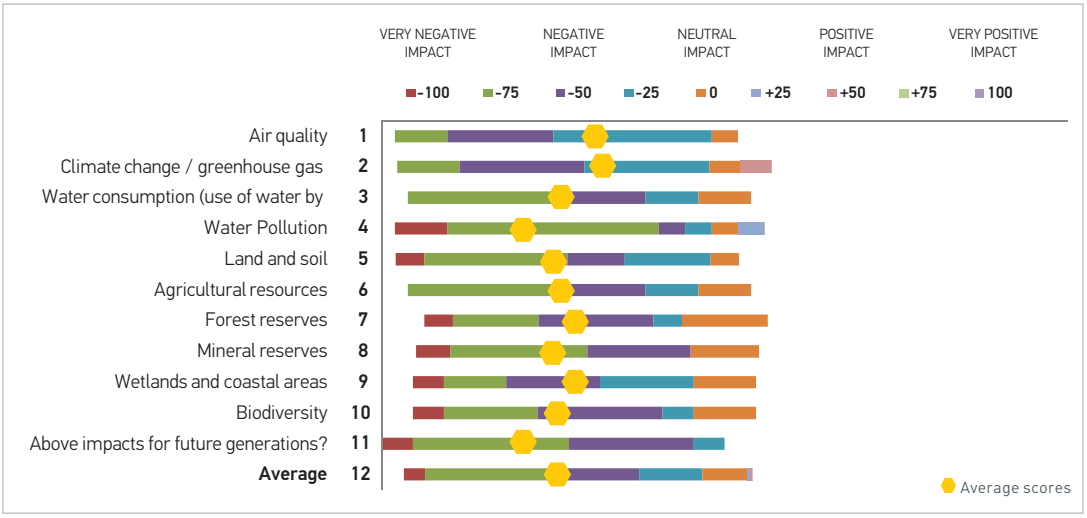
Negative impacts were expected to arise for corruption, management of land rights issues, professionalism of police and security forces, and concentration levels of power.

05. // Financial Capital

Financial capital is the financial resources available to society's institutions, groups and individuals

As shown in Figure F.5, marginally positive impacts were expected across financial capital impacts, with the exception of 'savings and investments for future generations' and 'direct income, rental payments, equity or investment dividends to landowners', which received comparatively negative responses.

FIGURE F.2 EXTRACTIVE PROJECTS IMPACTS TO NATURAL CAPITAL



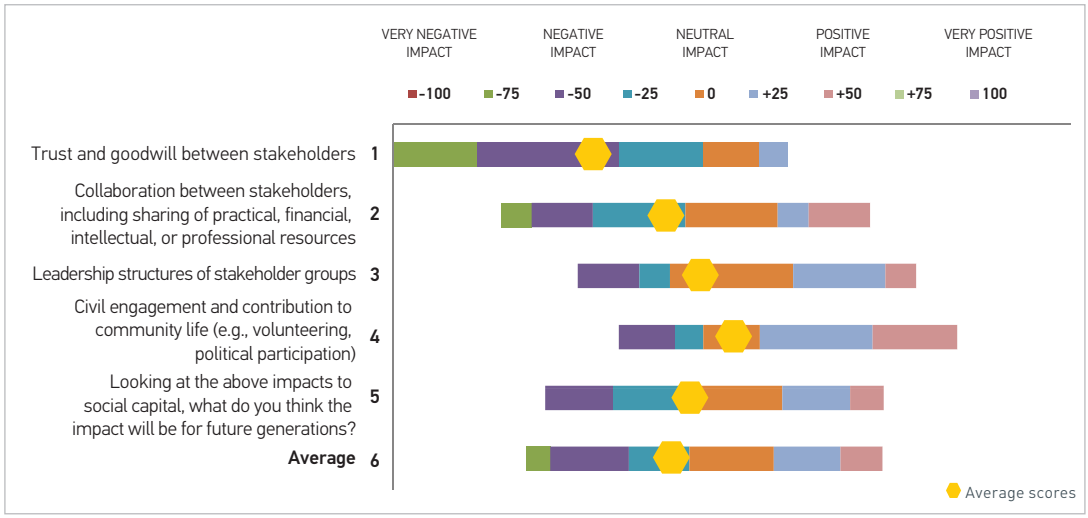


FIGURE F.3 EXTRACTIVE PROJECTS IMPACTS TO SOCIAL CAPITAL

FIGURE F.4 EXTRACTIVE PROJECTS IMPACTS TO POLITICAL CAPITAL

FIGURE F.5 EXTRACTIVE PROJECTS IMPACTS TO FINANCIAL CAPITAL

FIGURE F.6 EXTRACTIVE PROJECTS IMPACTS TO PHYSICAL CAPITAL

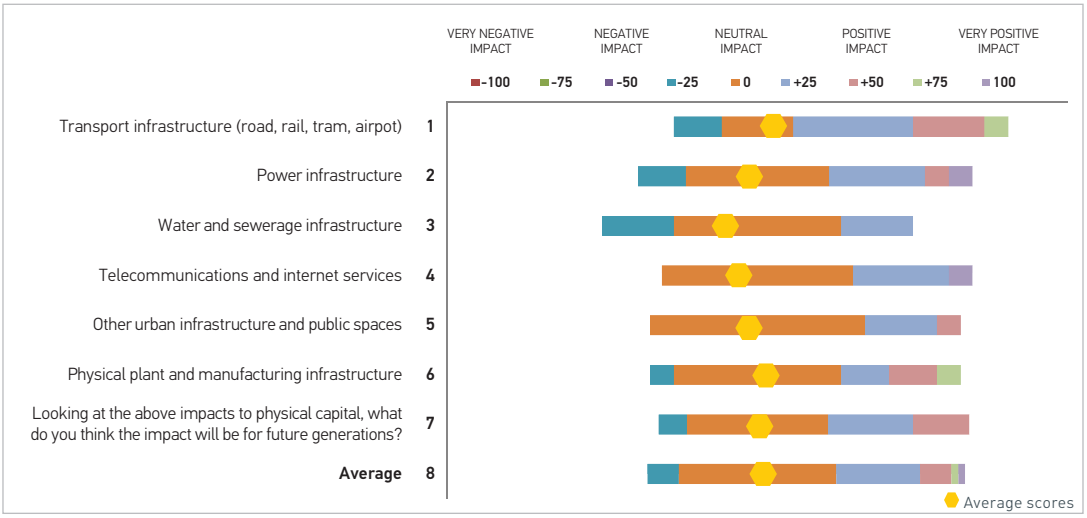


FIGURE F.7 EXTRACTIVE PROJECTS IMPACTS TO HUMAN CAPITAL

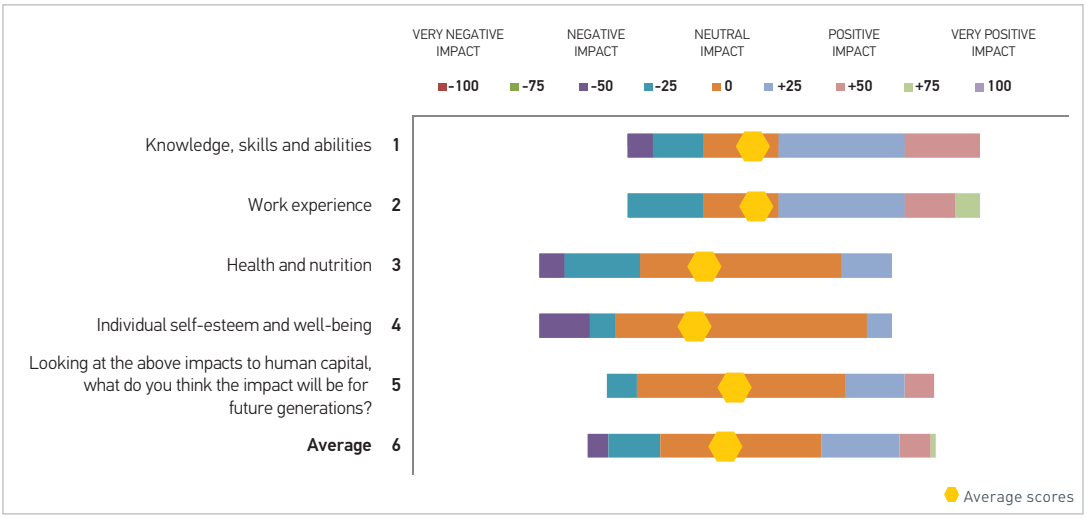
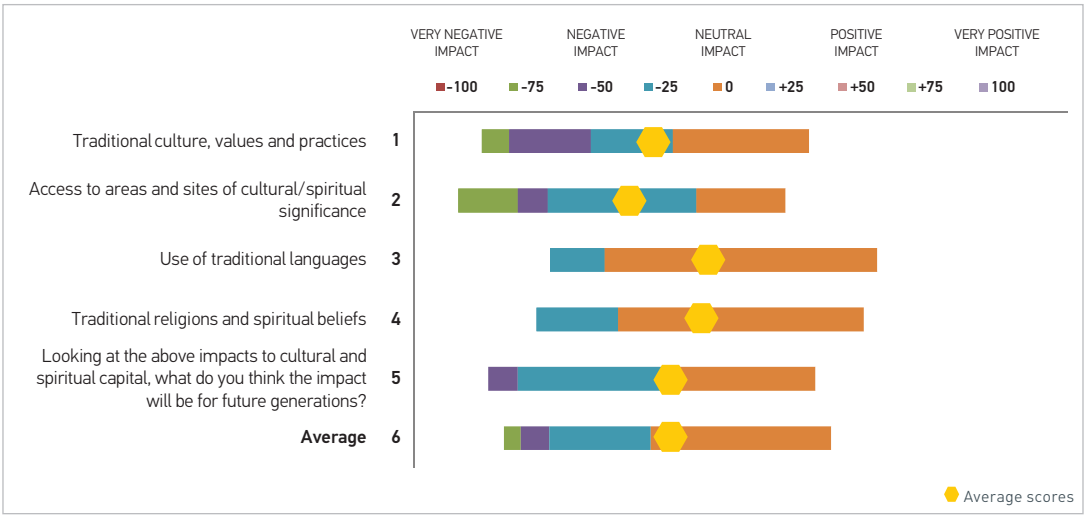


FIGURE F.8 EXTRACTIVE PROJECTS IMPACTS TO CULTURAL & SPIRITUAL CAPITAL



06. //
Physical Capital

Physical capital is the stock of equipment, physical plant, infrastructure, and other productive resources owned by individuals, industry, or a nation, as well as the management systems needed to make them work.

As shown in Figure F.6, Impacts to physical capital from extractive projects were generally viewed as being neutral or positive, with the lowest rating recorded for water and sewerage infrastructure.

07. //
Human Capital

Human capital is the levels of knowledge and skill, informal and formal education, and the health and nutrition of individuals, as well as their motivation and aptitude.

As shown in Figure F.7, perceptions of the likely impact to human capital indicators were on average neutral or positive, with slightly lower ratings recorded for health and nutrition and individual self-esteem and wellbeing.

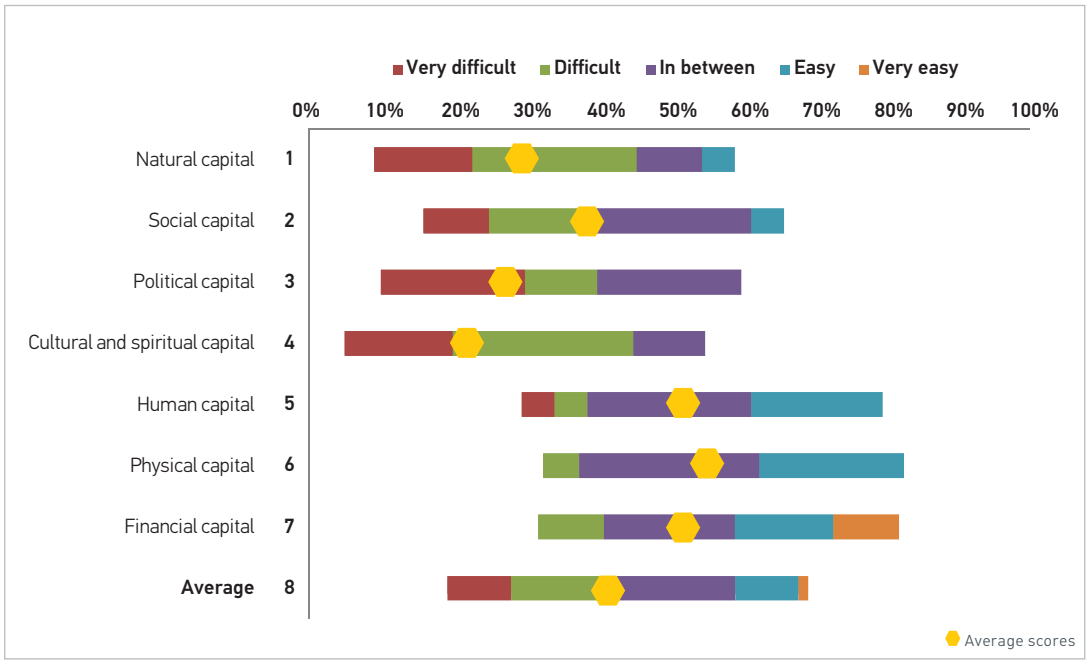


FIGURE F.9 HOW DIFFICULT OR EASY IS IT TO MEASURE CAPITALS?

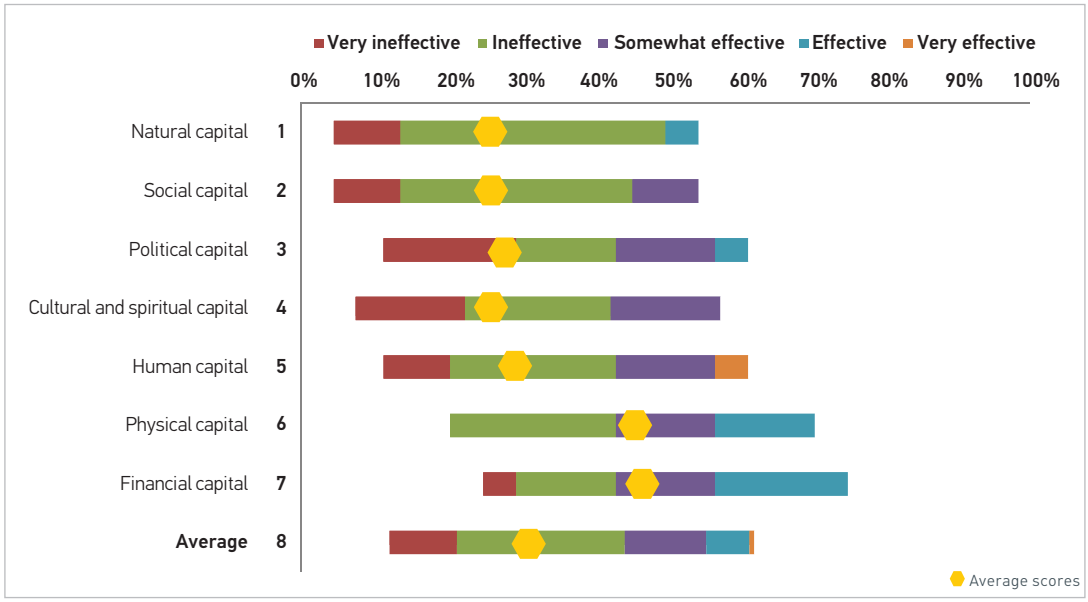
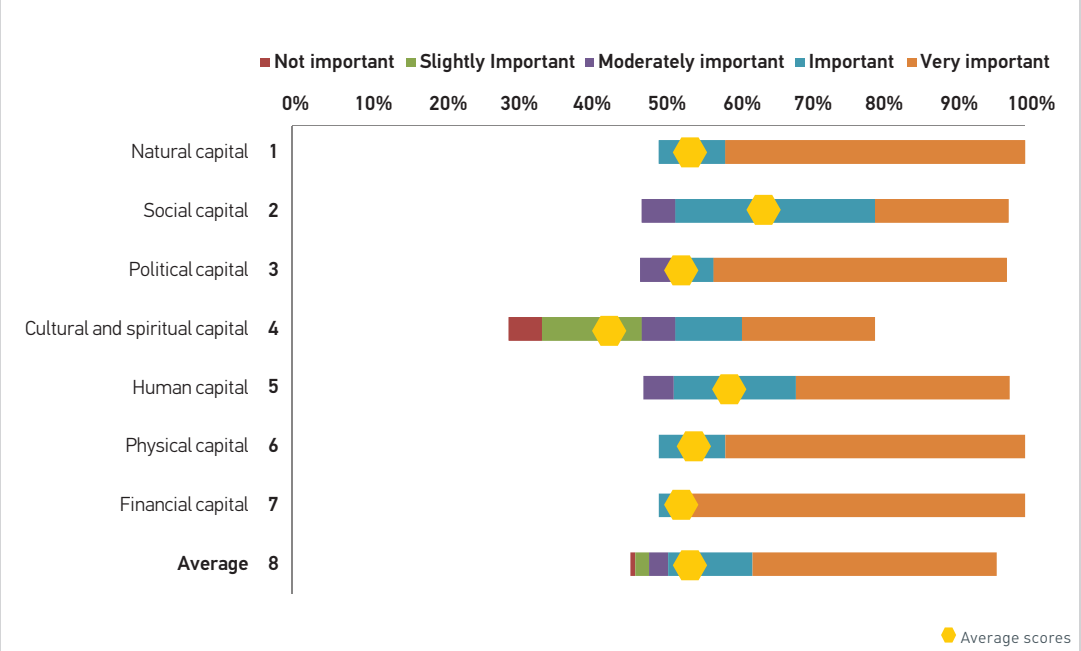


FIGURE F.10 HOW EFFECTIVELY ARE CAPITALS BEING MEASURED?

FIGURE F.11
HOW IMPORTANT IS IT TO MEASURE DIFFERENT CAPITALS



08. // Cultural and Spiritual Capital

Finally, cultural and spiritual capital refers to the way people know the world and their place in it; the extent to which local culture, values, traditions, language and religion promote or hinder wellbeing, social inclusion and social development.

A net negative impact was expected for all indicators of cultural and spiritual capital.

09. // Measurement of Capitals

The effectiveness of current measurement of non-fiscal impacts in the extractive sectors was also assessed.

As displayed in Figure F.9, respondents felt that financial capital, human capital and physical capital were less difficult to measure than social capital, natural capital, political capital and cultural and physical capital.

As displayed in Figure F.10, respondents felt that financial capital and physical capital were being measured somewhat effectively. In contrast, natural capital, social capital, physical capital, cultural and spiritual capital, and human capital was, on average, perceived to be measured ineffectively.

As shown in Figure F.11, all capitals were viewed as equally important to measure, with the exception of cultural and spiritual capital which was, relatively speaking, considered less important to measure.

10. // Government effectiveness and legislative instruments

As shown in Figures F.12 and F.13, government agencies were viewed as being ineffective when taking into account non-fiscal impacts for existing and new projects.

As shown in Figure F.14, legislative instruments were also viewed as being largely ineffective when it comes to the measurement of non-fiscal impacts.

11. // Stakeholder Capacity

As shown in Figure F.15, multilaterals and civil society organisations (**CSOs**) are viewed as more effective in taking non-fiscal impacts into account for existing and new projects, compared with local communities, extractive companies and governments and regulators.

There was also a perception that extractive companies, consultants and academia have greater capacity to directly assess, review and comprehend non-fiscal impacts, compared to CSOs, state governments, local communities and local government, who were viewed to have the least capacity (see Figure 16).

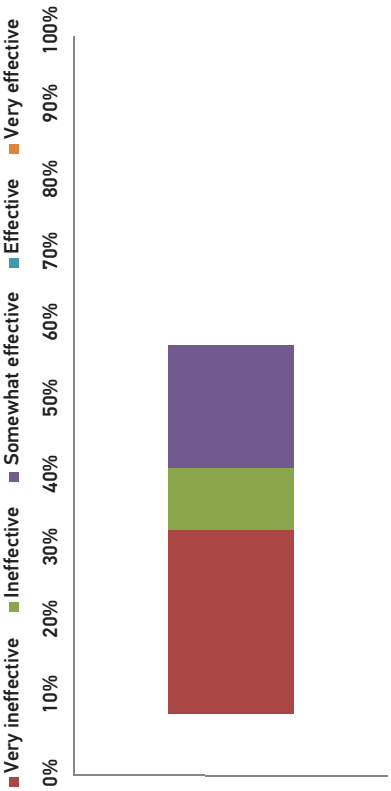


FIGURE F.12
GOVERNMENT AGENCY EFFECTIVENESS ASSESSING NON-FISCAL IMPACTS

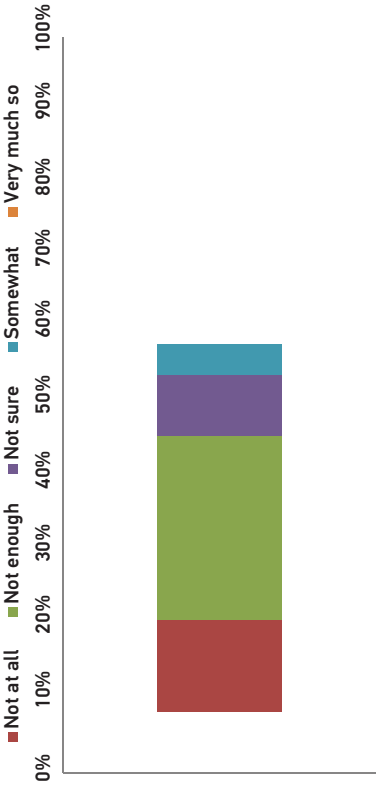


FIGURE F.13
GOVERNMENT AGENCY NON-FISCAL IMPACTS: NEW PROJECTS

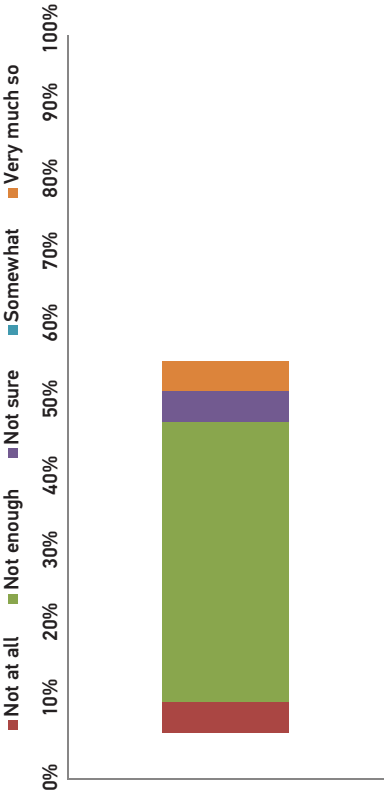


FIGURE F.14
LEGISLATIVE INSTRUMENTS INCORPORATE NON-FISCAL IMPACTS

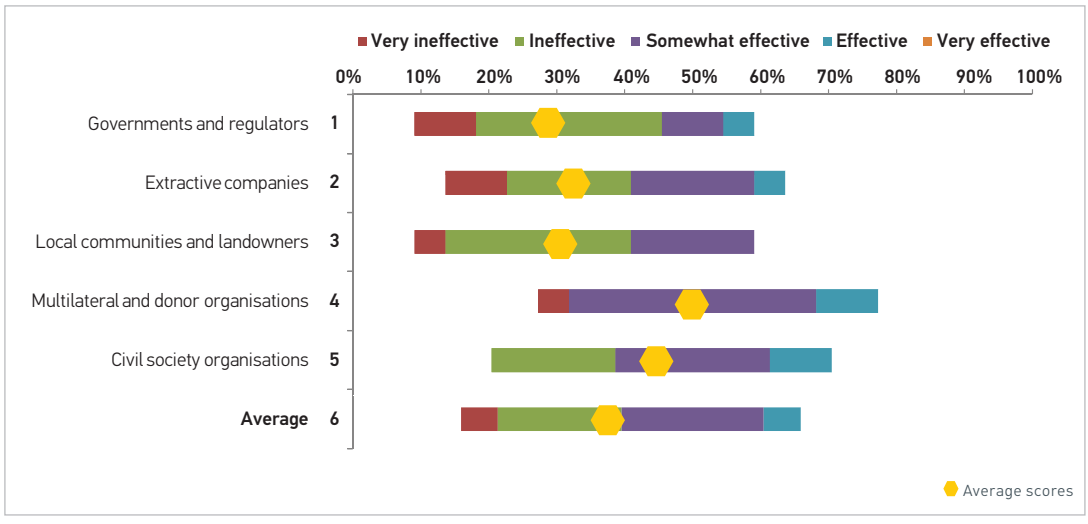


FIGURE F.15
STAKEHOLDER EFFECTIVENESS ASSESSING IMPACTS

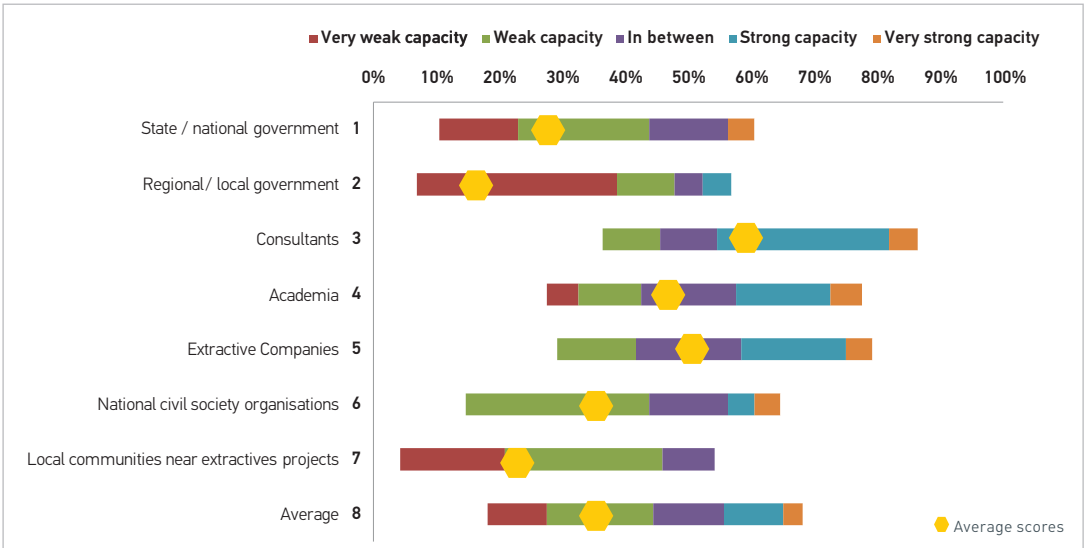


FIGURE F.16 STAKEHOLDER CAPACITY TO DIRECTLY ASSESS

12. // Summary of Priorities for NRGI Countries

In summary, therefore, the questionnaire for NRGI countries revealed the following priorities when measuring non-fiscal impacts:

- Net positive impacts were expected for financial capital, physical capital and human capital indicators, whereas net negative impacts were expected for natural capital, political capital, social capital and cultural and spiritual capital indicators. All capitals should be measured in NRGI countries so that both the positive and negative impacts of extraction are brought into public view.
- For natural capital, the impacts to water were rated slightly more negatively than other forms of impacts, as were the impacts on future generations. Particular attention should be given to these impacts during the measurement process.
- For social capital, 'trust and goodwill' was seen as likely to be negatively impacted by extractive projects. Therefore, particular attention should be given to measuring and managing stakeholder relations throughout the extractive process, and indeed throughout the measurement process.
- For political capital, governance practices around transparency were expected to be positively impacted by the extractive sector—particular attention should be given to measurement of extractive governance and perhaps its impacts on broader governance and transparency efforts. In comparison, negative impacts were expected to arise for corruption, management of land rights issues, professionalism of police and security forces, and concentration levels of power—attention should also be given to measuring these impacts.
- For financial capital, 'savings and investments for future generations' and 'direct income, rental payments, equity or investment dividends to landowners' received comparatively negative responses. These impacts can be prioritised in the measurement of financial capital impacts.
- For built capital, impacts were generally seen as being neutral or positive, with the lowest rating recorded for water and sewerage infrastructure (similar to the emphasis on water in natural capital assessments).
- For human capital, perceptions were neutral or positive, with slightly lower ratings recorded for health and nutrition and individual self-esteem and wellbeing. Health impact assessments are becoming increasingly common for extractive projects; it is important to ensure that these are standardised and include wellbeing assessments.
- Finally, a net negative impact was expected for all indicators of cultural and spiritual capital. These should be measured with particular sensitivity in NRGI countries through indexes, qualitative measurements or visual representations.

PART I +

APPENDIX C: NON-FISCAL TOOLS

NON-FISCAL TOOLS

APPENDIX C

AIR, CLIMATE OR GHG TOOL 1:
GREENHOUSE GAS PROTOCOL

GREENHOUSE GAS PROTOCOL

NATURAL CAPITAL TOOL

Overview

The GHG Protocol provides standards and guidance for companies and other organizations preparing a GHG emissions inventory. It was designed with the following objectives in mind:

- To simplify and reduce the costs of compiling a GHG inventory
- To provide business with information that can be used to build an effective strategy to manage and reduce GHG emissions
- To increase consistency and transparency in GHG accounting and reporting among various companies and GHG programs

http://www.ghgprotocol.org/standards/corporate-standard

Intended Client

Industry

Level of Analysis

Industry, site

Projection/Actual

Project or actual

Impact Type

GHG Emissions

Complexity

Low Complexity

Cost

Free to Download

Comparability

Highly comparable (i.e. across companies/ countries etc)

Training Available

Yes; Webinar - USD $475

DEVELOPER: WORLD RESOURCES INSTITUTE & WORLD BUSINESS COUNCIL ON SUSTAINABLE DEVELOPMENT

SUPPORTERS: ALCOA FOUNDATION, ANGLO AMERICAN, ASIA PACIFIC PARTNERSHIP, ARTHUR LEE, BAXTER INTERNATIONAL, THE BRITISH EMBASSY, BRITISH FOREIGN & COMMONWEALTH OFFICE, INTERNATIONAL CLIMATE INITIATIVE, BUNDESMINISTERIUM FÜR UMWELT, NATURSCHUTZ UND REAKTORSICHERHEIT (BMU), C40 CITIES CLIMATE LEADERSHIP GROUP, CATERPILLAR FOUNDATION, CHARLES STEWART MOTT FOUNDATION, CHEVRON CORPORATION, CHINA BUSINESS COUNCIL FOR SUSTAINABLE DEVELOPMENT, CLIMATE AND LAND USE ALLIANCE, DELL INC., DET NORSKE VERITAS, DOW CHEMICAL COMPANY, DUPONT, EMC CORPORATION, ENERGY FOUNDATION, ENVIRONMENT CANADA, FORD, GENERAL MOTORS, G.E. FOUNDATION, HEWLETT FOUNDATION, ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY, INTERNATIONAL PAPER, INTEL CORPORATION, JOHN D. AND CATHERINE T. MACARTHUR FOUNDATION, KIMBERLY CLARK FOUNDATION, LAFARGE, LAWRENCE BERKELEY NATIONAL LABORATORY, MICROSOFT, MINISTRY OF FOREIGN AFFAIRS OF THE NETHERLANDS, NATURAL RESOURCE CANADA, NORSK HYDRO, ONTARIO POWER GENERATION, PEPSICO, PETRO CANADA, POWERGEN, PRICEWATERHOUSECOOPERS, ROBERTSON FOUNDATION, S.C. JOHNSON FOUNDATION, SGS, SHELL, SIEMENS, SPENCER T. AND ANN W. OLIN FOUNDATION, STATOIL, STEPHEN M. ROSS PHILANTHROPIES, STMICROELECTRONICS, SULZER, SUNCOR, SWISS RE, TEXACO, TOKYO ELECTRIC POWER COMPANY, TOYOTA, TRANSALTA, U.K. DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS, UN-HABITAT, UNILEVER, UPS FOUNDATION, URBAN-LEDS (EUROPEAN UNION), U.S. ENVIRONMENTAL PROTECTION AGENCY, U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT, UNITED TECHNOLOGIES CORPORATION, VOLKSWAGEN, WALLACE GLOBAL FUND,

USERS: BP (USA); NORSK HYDRO (NORWAY); SHELL (CANADA); ANGLO AMERICAN (UK); ALCOA (AUSTRALIA); BHP BILLITON (AUSTRALIA); RIO TINTO (UK)

Adaptability

Currently used by extractive industry

Extractive Company Use: BP (USA); Norsk Hydro (Norway); Shell (Canada); Anglo American (UK); Alcoa (Australia); BHP Billiton (Australia); Rio Tinto (UK)

Data Inputs Required: Consumption or predicted consumption data (i.e. kilowatt hours, kilolitres of diesel, gigajoules of natural gas etc)

Method of Quantification

Quantitative, tCO2e

Step 1 – Define project/industry boundary

Choose one approach:

- Operational: elements that your company has operational control over
- Financial: elements that your business financially controls
- Equity: elements that your company owns

Step 2 – Decide which emissions will be included under scope

- Scope 1: Direct (i.e. diesel consumption)
- Scope 2: Indirect (purchased electricity)
- Scope 3: Indirect (supply chain)

Step 3 – Define period

- Financial or calendar year

Step 4 – Collect data

- I.e. electricity, diesel, gas etc

Step 5 – Calculate footprint

- Use relevant national emission factors or source from reputable sources (i.e. International Energy Agency)

Rating System

Popularity	★ ★ ★
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

- Widely used
- Generally accepted as international GHG accounting standard

WEAKNESSES

- Sole focus on GHG emissions
- Lag indicator/measure
- Does not assign a monetary value
- Time intensive, collecting and collating data into useable formats and engaging with relevant data providers.

BIODIVERSITY TOOL 1:
INTEGRATED BIODIVERSITY ASSESSMENT TOOL (IBAT)

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Site

Projection/Actual
Actual

Impact Type
Biodiversity

Complexity
Low

Cost
Revenue >USD$1billion $USD35,000 p.a. (subscription for full access)

Revenue <USD$1billion $USD2,950 (fee for each title of data - approximately 2,600 km^2)

Revenue <USD$1billion $USD750 (provides a single report, detailing protected areas and key biodiversity areas within 50 km of a given location)

Comparability
Highly

Overview

The Integrated Biodiversity Assessment Tool (IBAT) provides basic risk screening on biodiversity. IBAT is a central database for globally recognized biodiversity information including Key Biodiversity Areas and Legally Protected Areas. Through an interactive mapping tool, decision-makers are able to easily access and use this up-to-date information to identify biodiversity risks and opportunities within a project boundary. Exportable maps make it easy for users to quickly share biodiversity assessment results, while downloadable data sets enable your business to conduct additional in-house analysis.

https://www.ibatforbusiness.org/

DEVELOPER: INTERNATIONAL UNION FOR CONSERVATION OF NATURE, CONSERVATION INTERNATIONAL, BIRDLIFE INTERNATIONAL, UNITED NATIONS WORLD CONSERVATION MONITORING CENTRE

SUPPORTERS: BIRDLIFE INTERNATIONAL, CONSERVATION INTERNATIONAL, INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND UNITED NATIONS ENVIRONMENT PROGRAMME WORLD CONSERVATION MONITORING CENTRE.

USERS: ANGLO AMERICAN, BG GROUP, BHP BILLITON, BP, CHEVRON, CONOCOPHILLIPS, EXXONMOBIL, SHELL, RIO TINTO, NEWMONT, PETROBAS, WOODSIDE, TOTAL, ENI, BARRICK GOLD, VEDANTA, MAERSK, HESS CORPORATION, REPSOL, TULLOW OIL

Extractive Company Use: Anglo American, BG Group, BHP Billiton, BP, Chevron, ConocoPhillips, ExxonMobil, Shell, Rio Tinto, Newmont, Petrobas, Woodside, Total, Eni, Barrick Gold, Vedanta, Maersk, Hess Corporation, Repsol, Tullow Oil

Data Inputs Required: No data inputs required

Method of Quantification

- Qualitative (spatial identification of biodiverse areas)
- Provides basic risk screening on biodiversity, data is presented in spatial and tabular formats. Assessment based on information from International Union for Conservation of Nature (IUCN) knowledge products such as, Red List of Threatened Species, Key Biodiversity Areas and The World Database on Protected Areas.

Training Available

No

Adaptability

Yes

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

- Easy to use online mapping tool
- Not labor or time intensive to use
- Provides one 'source of truth' to screen for biodiversity risks
- Widely used by extractive companies

WEAKNESSES

- Desktop assessment only
- Subscription expensive

BIODIVERSITY TOOL 2:
NATURAL VALUE INITIATIVE (NVI)

NATURAL VALUE INITIATIVE

NATURAL CAPITAL TOOL

Intended Client

Industry

Level of Analysis

Site

Projection/Actual

Actual

Impact Type

Biodiversity

Overview

The Natural Value Initiative (NVI) aims to help financial institutions better understand and address the biodiversity impacts and associated risks of the financial services they provide. The NVI has created the Ecosystem Services Benchmark Toolkit to enable asset managers to better understand the impacts and dependency of their investments on biodiversity and ecosystem services.

The Ecosystem Services Benchmark (ESB) was conducted from September 2008 to March 2009 based on publicly available information (company websites, sustainability/ environmental reports, annual reports, and media searches). 1 (poor performance) to 4 (best practice).

http://www.naturalvalueinitiative.org/

DEVELOPER: FAUNA & FLORA INTERNATIONAL (FFI) LEAD A PARTNERSHIP WHICH INCLUDED THE UNITED NATIONS ENVIRONMENT PROGRAMME FINANCE INITIATIVE (UNEP FI)

Extractive Company Use: None identified

Data Inputs Required: Responses to questions in the Ecosystems Services Benchmark Spreadsheet

Complexity

Low

Cost

Free

Comparability

Medium (subjective nature of responses)

Training Available

No

Adaptability

Toolkit available for mining and oil and gas sectors

Method of Quantification

- Qualitative (benchmark) by external panel.
- The benchmark evaluates company performance against specific criteria (i.e. Policy and strategy, governance, management and implementation). For each criterion companies are rated (1-4) on their performance. The scores are then benchmarked on a cross sectoral, sectoral, and company level.
- The ESB considers five interdependent categories of performance (see figure 1) : Competitive advantage, Governance, Policy and strategy, Management and implementation, and Reporting. It assigns levels of performance ranging from

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ☆
Extractives Potential	★ ☆ ☆

STRENGTHS

- Allows for peer comparison
- Provides a basis for gap analysis and identifies areas for improvement

WEAKNESSES

- Open to subjectivity
- Analysis relies heavily on publicly available information
- Can be resource intensive from a research perspective

BIODIVERSITY TOOL 3:
DATA BASIN

DATA BASIN

NATURAL CAPITAL TOOL

Intended Client
Government, NGOs

Level of Analysis
Regional, site

Projection/Actual
Projection

Impact Type
Biodiversity

Complexity
Low

Cost
Free

Comparability
High

Training Available
Yes

Adaptability
Specific applications have been developed to support environmental risk assessments in the extraction sector

Overview

Data Basin is an on-line information platform that empowers users to apply spatial datasets and analytical tools to address conservation challenges. Individuals and organizations can explore and download a vast library of datasets, upload their own data, create complete conservation analyses and publish maps.

https://databasin.org/

DEVELOPER: CONSERVATION BIOLOGY INSTITUTE

SUPPORTERS: THE WILBURFORCE FOUNDATION, KRESGE FOUNDATION.

USERS: OVER 17000 SCIENTISTS, NATURAL RESOURCE PRACTITIONERS, STUDENTS & EDUCATORS, AND INTERESTED CITIZENS FROM DIVERSE SECTORS AND GEOGRAPHIES.

Extractive Company Use: None identified

Data Inputs Required: Data sets provided by data basin. User has choice to upload their own spatial data.

Method of Quantification

» Qualitative - full-screen mapping allows for analysis of geospatial conservation data; collaborate with colleagues; and custom summary reports of your user-defined data

Rating System

Popularity	★★☆
Quality	★★☆
Extractives Potential	★★☆

STRENGTHS

» Datasets can be brought together to create customized maps – visual tool
» Specific applications have been developed to support environmental risk assessments in the extraction sector
» Useful tool for screening process

WEAKNESSES

» Single focus – spatial tool/analysis only
» Can be time intensive if own datasets used

BIODIVERSITY TOOL 4:
INTEGRAL BIODIVERSITY IMPACT ASSESSMENT SYSTEM (IBIS)

NATURAL CAPITAL TOOL

Intended Client

Industry

Level of Analysis

Products

Projection/Actual

Projection

Impact Type

Biodiversity

Complexity

Low complexity

Cost

Free to download

Comparability

Highly comparable

Training Available

No

Adaptability

Generally inappropriate for extractives.

Overview

The Integral Biodiversity Impact Assessment System (IBIS) is a risk-screening method(based on decision-trees and scoring systems) used to predict the impact of products on biodiversity. Its objective is to provide a method for procurement officers, marketers and those involved in production processes to incorporate biodiversity-aspects into their decision making process. The goal of IBIS is to:

- Make it possible to compare biodiversity impact of products;
- Indicate whether the biodiversity of a product is acceptable;
- Assess overall issues related to biodiversity and either improve the production process or take other mitigation actions accordingly.

http://www.crem.nl/files/upload/documents/downloads/file/IBIS_Methodology_report_98_309.pdf

DEVELOPER: CONSULTANCY AND RESEARCH FOR ENVIRONMENTAL MANAGEMENT (CREM) IN THE NETHERLANDS, IN COLLABORATION WITH THE NETHERLANDS COMMITTEE FOR THE INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (NC-IUCN), THE CENTRAL LUZON STATE UNIVERSITY IN THE PHILIPPINES AND AMBIO FUNDACION IN COSTA RICA.

Extractive Company Use: No cases identified

Data Inputs Required: Knowledge and understanding of company process, products/services impacts on biodiversity. Data will help inform responses, but is not mandatory.

Method of Quantification

- Quantitative and qualitative
- Four-step process where impacts are expressed on a scale from high negative to high positive. Scores are given for each category. Negative impacts are assessed first, then positive impacts as a correction factor.

Step 1 - Assessment of red light

- Quickly determine if an impact is unacceptable (e.g. extreme land conversion).

Step 2 - Assessment of score per impact parameter

- Scores on several biodiversity impact parameters are determined.

Step 3 - Assessment of overall negative and positive impact

» The importance of each parameter is determined by granting weighting factors to the indicators based on the importance of the parameters with regard to biodiversity.

Step 4 - Assessment of overall impact

» Negative impacts are weighted against corresponding positive impacts.

Rating System

STRENGTHS

» The method is simple and straightforward.

» Easy to understand even by people outside of the industry.

» Each company can determine what category of biodiversity impact is considered acceptable.

WEAKNESSES

» The system was designed for harvested and cultivated products (e.g. crops, fish, forestry products, etc.) and may not be appropriate for the extractives industry.

» The scoring system is overly simplistic, subjective, and imprecise. For example, the user is asked to rate the extent of habitat destruction a scale of 1 (no impact) to 4 (high impacts).

» The user must already have a strong understanding of the impacts of their products on biodiversity, rendering the method nearly obsolete.

The downloadable guide is from the year 2000 and does not seem to have been updated since.

BIODIVERSITY TOOL 5:
NORMATIVE BIODIVERSITY METRIC

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Various geographical units

Projection/Actual
Projection

Impact Type
Biodiversity

Complexity
Medium to High complexity

Cost
Free to download

Comparability
Highly comparable

Training Available
No

Adaptability
Can be used for extractives. The site The site contains a worked example of the Normative Biodiversity Metric for a fictitious company, Precious Metals Inc. to demonstrate the process. The map layers "Inventory of owned land" and "Potential mine/ conservation sites" contain company specific information on sites owned by Precious Metals Inc.

Overview
The Normative Biodiversity Metric methodology assesses the land a company owns by measuring ecosystem pristineness and endangered species presence. These variables give each piece of land a score. This score can be used to track the land use management performance of an organization over time. Based on this methodology, Ecometrica created the 'normative biodiversity metric' map. This map is a tool which gives an approximate indication of the biodiversity significance of different areas, combining species data with pristineness data.

https://ecometrica.com/article/normative-biodiversity-metric-map-available

DEVELOPER: ECOMETRICA

Extractive Company Use: Rio Tinto

Data Inputs Required: The coordinates of the land and various land quality characteristics prescribed in the metric's designated worksheet.

Method of Quantification
» Quantitative

Step 1 – Compile an inventory of owned land
» Compile a database of the land owned by the company in the form of mapped polygons.

Step 2 – Eco-region information
» Data on eco-regions are used to understand the meaning of pristineness in different eco-regions. An eco-region is a geographically distinct assemblage of species, natural communities, and environmental conditions.

Step 3 – Pristineness scale
» The degree of pristineness for each segment of land is scored from 0 to 5. The tool provides a default table which can be used to determine the score.

Step 4 – Classification of assessed land
» The land is disaggregated into smaller parcels which are either: a) managed under a different land management strategy/used for a different purpose; or b) with different vegetation cover. Each parcel will be classified as into the following classes: artificial, monoculture, converted, impacted, minimal use, or pristine.

Step 5 – Endangered species presence

» The presence of endangered species on the company-owned land is assessed and documented.

Step 6 – Reporting the information

» The final business NBM score is calculated after taking the weighted average of all the assessed areas.

Rating System

Popularity ★★☆

Quality ★★☆

Extractives Potential ★★☆

STRENGTHS

» Outputs allow company to better manage ecosystems impacts including taking measures to restore pristineness.

» Allows a company to track yearly progress based on baseline data.

» The 'normative biodiversity metric' map allows for rapid assessment of land areas.

» Allowing for the assessed land to be broken down into further land parcels defined by their unique characteristics.

WEAKNESSES

» Assessment is limited to pristineness and endangered species.

» Pristineness of owned land is arguably in inaccurate metric to gauge environmental performance. Especially when simply gauged on a scale from 0-5.

» The measurement of "pristineness" cannot be carried across to or compared with other ecological accounting tools and systems.

» High level of subjectivity in assigning pristineness classes.

» Its use must be partnered with Ecometrica's other software "Our Ecosystem".

» Does not take into account the indirect impacts down the supply chain.

BIODIVERSITY TOOL 6:
NatureServe VISTA

NATURAL, SOCIAL, AND CULTURAL

Intended Client
Various decision makers

Level of Analysis
Site

Projection/Actual
Projection

Impact Type
Natural, social, and cultural impact

Complexity
High Complexity

Cost
Free for academic, non-profit, and government agencies using Vista for their own organizational purposes. Commercial use is USD 2,500 plus training and support fees for first year.

Comparability
Highly comparable

Overview
NatureServe Vista is an extension to ArcGIS that supports complex assessments and planning in any environment. NatureServe Vista enables assessment of impacts on a variety of natural, cultural, and development objectives, and creates options for sites, entire landscapes and seascapes. Vista supports decision-making by providing quantitative reports and maps, and allows testing of ad hoc management scenarios. The tool combines data, expert knowledge, and stakeholder values.

http://www.natureserve.org/conservation-tools/natureserve-vista

DEVELOPER: NatureServe

SUPPORTERS: CORPORATIONS SUCH AS GOOGLE & GOLDMAN SACHS, INDIVIDUALS, NGO'S AND GOVERRNMENT AGENCIES WHO SUPPORT THE CHARITY ACTIVITIES OF NATURESERVE.

USERS: PIKES PEAK AREA COUNCIL OF GOVERNMENTS (PPACG)

Extractive Company Use: No cases identified

Data Inputs Required:

- Planning region reference information (boundaries, streams, roads, place names, topography, digital orthophotos, etc.)
- Element distribution maps (NatureServe Heritage network element occurrences, Fish and Game species habitat maps, vegetation cover maps, modelled distribution maps, scenic views, historic sites, etc.)
- Element occurrence attributes (viability, integrity, confidence)
- Element information (name, weight, goal, conservation unit, minimum required area, etc.)
- Existing land use map
- Current land use and management policy maps (zoning, public land management plans, etc).
- Various skills and expertise

Method of Quantification
- Quantitative
- *Vista provides several distinct conservation planning analyses that can be used on their own or integrated in a comprehensive assessment and planning process:*
- ***Element Conservation Value layers:*** *indicate the relative value of areas for a single element (species, ecosystem type, cultural feature, desired land use, etc.)*

Training Available

A whole range of different training products are provided:

(i) Standard training

(ii) Custom on-site training

Training options are provided here:

http://www.natureserve.org/conservation-tools/data-maps-tools/natureserve-vista/vista-training-and-support

Adaptability

Can be used by extractives

- ***Landscape Condition Modelling:*** *integrates land and aquatic condition into the element conservation value layers and scenario evaluations and investigates potential water quality changes and ecological impacts from development, other land uses, and climate change.*
- ***Conservation Value Summaries:*** *that identify areas of high conservation value in the planning region.*
- ***Scenario Maps:*** *provide maps and statistics on the distribution of combinations of land uses, management practices, and disturbances and the policy mechanisms behind them.*
- ***Scenario Evaluations:*** *calculate goal achievement or gaps, identify places where goals are being met and those places causing conflict and goal shortfalls through incompatible land use or unreliable policy mechanisms.*
- ***Site Explorations:*** examine the conservation properties of locations based on Vista Conservation Value Summaries and Scenario Evaluations. Site Explorer provides data on the land use and/or policy types for the site selection, along with detailed information on element conservation goals achieved; in addition, Site Explorer enables the user to examine the effects on goals if alternative land uses and or policies are applied.
- ***Conservation Solution:*** facilitates data exchange between Vista and external conservation solution applications, specifically MARXAN and SPOT (the Spatial Portfolio Optimization Tool).

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★☆

STRENGTHS

- Allows for scenario planning and impact comparisons.
- Incorporates stakeholder values.
- Ability to continuously take in new data and reprocess data to improve the generated outcome.
- Compatible and works well in conjunction with other tools to provide for other functions (e.g. solution optimization, ecosystem services valuation, sector-specific suitability analysis and planning, etc.).

WEAKNESSES

- Requires pre-existing, expertise, and skills.
- High data input requirements.
- Complex process (548 page user manual).
- The user still plays a major part in the method and deriving the ultimate conservation strategy.
- User is required to evaluate and decide upon which criteria need to met for distribution data to be categorised as acceptable for use.

BIODIVERSITY TOOL 7:
BIODIVERSITY ACCOUNTABILITY FRAMEWORK

NATURAL CAPITAL

Intended Client
Industry

Level of Analysis
Business operations

Projection/Actual
Projection or actual

Impact Type
Biodiversity

Complexity
High complexity

Cost
Free guide

Comparability
Medium comparability

Overview

The Biodiversity Accountability Framework an alternative, interdisciplinary method, structured to delimit the responsibility of organizations to ecosystems. In addition, it aims to inform decision makers about the interactions between business operations and biodiversity. The underlying goal is the co-viability of biodiversity and business, determining a) how can businesses use profits to diversify living systems, and b) how can biodiversity be used to increased profits?

http://www.oree.org/en/presentation-of-the-guide-biodiversity.html

DEVELOPER: Oree

Extractive Company Use: No cases identified

Data Inputs Required: Data on all operations, assets, goods, services, and monetary transactions related to biodiversity.

Method of Quantification

Quantitative and qualitative

The Biodiversity Accountability Framework consists of two inseparable parts

Part A (Ecosystem accounting for business) involves:

1) Identifying and assessing all monetary transactions related to biodiversity.
2) Integrating non-monetary inputs - outputs into the accounting process.
3) Delineating interactions between business operations and biodiversity.

Part B (Ecosystem accounting for the relationships between businesses) involves:

1) *Extending the ecosystem accounting for business to all economic agents from the owners, managers and exploiters of land and sea ecosystems to shareholders.*
2) *Evaluating the costs of the management and restoration of ecosystems to be imputed to the business's active involvement of businesses in ecosystem accounting.*

Training Available

Working groups available

Adaptability

Can be used by extractives

Rating System

Popularity ★ ☆ ☆

Quality ★ ☆ ☆

Extractives Potential ★ ★ ☆

STRENGTHS

- Helps businesses understand the complexities of the interactions between their operations and biodiversity.
- Allows for collaboration with other organizations.
- Addresses the impacts of biodiversity on business, as well as the other way around.
- Robust guide with lots of background information.
- Addresses all business operations.

WEAKNESSES

- Requires the skills and knowledge to assess complex relationships between operations and biodiversity.
- Input and labour intensive.
- More user friendly and time efficient biodiversity tools available.
- Guidance is poorly written and organized.

BIODIVERSITY TOOL 8: LIFE METHODOLOGY

NATURAL CAPITAL TOOL

Intended Client

Various decision makers

Level of Analysis

Business operations

Projection/Actual

Projection or actual

Impact Type

Biodiversity

Overview

The LIFE Methodology helps businesses develop effective biodiversity conservation measures. The self-assessment methodology guides the evaluation of a company's impacts on biodiversity as well as mitigation and/or compensation measures through an collection biodiversity conservation actions. The methodology was developed to assess companies for LIFE Certification, but can also be useful for self-assessment purposes.

http://institutolife.org/en/
http://wbcsdpublications.org/project/eco4biz-ecosystem-services-and-biodiversity-tools-to-support-business-decision-making/
http://institutolife.org/wp-content/uploads/2014/09/InstitutoLIFE-EN.pdf

DEVELOPER: INSTITUTE OF LIFE

SUPPORTERS: PETROBRAS, FUNDACAO GRUPO BOTICARIO,

USERS: N/A

Extractive Company Use: MPX Energia SAPETROBRAS

Complexity

High complexity

Cost

Methodology is free. Certification costs unknown.

Comparability

High comparability

Training Available

Third-party certification assessments

Adaptability

Currently used my extractives companies

Data Inputs Required: Data on waste generation, GHG emissions, water usage, energy consumption, area occupation, business operations, and policy.

Method of Quantification

- Quantitative: meeting minimum performance standards and measuring metrics related to the effectiveness of conservation actions.
- Qualitative: the inclusion of biodiversity in environmental management.

The method is usually applied during a third part verification process (but can be used for self-assessment) based on four steps:

STEP 01:

- Verification of compliance with LIFE Certification Standards

STEP 02:

- Calculation of Biodiversity Estimated Impact Value (BEIV)

STEP 03:

- Definition of the minimum performance in Biodiversity Conservation Actions (BCA minimum)

STEP 04:

- Assessment of the effectiveness of BCA

Rating System

Popularity ★★☆

Quality ★★☆

Extractives Potential ★★★

STRENGTHS

- Identifies priority biodiversity measures.
- Combines minimum standards and general performance quantification.
- Interesting concept of Biodiversity Estimated Impact Value (BIEV).
- Can be conducted by a trained professional. (i.e. for a price, it can be conducted for you by an expert, however, it could be difficult to implement on your own).
- The third-party certification option could have marketing value.

WEAKNESSES

- Generally designed to be conducted by their internal auditors. Self-assessment is prone to inaccuracy and poor quality.
- Many documents only available in Portuguese. Seems obscure outside of Brazil.

BIODIVERSITY TOOL 9:
BUSINESS AND BIODIVERSITY INTERDEPENDENCE INDICATOR (BBII)

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Business operations

Projection/Actual
Projection or actual

Impact Type
Biodiversity

Complexity
Medium complexity

Cost
Free

Comparability
High comparability

Training Available
Working groups available

Adaptability
Can be used by extractives

Overview

The Business and Biodiversity Interdependence Indicator (BBII) is a self-assessment based guide with the aim of integrating biodiversity into corporate strategies and determining interactions between business and ecosystems. The BBII is a component of the Biodiversity Accountability Framework.

http://www.oree.org/en/bbii-indicator.html

DEVELOPER: ORÉE WORKING GROUP WITH HELP FROM THE MASTER'S PROGRAMME IN ENVIRONMENTAL SCIENCE AND

Extractive Company Use: None identified

Data Inputs Required: Data and intricate knowledge of the business's operations and impacts on biodiversity (e.g. Percentage of raw materials derived from living systems, Cost of raw materials derived from biodiversity as a fraction of the total production cost, etc.).

Method of Quantification

23 criteria were selected for the creation of the BBII,designed to characterise the interactions between biodiversity and the business. The 23 indicators are organized into five categories:

1) Criteria directly related to living systems
   a) dependence on raw materials
   b) dependence on services and technologies derived from living systems
   c) management of the variability, health and complexity of ecosystems
2) Criteria related to current markets
   a) dependence of company profits on biodiversity
3) Criteria related to impacts on biodiversity
   a) impacts of company operations on living systems
4) Criteria related to compensatory measures
   a) offset measures
5) Criteria related to business strategies
   a) the company's strategic positioning

Data will be collected and management guidance provided based on these 23 indicators.

Rating System

Popularity	★☆☆
Quality	★☆☆
Extractives Potential	★★☆

STRENGTHS

- Tested (and feedback given) by 24 companies and 4 local governments.
- Well thought out and well organised indicators
- Fits in with the Biodiversity Accountability Framework, but can be used independently
- Core indicators make for high comparability
- Helps businesses understand the complexities of the interactions between their operations and biodiversity.

WEAKNESSES

- Self-assessment is prone to inaccuracy and poor quality.
- Requires intricate knowledge of business operations.

WATER – CONSUMPTION OR POLLUTION TOOL 1:
GLOBAL WATER TOOL

NATURAL CAPITAL TOOL

Intended Client

Industry

Level of Analysis

Country, Site

Projection/Actual

Projection or actual

Impact Type

Water consumption

Complexity

Low complexity

Cost

Free to Download

Comparability

Highly comparable

Training Available

No

Adaptability

Currently used by extractive industry. Specific tool available for oil and gas.

Overview

The Global Water Tool tracks infows and outflows of project or activity and helps corporations to identify and manage water risks and opportunities. It includes a workbook (data input, inventory by site, key reporting indicators, metrics calculations), a mapping function to plot sites with datasets, and Google Earth interface for spatial viewing. Provides information on a country and watershed basis, including sub-basin data.

http://old.wbcsd.org/work-program/sector-projects/water/global-water-tool.aspx

DEVELOPER: WORLD BUSINESS COUNCIL ON SUSTAINABLE DEVELOPMENT

SUPPORTERS: WORLD RESOURCES INSTITUTE, GLOBAL REPORTING INITIATIVE, BASF, DSM, DUPONT, EDF, GDF SUEZ, ITALCEMENTI, PEPSICO AND SHELL, IPIECA, CDP, DOW JONES SUSTAINABILITY INITIATIVE, GEMI, FOOD AND AGRICULTURE ORGANIZATION OF THE UN'S AQUASTAT, WORLD HEALTH ORGANIZATION & UNICEF JOINT MONITORING PROGRAMME, UNITED NATIONS POPULATION DIVISION, INTERNATIONAL WATER MANAGEMENT INSTITUTE AND CONSERVATION INTERNATIONAL

USERS: ACCENTURE, BASF, BAYER, BOREALIS, THE COCA COLA COMPANY, DOW, DSM, DU PONT, EDF, GDF SUEZ, GE, GREIF, HOLCIM, IBM, ITT, KEMIRA, KIMBERLY-CLARK, KPMG, PEPSICO, PWC, RIO TINTO, SHELL, SCHNIEDER ELECTRIC, SIEMENS, SUNCOR, SWAROVSKI, UNILEVER, UNITED TECHNOLOGIES, VEOLIA

Extractive Company Use: Anglo American, Rio Tinto, Shell, and Alcoa on Advisory Board for tool development

Data Inputs Required: Geographic location, hydrocarbon type, water withdrawals (m^3/yr) water discharge (m^3/yr), recycled water (m^3/yr)

Method of Quantification

» Quantitative (i.e. Freshwater withdrawal – m^3/yr) & Qualitative (i.e. risk categorisation – extremely high water stress)

» Enter relevant geographic and water consumption data (m^3/yr) and simply follow instructions to get the tool to calculate relevant outputs.

Rating System

Popularity	★ ★ ★
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

- Provides assessment of water resource to inform decision making
- Specific tool developed for oil & gas industry
- Easy to use, not time or labor intensive

WEAKNESSES

- Non-monetary
- Focus on single impact

WATER – CONSUMPTION OR POLLUTION TOOL 2:
WATER ACCOUNTING FRAMEWORK

NATURAL CAPITAL

Intended Client

Industry

Level of Analysis

Site

Projection/Actual

Actual

Impact Type

Water consumption

Overview

The Minerals Council of Australia (MCA) developed the Water Accounting Framework (WAF) for the Minerals Industry to help manage the dual roles of water as both a value producing asset and a shared natural resource. The WAF allows users to account for, report on and compare site water management practices for specific project sites. It was designed to align with the Global Reporting Initiative (GRI) and Australian Water Accounting Standard (AWAS) frameworks.

http://www.minerals.org.au/file_upload/files/resources/water_accounting/WAF_UserGuide_v1.2.pdf

DEVELOPER: THE MINERALS COUNCIL OF AUSTRALIA

SUPPORTERS: THE MINERALS COUNCIL OF AUSTRALIA

USERS: ADANI MINING, ANGLOGOLD ASHANTI AUSTRALIA LTD, ARAFURA RESOURCES LTD, AREVA RESOURCES AUSTRALIA PTY LTD, BHP BILLITON LTD, BOSS RESOURCES LIMITED, CALEDON COAL PTY LTD, CAMECO AUSTRALIA LTD, CASTLEMAINE GOLDFIELDS LIMITED, CAULDRON ENERGY LIMITED, CENTENNIAL COAL COMPANY LTD, DART MINING NL, DEEP YELLOW LIMITED, DONALD MINERAL SANDS (ASTRON LTD), DOWNER EDI MINING PTY LTD, ENERGY

Complexity

High complexity

Cost

Free

Comparability

Highly comparable

Training Available

Training on application can be provided on a company specific or general basis.

Adaptability

Already tailored specifically to the Australian Minerals Industry

METALS LIMITED, ENERGY RESOURCES OF AUSTRALIA LTD, ENERGYAUSTRALIA, ENGIE, GBM RESOURCES LTD, GLENCORE, HEATHGATE RESOURCES PTY LTD, IDEMITSU AUSTRALIA RESOURCES PTY LTD, IGNITE ENERGY RESOURCES PTY LTD, JELLINBAH GROUP PTY LTD, KALBAR RESOURCES LTD, KIRKLAND LAKE GOLD, MANDALAY RESOURCES, MANHATTAN CORPORATION LIMITED, MANTLE MINING, MECRUS RESOURCES PTY LTD, MMG LIMITED, NAVARRE MINERALS LIMITED, NEW HOPE CORPORATION LTD, NEWCREST MINING LTD, NEWMONT AUSTRALIA PTY LTD, PEABODY ENERGY AUSTRALIA PTY LTD, PROVIDENCE GOLD & MINERALS PTY LTD, REX MINERALS LTD, RIO TINTO, ST BARBARA LTD, TELLUS HOLDINGS LTD, THE BLOOMFIELD GROUP, THIESS PTY LTD, TORO ENERGY LIMITED, VIMY RESOURCES LIMITED, VISTA GOLD, WESFARMERS RESOURCES LTD, WHITEHAVEN COAL LIMITED

Extractive Company Use: "To promote communication and transparency of minerals industry water use, MCA member Companies are asked to use the water accounting framework to meet their annual public water reporting needs at an aggregated company level". A list of member Companies can be found here: http://www.minerals.org.au/mca/mca_member_companies

Data Inputs Required: System boundary description, water resource data, water infrastructure data, water resource management instruments (e.g. policies and regulations), water management bodies (e.g. state water departments, climate conditions, systematic water inputs and outputs, allocations and restrictions, and trading activity.

Method of Quantification

Quantitative (i.e. Freshwater withdrawal – m^3/yr) &

Because this is a framework rather than a tool, the results are created usually through a combination of model results and manual calculations conducted by the user.

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

- Consistent across companies and operations
- Recognized by industry leaders
- Robust methodology, flexible implementation
- Compatible with other frameworks
- Includes human rights and social focus

WEAKNESSES

- It's a framework rather than a tool and therefore; time consuming, labour intensive, prone to user error.
- Focuses on a single impact area
- Specific to Australia

WATER – CONSUMPTION OR POLLUTION TOOL 3:
WaterMiner

SMI CWiMI
Centre for Water in the Minerals Industry

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Site

Projection/Actual
Projection

Impact Type
Water consumption

Complexity
Medium

Cost
Free

Comparability
Medium

Training Available
No

Adaptability
Designed for extractives

Overview

WaterMiner is a web-based tool that tracks the movement of water into, around and out of mine sites. Mine sites provide WaterMiner with a snapshot of their water system detailing where water is stored and used on site as well as its off-site source and destination. Based on this information, WaterMiner calculates, for a given time period, how much water mine sites use, re-use and recycle as well as how storage volumes change with altering climate conditions. These calculations are then used by mine site management to make strategic water management decisions.

http://cwimi.uq.edu.au/cwimi-tools
http://waterminer.smi.uq.edu.au/

DEVELOPER: CENTER FOR WATER IN THE MINERALS INDUSTRY (UNIVERSITY OF QUEENSLAND)

SUPPORTERS: THE UNIVERSITY OF QUEENSLAND

USERS: N/A

Extractive Company Use: No cases identified

Data Inputs Required: Water practices and infrastructure

Method of Quantification

» Quantitative (How much the water mine sites use, re-use and recycle, as well as how storage volumes charge with altering climate conditions).

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

» Web-based, easy to use, free tool

WEAKNESSES

» Very limited support

WATER – CONSUMPTION OR POLLUTION TOOL 4:
WATER VALUE TOOL

SMI CWiMI
Centre for Water in the Minerals Industry

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Site

Projection/Actual
Projection

Impact Type
Water consumption

Complexity
Medium

Cost
No information

Comparability
Medium

Training Available
No

Adaptability
Designed for extractives

Overview

The Water Value Tool captures and displays the risks and opportunities associated with mine sites water management practices. By using this tool mine sites can identity and quantify the effect that their water management practices have on their financial, environmental and social operations.

http://cwimi.uq.edu.au/cwimi-tools

DEVELOPER: CENTER FOR WATER IN THE MINERALS INDUSTRY (UNIVERSITY OF QUEENSLAND)

SUPPORTERS: THE UNIVERSITY OF QUEENSLAND

USERS: N/A

Extractive Company Use: No cases identified

Data Inputs Required: Mine sites water management practices

Method of Quantification

» Quantitative (the effect of water management practices on financial, environmental and social operations).

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

» n/a

WEAKNESSES

» Limited support available

WATER – CONSUMPTION OR POLLUTION TOOL 5:
KLOHN CRIPPEN BERGER

Klohn Crippen Berger

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Site

Projection/Actual
Projection

Impact Type
Water consumption

Complexity
Medium

Cost
No information

Comparability
Medium

Training Available
No

Adaptability
Designed for extractives

Overview

The true price of a product reflects the visible as well as the hidden costs of its production, so called externalities. It is defined as the sum of the retail price and the unpaid environmental and social costs, like water use and underpayment.

http://www.klohn.com/rd/technical-papers/hydrogeology-groundwater-computer-modelling-coal-mining-water-management/

DEVELOPER: KLOHN CRIPPEN BERGER

USERS: QUEENSLAND DEPARTMENT OF NATURAL

Extractive Company Use: No cases identified

Data Inputs Required: Pumping time on well yield in confined aquifers.

Method of Quantification

» Quantitative (a prediction of water production volume).

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

» Can produce statistically relevant results of prescribed scenarios to plan water handling and treatment requirements in discrete zones of operation.

» Balances numerical complexity against relative flexibility and simulation speed.

WEAKNESSES

» Still under development

» Complex and requires a specialized person to run the model.

WATER – CONSUMPTION OR POLLUTION TOOL 6:
CUMULATIVE IMPACTS ASSESSMENT

SMI CWiMI
Centre for Water in the Minerals Industry

NATURAL CAPITAL TOOL

Intended Client
n/a

Level of Analysis
n/a

Projection/Actual
n/a

Impact Type
n/a

Complexity
n/a

Cost
n/a

Comparability
n/a

Training Available
n/a

Adaptability
n/a

Overview

"The Cumulative Impacts Assessment Tool captures and displays the groundwater risks and opportunities associated adding a new project to an existing mined region."

The link to more information was not operational. There was not any more information readily available on the internet. There are two other tools created by the CWiMI: 'WaterMiner' and the Water Value Tool'.

http://cwimi.uq.edu.au/cwimi-tools

DEVELOPER: CENTRE FOR WATER IN THE MINERALS INDUSTRY (SUSTAINABLE MINERALS INSTITUTE)

SUPPORTERS: THE UNIVERSITY OF QUEENSLAND

USERS: N/A

Extractive Company Use: n/a

Data Inputs Required: n/a

Method of Quantification

n/a

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

» n/a

WEAKNESSES

» n/a

WATER – CONSUMPTION OR POLLUTION TOOL 7:
WATER FOOTPRINT ASSESSMENT TOOL

NATURAL CAPITAL TOOL

Intended Client

Companies, governments, NGOs, investors, consultants, researchers and others.

Level of Analysis

Various options for geographical scopes and sectors, river basin, project site, production step, or product supply chain.

Projection/Actual

Projection or actual

Impact Type

Water consumption

Complexity

Medium- high complexity

Cost

Free

Comparability

Highly comparable

Training Available

They offer training courses on water footprint assessment, but not necessarily the tool specifically.

Overview

The Water Footprint Assessment Tool is a free online platform providing insight into how water is appropriated for human uses and the resulting impacts.

The tool allows the user to calculate and map water footprints, assess sustainability implications and identify strategic actions for improvement. The tool allows you to complete either a geographic-based or production-based assessment. The geographic assessment allows the user to assess the sustainability of their water consumption in the context of a specific water basin or geographic area. The production assessment allows the user to quantify and map the operational water footprint of a facility or product. Both assessment types assess sustainability and identify opportunities for improvement.

The Water Footprint Assessment Tool is under continuous development.

http://waterfootprint.org/en/resources/interactive-tools/#CP

DEVELOPER: WATER FOOTPRINT NETWORK

SUPPORTERS: UNIVERSITY OF TWENTE, DEG – DEUTSCHE INVESTITIONS – UND ENTWICKLUNGSGESELLSCHAFT MBH, INTERNATIONAL FINANCE CORPORATION, UNILEVER AND

USERS: SERVICIOS AMBIENTALES S.A., THE COCA-COLA COMPANY, TATA, C&A, HNL EAST ENVIRONMENTAL AGENCY,

Extractive Company Use: No cases identified

Data Inputs Required: Geographic scope, sector, production data.

Method of Quantification

When assessing the water footprint of an industrial process, the tool calculates green, blue, and grey water footprints based either on direct measurement or proxy estimations. Information may also be used from global databases such as “WaterStat” or “Ecoinvent”.

This information is assessed in context alongside information such as local water scarcity and will provide information on the sustainability of the water footprint as well as opportunities for improvement.

Adaptability

Can be tailored to specific industrial processes such as the extraction of resources.

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

- Highly dynamic, with different methodologies allowing the assessment of products, production phases or geographic scopes
- Assesses sustainability based on local contexts
- Provides opportunities for improvement

WEAKNESSES

- Focuses on a single impact
- Still under development
- Non-monetary

GENERAL SOCIAL IMPACTS TOOL 1
POVERTY FOOTPRINT

SOCIAL AND HUMAN CAPITAL

Intended Client
Industry

Level of Analysis
Country, site

Projection/Actual
Projection

Impact Type
Social and human

Complexity
Medium – High

Cost
Engagement of external consultant required

Comparability
Medium

Overview

The Poverty Footprint is an assessment tool that enables companies and civil society partners to understand corporate impacts on multi-dimensional poverty. As a tool to help implement the Sustainable Development Goals, the Poverty Footprint provides a comprehensive overview of factors that influence poverty, and it emphasizes stakeholder engagement and partnership between companies and civil society as a means for establishing pro-poor business strategies.

https://www.unglobalcompact.org/library/3131

DEVELOPER: OXFAM AND UNITED NATIONS GLOBAL COMPACT

SUPPORTERS: MORE THAN 12000 SUPPORTING ORGANISATIONS

USERS: N/A

Extractive Company Use: None identified

Data Inputs Required: Study based tool, data inputs required dependant on scope agreed. Example information, investment ($) in local procurement, revenue ($), relevant stakeholder engagement initiatives etc

Method of Quantification

Quantitative(investment in employee training and management skills resulting in efficiency gains of X% or savings of $50,000 per annum) and qualitative (investment in training reduces risk of failure and damage to company brand)

Five key research areas:

1) Value chains: how a company's value chain influences the ability of poor people to access quality work and earn a living
2) Macro-economy: how a company's economic contributions affect the standard of living of poor people
3) Institutions and policy: how the company's actions regarding social institutions and policy affect the well-being of people living in developing countries
4) Social implications of environmental practices: how a company's environmental practices affect the livelihoods and health of poor people
5) Product development and marketing: how a company's products and services influence the cultural practices of indigenous and local communities

Training Available

No

Adaptability

Yes, can be used by extractives

Rating System

Popularity ★★☆

Quality ★★★

Extractives Potential ★★★

STRENGTHS

- Developed by internationally reputable organisations
- Suited to larger companies with global or national operations

WEAKNESSES

- Methodology stipulates that independent research teams carry out study supported by an NGO such as Oxfam
- Time and labor intensive

GENERAL SOCIAL IMPACTS TOOL 2: SOCIO-ECONOMIC ASSESSMENT TOOLBOX (SEAT)

AngloAmerican

SOCIAL AND HUMAN CAPITAL

Intended Client

Industry

Level of Analysis

Site

Projection/Actual

Actual

Impact Type

General social

Complexity

Medium

Overview

The Socio-Economic Assessment Toolbox (SEAT) is intended to help operations to benchmark and improve the management of their local social and economic impacts. The SEAT process enables operations to take a more strategic view of their interactions in relation to, for example, local employment; reducing the exclusion of disadvantaged groups; training; procurement; and community social investment.

http://www.angloamerican.com/sustainability/communities

DEVELOPER: ANGLO AMERICAN

SUPPORTERS: ANGLO AMERICAN (PROPRIETARY TOOL)

USERS: ANGLO AMERICAN, DE BEERS GROUP (ANGLO

Extractive Company Use: Anglo American, De Beers Group (Anglo subsidiary)

Data Inputs Required: Key data inputs are identifying social initiatives to be implemented, investment ($) in social initiatives

Method of Quantification

Quantitative (i.e. Invested $30,000 in a training program that benefited 90 locals; invested $200,000 in water treatment and sewage that benefited 1,800 locals) and qualitative (i.e. delivery of monthly newsletter on project progress to local households)

Cost

Free

Comparability

Medium

Training Available

No

Adaptability

Designed for extractives

Provides tools on the following to deliver the assessment:

- Profiling and engagement: household surveys, stakeholder focus groups, census data, research papers etc
- Impact identification and assessment: stakeholder engagement and risk assessment developed
- Social performance management: complaints and grievance procedure, conflict assessment and management, contractor management, resettlement planning and implementation etc
- Socio-economic benefit: assessment categories specified (i.e. community relations, capacity, legitimacy, financial resources etc) and score given

Rating System

Popularity ★★☆

Quality ★★★

Extractives Potential ★★★

STRENGTHS

- Provides a strategic approach to manage the socio-economic impacts of an extractive project
- Facilitates the generation of data to communicate local development opportunities

WEAKNESSES

- Not independent – developed by company profiting from extractive operations
- Vulnerable to bias/subjectivity
- Labor and time intensive, multi stakeholder team required

GENERAL SOCIAL IMPACTS TOOL 3: PROGRESS OUT OF POVERTY INDEX® (PPI®)

SOCIAL AND HUMAN CAPITAL

Intended Client

Industry

Level of Analysis

Country, region, site

Overview

The Progress out of Poverty Index® (PPI®) is a poverty measurement tool for organizations and businesses with a mission to serve the poor. With the PPI, organizations can identify the clients, customers, or employees who are most likely to be poor or vulnerable to poverty, integrating objective poverty data into their assessments and strategic decision-making.

http://www.progressoutofpoverty.org/

DEVELOPER: GRAMEEN FOUNDATION

Projection/Actual

Projection

Impact Type

General social

Complexity

Low

Cost

Free

Comparability

Medium

Training Available

Yes

Adaptability

Yes, could be used by extractives

SUPPORTERS: CISCO FOUNDATION, MASTERCARD FOUNDATION, CATHOLIC RELIEF SERVICES, UKAID, GRAMEEN FOUNDATION, INTERNATIONAL FINANCE CORPORATION, OPPORTUNITY INTERNATIONAL, VISIONFUND INTERNATIONAL, WORLD VISION, ACUMEN, GRAMEEN

USERS: PRISMA MICROFINANCE, MARIE STOPES

Extractive Company Use: None identified

Data Inputs Required: The 10 questions for the relevant country and local response

Method of Quantification

- Quantitative (answers to questions assigned a number of points, all 10 questions equal to 100 points. All questions added up at the end. Zero – extremely poor, 100 – not poor)
- 10 questions about a household's characteristics and asset ownership are scored to compute the likelihood that the household is living below the poverty line – or above by only a narrow margin. NOTE: Each country has a set of different questions.

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

- Ease of use
- Developed by reputable organisation
- Questions developed for all developing countries

WEAKNESSES

- Outcomes based on accuracy of respondents answers
- Potentially time and labor intensive based on approach to getting responses to questions (door knock/local community visit etc)

GENERAL SOCIAL IMPACTS TOOL 4
CENTER FOR RESILIENCE

SOCIAL AND HUMAN CAPITAL

Intended Client

Industry

Level of Analysis

Site

Projection/Actual

Projection or Actual

Impact Type

General social

Complexity

Medium

Cost

Free

Comparability

Medium

Training Available

No

Adaptability

Designed for industry in general, including extractives

Overview

Ohio State University has developed an approach called Eco-Synergy that enables the assessment and design of sustainable products and processes by accounting for ecosystem services.

http://www.resilience.osu.edu/CFR-site/pdf/Eco-Synergy_Fact_Sheet.pdf

DEVELOPER: CENTER FOR RESILIENCE – OHIO STATE UNIVERSITY

Extractive Company Use: No cases identified

Data Inputs Required: Key data inputs are demand and supply analyses of ecosystem services within a selected boundary.

Method of Quantification

» Quantitative (Eco-LCA™ quantifies how industrial activities use or effect ecosystem services in terms of mass, energy, or money and can consider systems at multiple scales) and qualitative (Eco-Flow™ optimizes the design of materials and energy flow networks to maximize both profitability and ecosystem service protection)

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ☆
Extractives Potential	★ ★ ☆

STRENGTHS

- Expands the design space by supporting innovative breakthroughs that would not be normally discovered by engineering methods
- It enables a bottom-up approach that develops islands of sustainability within local carrying capacity and enables a top-down approach that leverages ecosystem services at a regional or national scale.
- Independent – developed by a research organization

WEAKNESSES

- Vulnerable to subjectivity
- Can involve long hours of specialized skilled workers

GENERAL SOCIAL IMPACTS TOOL 5:
BASE OF PYRAMID IMPACT ASSESSMENT FRAMEWORK (BOP IAF)

WILLIAM DAVIDSON INSTITUTE
AT THE UNIVERSITY OF MICHIGAN

SOCIAL, FINANCIAL AND HUMAN

Intended Client
Industry, NGO

Level of Analysis
Company, organization

Projection/Actual
Actual

Impact Type
Poverty alleviation

Complexity
Medium complexity

Overview
The Base of Pyramid Impact Assessment Framework (BoP IAF) was designed to provide companies with an understanding of their impacts on poverty alleviation pertaining to BoP stakeholders including customers, sellers/producers and community members. The framework provides a systematic approach to strategic and performance analysis to identify, track, and improve key indicators over time.

http://wdi-publishing.com/roy/

DEVELOPER: THE WILLIAM DAVIDSON INSTITUTE

Extractive Company Use: No cases identified

Data Inputs Required: Questionnaire and survey results related to three areas of well-being: economic, capability and relationship. Specific data inputs vary depending on the results of the 'Strategic Analysis' phase.

Method of Quantification
BoP IAF is an interactive tool that includes an initial 'Strategic Analysis' phase followed by a 'Performance Analysis' phase. The Strategic Analysis phase involves identifying a list of potential indicators and conducting interviews with key BoP stakeholders. The 'Performance Analysis' phase is an empirical quantitative assessment of the prioritized indicators identified during the Strategic Analysis phase.

Cost

Free

Comparability

Low comparability

Training Available

Yes

Adaptability

Adaptable by nature

Provides tools on the following to deliver the assessment:

- Profiling and engagement: household surveys, stakeholder focus groups, census data, research papers etc
- Impact identification and assessment: stakeholder engagement and risk assessment developed
- Social performance management: complaints and grievance procedure, conflict assessment and management, contractor management, resettlement planning and implementation etc
- Socio-economic benefit: assessment categories specified (i.e. community relations, capacity, legitimacy, financial resources etc) and score given

Rating System

Popularity	★★★
Quality	★★☆
Extractives Potential	★☆☆

STRENGTHS

- Involves stakeholders in the materiality process
- Multidimensional approach on how other factors (social and environmental) influence poverty reduction
- Collaborative and iterative process

WEAKNESSES

- Focus on one main issue (poverty reduction)
- Customized sets of indicators make for poor comparability.

GENERAL SOCIAL IMPACTS TOOL 6: MULTIDIMENSIONAL POVERTY INDEX (MPI)

SOCIAL AND HUMAN CAPITAL

Overview

The Multidimensional Poverty Index (MPI) complements monetary measures of poverty by considering other variables that also affect poverty (e.g. health and education). The index identifies deprivations per the same three dimensions (health, education, and standard of living) as the Human Development Index. The MPI generates the number of people who are multi-dimensionally poor (suffering deprivations in 33% or more of weighted indicators) and the number of deprivations that the poor households typically must contend with.

http://hdr.undp.org/en/content/multidimensional-poverty-index-mpi

Intended Client

Various decision makers

Level of Analysis

Various options

Projection/Actual

Projection or actual

Impact Type

General social

Complexity

Low complexity

Cost

Free

Comparability

High comparability

Training Available

Online Training Portal found here: http://www.ophi.org.uk/resources/online-training-portal/

Adaptability

Limited relevance to the extractives industry

SUPPORTERS: OXFORD POVERTY & HUMAN DEVELOPMENT INITIATIVE (OPHI) AND THE UNITED NATIONS DEVELOPMENT

Extractive Company Use: No cases identified

Data Inputs Required: Micro-survey data related to the ten indicators: nutrition, child mortality, years of schooling, children enrolled, cooking fuel, toilet, water, electricity, floor, assets.

Method of Quantification

Quantitative and Qualitative

The MPI is calculated based on the results of micro-surveys. Answers are weighted based on specific contexts and the questions relate to the ten indicators (above) and three overarching dimensions of health, education, and standard of living. Examples of survey questions include:

- Does the household use improved drinking water sources?
- Does the household solid fuel for cooking and heating?

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★☆☆

STRENGTHS

- Captures multiple factors that influence poverty
- Developed by the UNDP
- Based on accessible data
- Can help the effective allocation of resources

WEAKNESSES

- Simplistic and misses many crucial aspects of quality of life.
- More of a raw indicator rather than a guiding tool
- Narrow scope of only poverty
- Limited relevance to the extractives industry
- Not designed to guide business decision making

GENERAL SOCIAL IMPACTS TOOL 7
HUMAN DEVELOPMENT INDEX (HDI)

SOCIAL AND HUMAN CAPITAL

Intended Client
Various decision makers

Level of Analysis
Various options

Projection/Actual
n/a

Impact Type
General social

Complexity
Low complexity

Cost
Free

Comparability
Highly comparable

Training Available
Unsure

Adaptability
Limited relevance to the extractives industry

Overview
The Human Development Index (HDI) measures the average achievement in the three key dimensions of human development (along and healthy life, knowledge and a decent standard of living. The HDI is the average of normalized indicators for each of the three dimensions.

http://hdr.undp.org/en/content/human-development-index-hdi

DEVELOPER: UNITED NATIONS DEVELOPMENT PROGRAMME

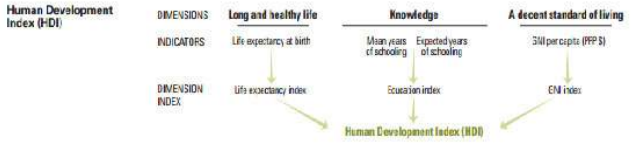
SUPPORTERS: UNITED NATIONS DEVELOPMENT PROGRAMME

USERS: N/A

Extractive Company Use: No cases identified

Data Inputs Required: Data related to the indicators such as: income data, life expectancy data, and education statistics.

Method of Quantification
The health dimension is assessed by life expectancy at birth, the education dimension is measured by mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita. The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GNI. The scores for the three HDI dimension indices are then aggregated into a composite index using geometric mean.



Rating System

Popularity	★★★
Quality	★★★
Extractives Potential	★☆☆

STRENGTHS

- Based on relatively accessible data
- Developed by the UNDP
- Captures multiple factors that influence poverty
- Core set of indicators makes for high comparability

WEAKNESSES

- Simplistic and misses many crucial aspects of quality of life.
- More of a raw indicator rather than a guiding tool
- Narrow scope of human development
- Limited relevance to the extractives industry
- Not designed to guide business decision making

GENERAL ENVIRONMENTAL IMPACTS TOOL 1:

InVEST
integrated valuation of ecosystem services and tradeoffs

NATURAL CAPITAL

Intended Client

Government, NGO, Industry

Level of Analysis

Site, region, country

Projection/Actual

Projection

Impact Type

General environmental

Complexity

Medium – high complexity (dependent on level of analysis)

Cost

Free to Download

Comparability

Highly comparable

Training Available

Yes, at the Natural Capital Symposium (annual event) and online training

Adaptability

Can be used for extractives

Overview

Integrated Valuation of Ecosystem Services and Tradeoffs is a family of tools developed by the Natural Capital Project that provides a suite of free, open-source software models used to map and value the goods and services from nature that sustain and fulfil human life. It has eighteen distinct ecosystem service models designed for terrestrial, freshwater, marine, and coastal ecosystems. Its models are spatially-explicit, using maps as information sources and producing maps as outputs. InVEST returns results in either biophysical terms (e.g., tonnes of carbon sequestered) or economic terms (e.g., net present value of that sequestered carbon).

http://www.naturalcapitalproject.org/invest/

DEVELOPER: THE NATURAL CAPITAL PROJECT

SUPPORTERS: STANFORD UNIVERSITY, UNIVERSITY OF MINNESOTA, THE NATURE CONSERVANCY, AND THE WORLD WILDLIFE FUND

USERS: GOVERNMENT OF BELIZE, NATCAP, NATIONAL ACADEMY OF SCIENCES IN CHINA.

Extractive Company Use: No cases identified

Data Inputs Required: Data sets/information for each of the sub-tools: habitat quality, habitat risk assessment, marine water quality, forest carbon, water yield, nutrient retention, land-cover etc

Method of Quantification

- Monetary (i.e. dollars of avoided damage, net revenue from recreational value) and quantitative (i.e. tonnes of carbon sequestered)
- Data sets/information imported into tool and then InVEST models impact (i.e. habitat risk assessment evaluates anthropogenic risk factors to marine and terrestrial environment, land cover data – such as grassland, agriculture, forest etc – model then runs scenarios based on changes)

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

- Assigns monetary value
- Accounts for both service supply (i.e. living habitats as buffers for storm waves) and the location and activities of people who benefit from services (e.g., location of people and infrastructure potentially affected by coastal storms

WEAKNESSES

- Quantifying the qualitative
- Availability of quality data

GENERAL ENVIRONMENTAL IMPACTS TOOL 2:
SYSTEM OF ENVIRONMENTAL-ECONOMIC ACCOUNTING

Overview

The System of Environmental-Economic Accounting (SEEA) contains the internationally agreed standard concepts, definitions, classifications, accounting rules and tables for producing internationally comparable statistics on the environment and its relationship with the economy. Subsystems of the SEEA framework elaborate on specific resources or sectors, including: Energy, Water, Fisheries, Land and Ecosystems, and Agriculture.

http://unstats.un.org/unsd/envaccounting/seea.asp

NATURAL CAPITAL TOOL

Intended Client
Country

Level of Analysis
Country & region

Projection/Actual
Actual

Impact Type
General environmental

Complexity
Low – high complexity (dependent on state/ structure of national accounts)

Cost
Free

Comparability
Highly comparable

Training Available
Yes

DEVELOPER: UNITED NATIONS, EUROPEAN COMMISSION, INTERNATIONAL MONETARY FUND, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, THE WORLD BANK

SUPPORTERS: UNITED NATIONS, EUROPEAN COMMISSION, INTERNATIONAL MONETARY FUND, ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, THE WORLD BANK

USERS: N/A

Extractive Company Use: No, national and sub-national government

Data Inputs Required: Example inputs required include: gross domestic product (GDP), gross value added (GVA), expenditure, revenue from environment related taxes, employment associated with environmental activity, expenditure on environmental protection, material flows (air emissions, energy use, waste generation, water consumption)

Method of Quantification

» Quantitative (i.e. intensity measures – water, GHG, waste, energy – per unit of economic production, water consumption by industry etc) & monetary (environmental asset valuation – Land $XXXX, Mineral and Energy $XXXX, Timber $XXXX)

» Data inputs are used to develop a number of indicators in line with the System of National Accounts accounting structure. Example indicators include intensity measures to monitor environmental pressure per unit of economic production – tCO2e/GVA, Gigalitres/GVA. Estimates on the value of environmental assets – subsoil assets, timber, aquatic resources, water and biological resources.

Adaptability

Yes, extractives could use relevant SEEA data

Rating System

Popularity	★★★
Quality	★★★
Extractives Potential	★★☆

STRENGTHS

- Valuable in a data poor environment
- Adaptable depending on priorities

WEAKNESSES

- Aimed at national and sub-national level
- Lag indicator/measure
- Labor and time resource dependent on availability and quality of data

GENERAL ENVIRONMENTAL IMPACTS TOOL 3:

ARTIFICIAL INTELLIGENCE FOR ECOSYSTEM SERVICES (ARIES)

NATURAL CAPITAL TOOL

Intended Client

Government, Industry, NGO

Level of Analysis

Site, country

Projection/Actual

Projection

Impact Type

General environmental

Overview

ARtificial Intelligence for Ecosystem Services (ARIES) is a computer model and decision-support infrastructure to assist decision makers and researchers by estimating and forecasting ecosystem services provision and their correspondent range of economic values in a specific area.

http://aries.integratedmodelling.org/

DEVELOPER: ARIES (INTERNATIONAL NETWORK OF SCIENTISTS)

SUPPORTERS: ARIES (INTERNATIONAL NETWORK OF SCIENTISTS)

USERS: GOVERNMENTAL ENTITIES (DEPARTMENTS OF URBAN PLANNING)

Extractive Company Use: None identified

Data Inputs Required: No data required for basic analysis. Detailed spatial data (i.e. regional carbon dynamics, water supply and use, population density etc) can be input for more specific analysis/ predictions.

Complexity
High complexity

Cost
Free

Comparability
Highly comparable

Training Available
Yes, customised training available

Adaptability
Yes, could be applied to extractive industry

Method of Quantification
» Monetary

» ARIES uses k.Lab software to assess carbon sequestration, river and coastal flood regulation, freshwater supply, sediment regulation, fisheries, recreation, aesthetic view-sheds, and open-space proximity values.

Rating System
Popularity ★★☆
Quality ★★☆
Extractives Potential ★★☆

STRENGTHS
» Transparent, so users know information sources
» Designed to be continually updated with the latest data
» Results easy to interpret (visual)

WEAKNESSES
» 'ARIES explorer' which is the user web interface is still in development, requiring potential users to attend training sessions on specific tools
» Time intense and technical skills required if going beyond basic analysis

GENERAL ENVIRONMENTAL IMPACTS TOOL 4:
ENVIRONMENTAL PROFIT & LOSS ACCOUNT (EP&L)

KERING

NATURAL CAPITAL TOOL

Overview
An Environmental Profit & Loss account (EP&L) allows a company to measure in $ value the costs and benefits it generates for the environment, and in turn make more sustainable business decisions.. Expressing the scale of impacts in monetary terms enables environmental impacts to be considered alongside conventional business costs and place sustainability at the core of business decisions.

http://www.kering.com/en/sustainability/epl

Intended Client

Industry

Level of Analysis

Industry

Projection/Actual

Actual

Impact Type

General environmental

Complexity

High

Cost

Free

Comparability

High

Training Available

No

Adaptability

Yes, can be used by extractives

DEVELOPER: KERING

SUPPORTERS: KERING GROUP

USERS: KERING GROUP BRANDS

Extractive Company Use: None identified

Data Inputs Required: Dependent on what the user decides to measure, may include:

- GHG emissions (tCO2e)
- Water consumption (ML)
- Electricity consumption (kWh)
- Diesel consumption (kL)
- Land use (Hectares)
- Waste (tonnes)
- Revenue ($)

Method of Quantification

- Monetary

Rating System

Popularity	★★★
Quality	★★★
Extractives Potential	★★☆

STRENGTHS

- Results easier to interpret for executives and stakeholders
- It demonstrates where is best to implement initiatives

WEAKNESSES

- Complex to carry out, requires high level support
- Labor and time intensive. Multi stakeholder team required.

GENERAL ENVIRONMENTAL IMPACTS TOOL 5:
CO$TING NATURE

Co$ting Nature

NATURAL CAPITAL TOOL

Intended Client

Industry, government, NGOs

Level of Analysis

Site, country

Projection/Actual

Actual

Impact Type

General environmental

Complexity

Low

Cost

Free

Comparability

High

Training Available

Yes (user manual and training videos online)

Adaptability

Yes, website list includes the tools 'audience' as 'industry (e.g. extractives)'

Overview

Co$ting Nature is a web based policy-support tool for natural capital accounting and analysis of ecosystem services provided by natural environments. It identifies the beneficiaries of these ecosystem services; and assesses the impacts of human interventions for conservation prioritisation and planning.

http://www.policysupport.org/costingnature

DEVELOPER: KING'S COLLEGE LONDON, AMBIOTEK, UNEP-WCMC

SUPPORTERS: KING'S COLLEGE LONDON, AMBIOTEK,

USERS: USED BY 1179 ORGANISATIONS FROM 141 COUNTRIES INCLUDING: CONSERVATION INTERNATIONAL, UNEP-WCMC, WWF, FFI, TNC, WORLD BANK GROUP, RESOURCES FOR THE FUTURE, ZSL, AMAZON CONSERVATION, RSPB, BIRDLIFE INTERNATIONAL, EARTHWATCH, EPA, USAID, CAFOD, EUROPEAN PARLIAMENT, UNDP, BCCI, A NUMBER OF GEF PROJECTS, UNIVERSITIES AND NATIONAL HYDROLOGICAL AND METEOROLOGICAL SERVICES AROUND THE WORLD,

Extractive Company Use: None identified

Data Inputs Required: No data input required

Method of Quantification

» Quantitative (index, 0-1)

» The tool incorporates detailed spatial datasets at 1-square km and 1-hectare resolution for the entire world, spatial models for biophysical and socioeconomic processes, and scenarios for climate change, land use change and user valuation of ecosystem services and conservation priorities. It uses these datasets to generate a total ecosystem service and nature conservation priority index (on a global scale 0-1 globally) that is displayed alongside maps.

Rating System

Popularity	★★☆
Quality	★★☆
Extractives Potential	★★★

STRENGTHS

- Data supplied globally
- Visual output making results easy to assess for decision making
- Not labor or time intensive unless using own datasets.

WEAKNESSES

- Does not support mapping of individual services, tradeoffs or valuation
- Commercial users have to provide some of their own datasets

GENERAL ENVIRONMENTAL IMPACTS TOOL 6:
Eco LCA

NATURAL CAPITAL TOOL

Intended Client

Industry, government, NGO

Level of Analysis

Sector

Projection/Actual

Projection

Impact Type

General environmental

Complexity

Low

Cost

Free

Overview

Eco LCA is an on-line tool that provides accounting system software that quantifies the role of natural resources in Life Cycle Assessment (LCA). It complements other LCA tools by taking into account a broad range of ecosystem services.

http://resilience.eng.ohio-state.edu/eco-lca/

DEVELOPER: OHIO STATE UNIVERSITY – CENTER FOR RESILIENCE

SUPPORTERS: N/A

USERS: N/A

Extractive Company Use: None identified

Data Inputs Required: No data input required

Method of Quantification

- Quantitative (i.e. GHG emissions – kgCO2e, water – m3, land – acre, energy – joules)

Comparability

High

Training Available

Yes (online tutorial and 'guided tour')

Adaptability

Yes, mining, oil and gas sectors included in software

Rating System

Popularity ★ ☆ ☆

Quality ★ ★ ☆

Extractives Potential ★ ★ ☆

STRENGTHS

- Provides visualisations (graphs etc) of impacts
- Efficient way of obtaining sector overview. Not time or labor intensive.

WEAKNESSES

- Best suited for assessment at the scale of economic sectors
- High level analysis

GENERAL ENVIRONMENTAL IMPACTS TOOL 7:
FINANCIAL VALUATION TOOL

Financial Valuation Tool
For Sustainability Investments

NATURAL & SOCIAL CAPITAL TOOL

Intended Client

Industry

Level of Analysis

Site

Overview

The Financial Valuation (FV) Tool was developed to help companies identify the optimum sustainability investment portfolio to deliver maximum business and social value. It allows an organization to test whether its sustainability initiatives will effectively create or protect value for a project and, most importantly, manage risks that could negatively impact project completion and ongoing business operations.

https://www.fvtool.com/

DEVELOPER: INTERNATIONAL FINANCE CORPORATION IN CONJUNCTION WITH DELOITTE AND RIO TINTO

SUPPORTERS: RIO TINTO AND DELOITTE

USERS: RIO TINTO, PACIFIC E&P,CAIRN ENERGY AND NEWMONT

Extractive Company Use: Pacific Exploration and Production Corporation (Colombia); Rio Tinto (Southern Africa); Cairn Energy (India); Newmont Gold Mine (Ghana)

Data Inputs Required: Project level cash flows; stakeholder engagement activities; defined environmental and social risks; quantified risk parameters (i.e. estimated ranges on the likelihood and severity of each risk event); Investment scenarios and associated CAPEX, OPEX and quantifiable benefits

Projection/Actual

Projection

Impact Type

Total impacts [environment and social risks defined by the user]

Complexity

Medium - high complexity

Cost

Free to download

Comparability

Highly comparable

Training Available

No (user guide available on website)

Adaptability

Currently used by extractive industry

Method of Quantification

Monetary (Net Present Value)

Step 1 – Enter general information

» Set-up project phases of the project (i.e. mine site) and baseline financial information

Step 2 – Project cash flows

» Enter forecast revenue, costs, and net cash flow minus sustainability spend for each year in the project lifespan

Step 3 – Project risks

» Determine project risks/consequences, and calculate portion of manageable risks for each

Step 4 – Sustainability investments

» Define portfolio sustainability investments

Step 5 – Quality of sustainability investments

» Complete self assessment questionnaire which upon completion automatically fills in fields

Step 6 – Costs and benefits

» Calculate and enter traditional Cost Benefit Analysis data for each of the potential sustainability investments

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

» Assesses financial value of sustainability programs

» Applicable across projects and countries

WEAKNESSES

» External facilitation is required for first time users

» Data availability and verification

» Difficult to quantify company reputation/ brand

» Time and resources to implement the tool vary significantly from as little as 1-2 weeks by a small team to more than 12+ weeks in order to configure the tool and interpret the results. The range of time of required to model investment scenarios is dependant on the skill set of the team, management buy-in, and the availability of information

GENERAL ENVIRONMENTAL TOOL 8:
NATURAL CAPITAL MANAGEMENT APPLICATION (NCMS)

climate earth

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Business operations

Projection/Actual
Projection

Impact Type
General environmental

Complexity
Low complexity

Cost
Free to download

Comparability
Highly comparable

Training Available
No, but one-on-one consultation can be booked with Climate Earth directly.

Adaptability
Can be used by extractives

Overview
Natural Capital Management Application (NCMS)is a web-based tool that allows organizations to actively manage natural capital assets and quantify the financial cost of business operations by placing a dollar value on resource consumption (e.g. water use or landuse change). Its designed illustrate which natural assets they the user depends on most and where they are being consumed. Further, it helps communicate this internally, and externally to facilitate collaboration with a company's value chain partners.

http://www.climateearth.com/solutions-ncms/

DEVELOPER: CLIMATE EARTH

SUPPORTERS: FOUR TWENTY SEVEN, AUTOMOTIVE INDUSTRY ACTION GROUP (AIAG), CARBON LEADERSHIP FORUM, NATIONAL READY MIX ASSOCIATION, U.S. GREEN

USERS: WEBCOR BUILDERS

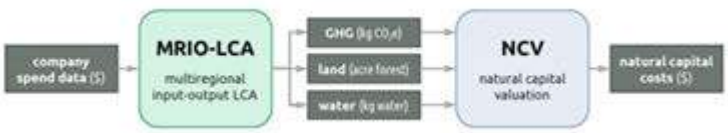
Extractive Company Use: No international extractive giants, but Webcor Builders, a general contractor serving clients including EBay and Lucasfilm.

Data Inputs Required: Industry spend data ($)

Method of Quantification
Quantitative

There are two steps in their calculation of natural capital costs. First, a multi-regional input–output life cycle assessment (MRIO-LCA) model is converts company spend data into global supply chain environmental impacts. In the case of the Webcor SFPUC project, they focused on three impact categories: global warming potential ("GHG") in kg CO2e, forest land use impacts ("land") in acres of forest land, and water use impacts ("water") in kg water.

Second, natural capital valuation (NCV) factors are applied to convert global supply chain impacts into natural capital costs in financial units. Thus, impacts from GHG, land, and water can be compared using a common unit of dollars of natural capital depletion. The figure below illustrates the higher- level process of calculating the natural capital costs from company spend data.



Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

- Shared cloud-based databases allowing for access to data collaboration and synergies.
- Allows companies to assess their impacts on a division, project, business unit or other level of detail (scalable).
- Allows companies to assess the impact of their suppliers and other stakeholders.
- Attaches a dollar value to the company's natural capital impacts and assets. Allows for the financial management of natural capital flows.

WEAKNESSES

- Assessing global supply chain impacts based on only spend data relies on many assumptions.
- Assigning a fixed monetary value to social impacts might be involving too much subjectivity.

GENERAL ENVIRONMENTAL TOOL 9: LOCAL ECOLOGICAL FOOTPRINTING TOOL (LEFT)

Overview

The Local Ecological Footprinting Tool (LEFT), is a web-based decision support tool that helps businesses quickly determine the likely environmental impacts of their land use related activities and decisions. The user designates an area anywhere in the world with a web-based map and scientifically vetted data sets and algorisms automatically aggregate the results to produce a single map and report of relative ecological value.

https://www.left.ox.ac.uk

NATURAL CAPITAL TOOL

Intended Client

Various decision makers

Level of Analysis

Site

DEVELOPER: BIODIVERSITY INSTITUTE FROM THE UNIVERSITY OF OXFORD

SUPPORTERS: UNIVERSITY OF OXFORD

USERS: MEGASCALE URBAN AND BUSINESS PROJECT

Extractive Company Use: No cases identified

Data Inputs Required: The coordinates for the landscape of interest

Projection/Actual

Projection

Impact Type

Ecological impact

Complexity

Very low complexity, a very flat learning curve

Cost

Each LEFT credit (which buys one LEFT report and associated raster data sets) costs £250(inclusive of Value Added Tax of 20%)

Comparability

Highly comparable

Training Available

Yes, webinars and user guides

Adaptability

Can be used for extractives. Mineral and fuel extraction was used as a prime example of type the type of projects that could benefit from the tool.

Method of Quantification

Quantitative and qualitative

Step 1 – Delineate the landscape of interest

A user defines an area of interest anywhere in the world using a web-based map.

Step 2 – Automatic processing

LEFT automatically processes a series of high-quality datasets using standard published algorithms.

Step 3 – Review the results

The LEFT tool will produce:

- Maps at 30m resolution of land cover classes
- Numbers of globally threatened terrestrial vertebrate and plant species
- Beta-diversity of terrestrial vertebrates and plants
- Habitat fragmentation
- Wetland habitat connectivity
- Numbers of migratory species
- Vegetation resilience

And aggregate these results to produce a single map of relative ecological value. The tool also generates a customized pdf report and a zip file of GIS data for the landscape of interest.

Rating System

Popularity	★ ★ ☆
Quality	★ ★ ★
Extractives Potential	★ ★ ★

STRENGTHS

- Rapid and robust assessments without the need for field work(quick, easy and dependable).
- User friendly web platform and dashboard.
- Low user inputs (in terms of both time, effort, and data, and expertise).
- Databases and algorithms have been scientifically vetted.
- Thorough yet comprehensible results in several forms (maps, raw data, summary report).
- Highly applicable to extractives.

WEAKNESSES

- Assesses mostly the existing ecological value of the landscape, actual impacts of a project/scenarios are not quantified.
- Limited to land use related projects and ecological impacts.
- Seems to neglect impacts on water resources.
- LEFT does not assess some key ecosystem services (e.g. soil protection and carbon stocks).

GENERAL ENVIRONMENTAL TOOL 10: ECOMETRIX

Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

NATURAL CAPITAL TOOL

Intended Client

Various

Level of Analysis

Site

Projection/Actual

Actual

Impact Type

General environmental

Complexity

Medium

Cost

No information

Comparability

Medium

Overview

EcoMETRIX is a software system for measuring ecosystem services at site scales using field surveys, designed to help local governments design and implement ecosystem service conservation programs, including payment for ecosystem service programs.

https://unstats.un.org/unsd/envaccounting/seeaRev/meeting2013/EG13-BG-10.pdf

DEVELOPER: PARAMETRIX

SUPPORTERS: ECOMETRIX SOLUTIONS GROUP (PROPRIETARY TOOL)

USERS: BUREAU OF LAND MANAGEMENT (BLM) AND THE U.S. GEOLOGICAL SURVEY (USGS)

Extractive Company Use: No cases identified

Data Inputs Required: The inputs to EcoMETRIX include proposed development, site's landscape and ecosystem services.

Method of Quantification

- Quantitative (EcoMETRIX evaluates the amount of damage and loss that will be caused by a development and identifies best possible scenario to minimize such loss, which can be compensated through Corporate Social Responsibility and reported in a company's CSR report).

Training Available

No

Adaptability

Designed for industry in general, including extractives

Rating System

Popularity ★★☆

Quality ★★☆

Extractives Potential ★★★

STRENGTHS

- EcoMETRIX provides a system that allows companies to identify the best possible alternative for a development that minimizes the losses and impact to a site.
- It projects how a development will impact a landscape and offer solutions for restoration activities
- Can be used as a transaction tool – an offset transaction to any damage caused by a development can be enforced to bring an equivalent benefit to the loss caused by the same development.
- Relatively short amount of time required to conclude the analysis.

WEAKNESSES

- Focuses only on ecosystem services without measuring the economic and social impact

GENERAL ENVIRONMENTAL IMPACTS TOOL 11:
SUSTAINABLE OPERATIONS (SUSOP)

SUSOP sustainable operations

NATURAL & SOCIAL CAPITAL TOOL

Intended Client

Industry

Level of Analysis

Site

Overview

Sustainable Operations (SUSOP) is a structured process of multi-disciplinary workshops and supporting analysis conducted at the early phases (concept, pre-feasibility and feasibility) of industrial projects (mining, chemical, energy, oil and gas). At the heart of SUSOP is a systematic and rigorous step-by-step procedure. This ensures critical environmental, community and social issues are identified and then translated into real operating designs and practices which deliver new innovative solutions.

http://www.susop.com.au/

DEVELOPER: UNIVERSITY OF QUEENSLAND, UNIVERSITY OF TECHNOLOGY SYDNEY, GHD PTY LTD, HATCH ASSOCIATES PTY LTD, COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

Projection/Actual

Projection

Impact Type

Total impacts [environment and social risks defined by the user]

Complexity

Medium

Cost

Consultancy engagement with JKTech (http://jktech.com.au)

Comparability

Medium

Training Available

No

Adaptability

Can be used by extractives

SUPPORTERS: M+W GROUP, BOULTING GROUP, GXPI, PHARMAFLOW, THE AUSTIN COMPANY, Z-TECH CONTROL SYSTEMS LTD, ARCINOVA, CHEMICALS NORTHWEST, BIONOW

USERS: GSK CAPITAL PROJECT MANAGEMENT, ALLERGY THERAPEUTICS, PFIZER, BAT

Extractive Company Use: None identified

Data Inputs Required: Workshop participation: identification of environmental, community and social issues; identification of and prioritisation of risks and opportunities

Method of Quantification

- Quantitative (Sustainable Development Balance Sheet scores -5 to +5) and Qualitative (Sustainability Register - formal record of outcomes similar to a risk register)
- Quantified through a series of multi-disciplinary workshops that cover opportunities and risks, prioritisation, and decision support. Analysis is carried out between workshops and action plans developed. A final study report is produced along with the Sustainability Register.

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

- Developed by reputable organisations including two tertiary institutions
- Facilitates the early identification of risks and opportunities so management methods can be put in place to mitigate the risks or capitalise on opportunities

WEAKNESSES

- Time and labor intensive. Multidisciplinary teams required for multiple workshops.
- Proprietary tool requiring engagement of a third party (consultant)

GENERAL ENVIRONMENTAL TOOL 12:
EcoServ-GIS

EcoServ-GIS

NATURAL CAPITAL TOOL

Intended Client

Various

Level of Analysis

Site

Projection/Actual

Projection

Impact Type

General environmental

Complexity

Medium

Cost

Free

Comparability

Medium

Training Available

No

Adaptability

Designed for industry in general, including extractives

Overview

EcoServ-GIS is a Geographic Information System (GIS) toolkit for mapping ecosystem services at a county or regional scale. It uses input GIS/map data to generate fine-scale maps that illustrate human need or demand for ecosystem services as well as the capacity of the natural environment to provide them.

No official website

DEVELOPER: ECOSERV-GIS STEERING GROUP (DURHAM WILDLIFE TRUST)

SUPPORTERS: DURHAM WILDLIFE TRUST, SCOTTISH WILDLIFE TRUST, SCOTTISH NATURAL HERITAGE, SCOTTISH ENVIRONMENT PROTECTION AGENCY AND THE GLASGOW AND GREEN CLYDE VALLEY NETWORK

USERS: SCOTTISH NATURAL HERITAGE

Extractive Company Use: No cases identified

Data Inputs Required: The inputs to EcoServ-GIS include freely available GIS datasets and OS MasterMap Topography data.

Method of Quantification

» Qualitative (EcoServ-GISillustrates the human need for ecosystem services and the capacity of the environment to provide them. The illustration is done through fine-scale maps).

Rating System

Popularity	★★☆
Quality	★★☆
Extractives Potential	★★☆

STRENGTHS

- Relatively more simplified process models, reducing the need for academic or specialist input.
- Incorporates both physical landscape factors and socio-economic factors. This combination allows the user to identify where ecosystem services occur, where there is high demand for a service, and where there is high capacity to provide a service.
- EcoServ-GIS illustrates need for ecosystem services, and capacity of the environment to provide it, visually.
- The outputs can also be used to create Ecological Habitat Network maps (to show where areas are more or less connected to a wider network of sites for focal species) and Biodiversity Opportunity Area Maps (to identify areas where habitat creation or habitat buffering might be suitable).
- Open-source, free access.

WEAKNESSES

- No official website or organization that is responsible for the EcoServ-GIS.

GENERAL ENVIRONMENTAL TOOL 13: MIMES

AFORDable Futures LLC

NATURAL CAPITAL TOOL

Intended Client

Various

Level of Analysis

Site

Projection/Actual

Projection or actual

Impact Type

General environmental

Complexity

Medium

Overview

MIMES is a multi-scale, integrated set of models that assess the value of ecosystem services. These sophisticated models allow government decision-makers, NGOs, and any other natural resource managers to quickly understand:

- Dynamics of ecosystem services
- How ecosystem services are linked to human welfare?
- How the value might change under various management scenarios?

http://www.afordablefutures.com/orientation-to-what-we-do/services/mimes

DEVELOPER: AFORDABLE FUTURES LLC

SUPPORTERS: AFORDABLE FUTURES LLC

USERS: US ENVIRONMENTAL PROCTECTION AGENCY (EPA)

Extractive Company Use: No cases identified

Data Inputs Required: The inputs to MIMES are the production from the economic and ecological systems. MIMES also requires relevant spatial data.

Cost

No information

Comparability

Medium

Training Available

Yes

Adaptability

Designed for industry in general, including extractives

Method of Quantification

» Quantitative (MIMES facilitates quantitative measures of ecosystem service effects on human well-being).

Rating System

Popularity ★★☆

Quality ★★★

Extractives Potential ★★☆

STRENGTHS

» Highly scalable

WEAKNESSES

» Some models are still in development
» Use of MIMES would require hiring an experienced system modelling expert
» Local models would need to be adapted or developed
» Resources for MIMES are limited.

GENERAL ENVIRONMENTAL IMPACTS TOOL 14:
SOCIAL VALUES FOR ECOSYSTEM

NATURAL, SOCIAL, PHYSICAL, FINANCIAL,

Intended Client

Various

Overview

ArcGIS toolbar for mapping social values for ecosystem services based on survey data or value transfer

https://solves.cr.usgs.gov/

DEVELOPER: USGS

SUPPORTERS: US GOVERNMENT

USERS: HINCHINBROOK ISLAND NATIONAL PARK, NATIONAL FORESTS IN CO AND WY

Extractive Company Use: No cases identified

Data Inputs Required: SolVES requires environmental data in raster form. Community responses to survey data must be collected and associated with raster environmental data.

Level of Analysis

Site

Projection/Actual

Projection

Impact Type

General environmental

Complexity

Medium

Cost

Free

Comparability

Medium

Training Available

Yes

Adaptability

Designed for industry in general, including extractives

Method of Quantification

» Quantitative (SolVES quantifies perceived social values).

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

» Designed to work on landscape or watershed scales
» Relatively fast to use once the relevant data is collected
» Resources about SolVES are widely available

WEAKNESSES

» Requires specifically formatted data
» Survey data can be time consuming to collect and code

GENERAL ENVIRONMENTAL IMPACTS TOOL 15:

NATURAL, FINANCIAL, HUMAN & SOCIAL

Intended Client

Industry

Level of Analysis

Company

Projection/Actual

Actual

Impact Type

Social, financial, environmental, and human.

Complexity

Medium complexity

Cost

Free

Comparability

Highly comparable

Training Available

No

Adaptability

Can be used for extractives

Overview

"MDG Scan" was developed to track the contribution of private companies toward the achievement of the Millennium Development Goals. The Millennium Development Goals are eight time-bound (2015) goals established in 2000 by a partnership of committed nations (convened by the UN) to reduce extreme poverty and other development related issues.

The scores for each of the 77 indicators are weighted and aggregated to a score between 0 and 100 for each MDG.

http://www.sustainalytics.com/sites/default/files/BusinessImpactReport2010.pdf

DEVELOPER: THE SCAN WAS FINANCED BY THE DUTCH COMMISSION ON SUSTAINABLE RESEARCH (NCDO) AND WAS

Extractive Company Use: BHP Billiton. Royal Dutch Shell. ArcelorMittal.

Data Inputs Required: Data related to commercial activities and community investments contributing to the progression towards MDGs.

Method of Quantification

The quantification of progress is based on estimates of the number of people that benefit from a company's local operations and products, as well as community investments. This is based on data provided by the companies. These estimates are combined with an estimation of indirect effects on household members.

Rating System

Popularity	★ ☆ ☆
Quality	★ ★ ★
Extractives Potential	★ ☆ ☆

STRENGTHS

- Based on indicators vetted by the United Nations and participating countries.
- Measures concrete private sector contributions towards (arguably) the most crucial development goals.

WEAKNESSES

- Depends on self-reported data
- Mainly focuses on positive impacts, negative impacts not fully assessed
- Focuses only on impacts in developing countries.
- The MDGs were set to be achieved by 2015 (already passed)

TOTAL IMPACTS TOOL 1:
TOTAL IMPACT MEASUREMENT & MANAGEMENT (TIMM)

NATURAL, FINANCIAL, HUMAN & SOCIAL CAPITAL

Intended Client

Industry

Level of Analysis

Country, industry, site

Projection/Actual

Projection and actual

Impact Type

Total impacts

Complexity

High complexity

Cost

Unknown, would need to engage PWC as a project consultant. Fees would vary depending on nature of project and engagement.

Overview

Total Impact Measurement & Management (TIMM) enables users to develop a better understanding of the social, fiscal, environmental and economic impacts of their activities. It gives them the ability to compare strategies and make business decisions such as investment choices using quantified data, and evaluate the total impact of each decision and choice they make.

http://www.pwc.com/gx/en/services/sustainability/publications/total-impact-measurement-management.html

DEVELOPER: PRICE WATERHOUSE COOPERS (PWC)

SUPPORTERS: PRICE WATERHOUSE COOPERS (PWC)

USERS: KERING, SSE, TRAVEL FOUNDATION AND TUI GROUP, ST GILES TRUST, PWC UK

Extractive Company Use: None identified

Data Inputs Required: Employment numbers, tax payments, resource use (i.e. energy, water, waste etc), investment/CAPEX spend, procurement and expense figures, subsidies received, health (i.e. mortality rate) and education data (i.e. enrolment numbers, average level of education achieved)

Method of Quantification

Monetary

Step 1 – Define scope

» What's the objective? To determine the right investment choice? Or demonstrate value to stakeholders?

Step 2 – Define dimensions of value

» How far do the impacts reach? Map total impacts

Step 3 – Collect existing data

» What information can be provided?

Comparability
Highly comparable

Training Available
No, tool accessed through consultant engagement

Adaptability
Yes, could be applied to extractive industry

Step 4 – Source new data
» What additional information is required and how can it be generated?

Step 5 – Analyse data and value impacts
» What is the value of the impacts? Put an economic and social value on impacts. Involves using techniques such as economic and process modelling

Rating System
Popularity ★★☆
Quality ★★★
Extractives Potential ★★★

STRENGTHS
- Evaluates total impact of strategies and investment choices to allow comparison
- Assigns monetary value
- Easy to comprehend results (visual output)

WEAKNESSES
- Availability of quality data
- Unclear how $ figures assigned
- Time and labour intensive

TOTAL IMPACTS TOOL 2:
MEASURING IMPACT FRAMEWORK

NATURAL, SOCIAL, PHYSICAL, FINANCIAL, HUMAN

Intended Client
Industry

Level of Analysis
Country, site

Overview
The Measuring Impact Framework is designed to help companies understand their contribution to development and use this understanding to inform their operational and long-term investment decisions. The Framework is based on a four-step methodology where business activities are grouped: 1) Governance & Sustainability; 2) Assets; 3) People; 4) Financial flows.

http://wbcsdpublications.org/project/measuring-impact-framework-methodology-understanding-the-business-contribution-to-society/

DEVELOPER: WORLD BUSINESS COUNCIL ON SUSTAINABLE DEVELOPMENT& INTERNATIONAL FINANCE CORPORATION

SUPPORTERS: AES, AKZO NOBEL, ALCOA, ANGLO AMERICAN, BG GROUP, BP, CATERPILLAR, DUPONT, ERM, EKSOM, GRUPO NUEVA, HOLCIM, INTERFACE, KIMBERLY-CLARK, KPMG, PETRO-CANADA, PHILIPS, PWC, RIOTINTO, STATOILHYDRO, UNILEVER, VODAFONE

USERS: NEWMONT (GHANA), MINERAALUMBRERA (JOINT VENTURE BETWEEN GLENCORE & YAMANA – ARGENTINA)

Projection/Actual

Actual

Impact Type

Total impacts

Complexity

Medium - high complexity

Cost

Free to Download

Comparability

Highly comparable

Training Available

No

Adaptability

Has been used by extractives

Extractive Company Use: Newmont (Ghana), MineraAlumbrera (Joint Venture between Glencore &Yamana - Argentina)

Data Inputs Required: Dependent on level of analysis/business activities selected. Can include: Key stakeholders, key issues, investment in infrastructure, use of resources etc

Method of Quantification

Quantitative (i.e. number of jobs created, water consumption, GHG emissions etc) and qualitative (i.e. identifying sources of impact arising from the project to identify development priorities – access to healthcare, SME sector development etc)

Step 1 – Set boundaries

"Define your business"

Determine the scope and depth of the overall assessment in terms of geographical boundary and types of business activities to be assessed.

1.1 Identify the objective(s) for the assessment

1.2 Define the geographic area of the assessment

1.3 Collect development context information for the assessment area

1.4 Select the business activities to be assessed

Step 2 – Measure direct and indirect impacts

"Measure your company footprint"

Identify and measure direct and indirect impacts, mapping out what is within the company's control and what it can influence through its business activities.

2.1 Identify the sources of impact for each business activity

2.2 Identify relevant indicators for direct and indirect impacts

2.3 Measure

Step 3 – Assess contribution to the development

"Understand your footprint in the development context"

Assess what the company's direct and indirect impacts contribute to the development issues/priorities in the assessment area.

3.1 Determine the level of stakeholder engagement

3.2 Engage with stakeholders to prioritize the development issues (optional)

3.3 Build hypothesis of the business contribution to development

3.4 Test hypothesis with stakeholders and refine the overall assessment (optional)

Step 4 – Sustainability investments

"Make better-informed decisions"

Extract the key risks and opportunities relative to the company's societal impact and based on this, develop the management response.

4.1 Identify priority areas for action

4.2 Consider possible management responses and prepare recommendations for management

4.3 Decide on way forward

4.4 Develop indicators to monitor progress

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

- Provides detailed guidance
- Useful source of information (i.e. provides example direct and indirect indicators)

WEAKNESSES

- Skilled practitioner required
- Appears labor and time intensive, skilled practitioner required

TOTAL IMPACTS TOOL 3:
SOCIAL RETURN ON INVESTMENT

SOCIAL, NATURAL, FINANCIAL CAPITAL

Intended Client

Government, industry, NGO

Level of Analysis

Site

Projection/Actual

Actual & projected

Impact Type

Total impact

Overview

Social Return on Investment (SROI) is an outcomes-based measurement tool that helps organisations to understand and quantify the social, environmental and economic value they are creating. An SROI analysis produces a narrative of how an organisation creates and destroys value in the course of making change in the world.

N/A

DEVELOPER: DEVELOPED FROM TRADITIONAL COST-BENEFIT ANALYSIS

SUPPORTERS: CENTRE FOR SOCIAL IMPACT (CSI), PRICEWATER HOUSECOOPERS (PWC) AND SOCIAL VENTURES AUSTRALIA (SVA)

USERS: FOOD CONNECT BRISBANE (FCB), STREAT, PEOPLE POWER CLEANING (PPC), TASTY FRESH COMMUNITY CATERING, LIVINGIN CONSTRUCTIONS, SANDGATE ENTERPRISE ECONOMIC DEVELOPMENT (SEED).

Extractive Company Use: No specific examples identified. KPMG conducted SROI analysis on 30 mining projects in South Africa and monetised material social outcomes.

Data Inputs Required: Dependant on analysis user wants to complete. Some examples include the cost ($) of:

- Training programs
- Health programs

Complexity

Medium – high complexity

Cost

Guides free to download from reputable sources, and SROI Practitioner course available

Comparability

High comparability (with uniform indicators)

Training Available

Yes (i.e. Social Value International http://socialvalueint.org/our-work/training/)

Adaptability

Yes, can be used by extractive industry

- Conservation programs
- Local employment
- Local education
- Local suppliers

Method of Quantification

Monetary

Based on costs and outcomes delivered (i.e. for a training program, the investment required vs the outcomes delivered such as new jobs, better income etc) a ratio is developed that states how much social value ($) is created for every $1 of investment.

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★☆☆

STRENGTHS

- Helps understand what social value an activity creates in a robust and rigorous way
- Assurance and verification is available through a number of bodies
- Puts social impact into the language of 'return on investment'

WEAKNESSES

- It can be time-consuming to conduct an SROI analysis first time around
- Risk of focusing narrowly on the ROI ratio
- Time and labor intensive depending on depth of analysis. Multi stakeholder team delivers best outcome

TOTAL IMPACTS TOOL 4:
CORPORATE ECOSYSTEM SERVICES REVIEW

WORLD RESOURCES INSTITUTE

NATURAL & CULTURAL CAPITAL TOOL

Intended Client

Industry

Overview

The Corporate Ecosystem Services Review (ESR) consists of a structured methodology that helps managers proactively develop strategies to manage business risks and opportunities arising from their company's dependence and impact on ecosystems.

http://www.wri.org/publication/corporate-ecosystem-services-review

DEVELOPER: WORLD RESOURCES INSTITUTE, MERIDIAN INSTITUTE, WORLD BUSINESS COUNCIL ON SUSTAINABLE DEVELOPMENT

Level of Analysis
Industry, site

Projection/Actual
Projection

Impact Type
Total impacts

Complexity
Low – medium complexity

Cost
Free to download guide and associated 'Dependence and Impact Assessment Tool'

Comparability
Highly comparable

Training Available
Yes

Adaptability
Yes, been used by extractives

SUPPORTERS: MERIDIAN INSTITUTE, WORLD BUSINESS COUNCIL ON SUSTAINABLE DEVELOPMENT

USERS: AKZO NOBEL, BC HYDRO, MONDI, RIO TINTO, SYNGENTA, YVES ROCHER, LAFARGE, AND CEMEX

Extractive Company Use: Anglo American, Jacaré Project (Nickel Mine) Brazilian Amazon Basin. Rio Tinto was a 'road-test' company in the tools development.

Data Inputs Required: Priority ecosystem services (complete Ecosystem Services Dependence and Impact Assessment Tool), business risks and opportunities (operational, regulatory and legal, reputational, market and product, financing)

Method of Quantification

Monetary, qualitative, quantitative. Note: method does not prescribe specific unit of measurement.

Step 1 – Select the scope
Business unit, market, project etc

Step 2 – Identify ecosystem services
Systematically evaluate the company's dependence and impact on more than 20 ecosystem services

Step 3 – Analyse trends in priority services
Research and evaluate the condition and trends in priority ecosystem services, as well as the drivers of these trends

Step 4 – Identify business risks and opportunities
Identify and evaluate business risks and opportunities arising from trends

Step 5 – Develop strategies
Develop strategy for managing risks and opportunities

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS

- Can be used as a standalone tool or integrated into existing management systems
- Widely used
- Developed by reputable organisation

WEAKNESSES

- 'Ecosystem Services Dependence and Impact Assessment Tool' open to internal bias/subjectivity based on internal responses
- Multi stakeholder team will deliver best outcome. Time and labor investment dependant on detail of assessment targeted.

TOTAL IMPACTS TOOL 5:
SUSTAINABILITY ACCOUNTING STANDARD BOARD

NATURAL & CULTURAL CAPITAL

Intended Client
Industry

Level of Analysis
Industry, site

Projection/Actual
Projection

Impact Type
Total impacts

Complexity
Low

Cost
Free. Not time or labour intensive.

Comparability
Highly comparable

Training Available
Yes

Adaptability
Yes, been used by extractives

Overview

The Sustainability Accounting Standard Board's Materiality Map identifies likely material sustainability issues on an industry-by-industry basis. It provides suggested accounting metrics and additional information for each issue. It includes information for oil and gas, coal, iron and steel, and metals and mining.

http://www.sasb.org/materiality/sasb-materiality-map/

DEVELOPER: SUSTAINABILITY ACCOUNTING STANDARDS BOARD

SUPPORTERS: PWC, BLOOMBERG PHILANTHROPIES, FB HERON, TOMKAT CHARITABLE TRUST, GORDON AND BETTY MOORE FOUNDATION, FORD FOUNDATION, DELOITTE, THE DAVID LUCILE AND PACKARD FOUNDATION, THE ROCKEFELLAR FOUNDATION, SURDNA, THE KRESGE FOUNDATION, DORIS DUKE CHARITABLE FOUNDATION, GENERATION FOUNDATION, MORGAN STANLEY, CROWE HORWATH, BRECKENRIDGE CAPITAL, THE BETSY & JESSE FINK FOUNDATION, EILEEN FISHER COMMUNITY FOUNDATION, THE JEREMY GRANTHAM FOUNDATION FOR THE PROTECTION OF THE ENVIRONMENT, THE MCKNIGHT FOUNDATION, METANOIA FUND, ROCKEFELLER BROTHERS FUND, BLOOMBERG LP, BRANDLOGIC, RELATIONSHIP

USERS: BLOOMBERG LP, DUPONT, APACHE CORPORATION, FMC CORPORATION, NASDAQ OMX, NOVO NORDISK,

Extractive Company Use: None identified

Data Inputs Required: No data inputs required.

Method of Quantification

Qualitative. Materiality Map provides summary of material issues for the sector and guidance on accounting metrics that should be reported on/tracked of each material issue. For example, Metals and Mining:

- GHG emissions – Scope 1 emissions
- Air quality – emissions from CO, NOx, SOx, PM, Lead, VOCs
- Human rights – Proven and probable reserves in or near indigenous land
- Labor relations - % of active workforce under collective bargaining agreements

Rating System

Popularity	★★★
Quality	★★★
Extractives Potential	★★☆

STRENGTHS

- Facilitates the prompt identification of material issues
- Identifies financial impacts
- Visual/interactive
- Provides suggested accounting/ reporting metrics for each issue

WEAKNESSES

- Focussed on material issues investors expect to see reported on, may differ to those associated with a particular project or local community/stakeholders

TOTAL IMPACTS TOOL 6:
ISO 26000

NATURAL, SOCIAL, HUMAN CAPITAL

Intended Client

Industry

Level of Analysis

Industry

Projection/Actual

Projection

Impact Type

Total impacts

Overview

ISO 26000 provides *guidance* on how businesses and organizations can operate in a socially responsible way. As it provides *guidance* rather than requirements, it cannot be certified unlike some other well-known ISO standards. It helps clarify what social responsibility is, helps businesses and organizations translate principles into effective actions and shares best practices relating to social responsibility, globally

http://www.iso.org/iso/home/standards/iso26000.htm

DEVELOPER: INTERNATIONAL STANDARDS ORGANISATION

SUPPORTERS: POST PUBLICATION ORGANIZATION, OR PPO, FOR ISO 26000, SWEDISH STANDARDS INSTITUTE (SIS) AND ABNT, BRAZILIAN ASSOCIATION OF TECHNICAL

USERS: A WIDE NUMBER OF TARGET COMPANIES THAT NEED TO FULFILL THEIR COMMITMENT TO

Extractive Company Use: None identified (referenced in 'Why human rights matter' by Rio Tinto)

Data Inputs Required: Existing information on core subject areas: organisational governance, human rights, labor practices, environment, fair operating practices, consumer issues, community involvement and development

Complexity

Low

Cost

USD$195

Comparability

High

Training Available

Yes, via third parties (i.e. SGS)

Adaptability

Yes, can be used for extractives

Method of Quantification

Qualitative. Standard provides guidance on how to integrate social responsibility aspects into business strategy.

Rating System

Popularity	★ ★ ★
Quality	★ ★ ★
Extractives Potential	★ ★ ☆

STRENGTHS

- Provides a good starting point for organisations on relevant corporate social responsibility issues
- Produced by a reputable organisation

WEAKNESSES

- Does not allow for third party auditing and certification
- Standard only provides high level guidance
- Expectations are vague
- Time and resource intensive, multi stakeholder team required for successful implementation.

TOTAL IMPACTS TOOL 7:

<IR>

SOCIAL AND HUMAN CAPITAL

Intended Client

Industry

Level of Analysis

Industry

Projection/Actual

Actual

Impact Type

Total impact

Complexity

Medium

Cost

Free

Comparability

Highly

Training Available

Yes

Adaptability

Used by extractives

Overview

Applies principles and concepts that are focused on bringing greater cohesion and efficiency to the reporting process, and adopting 'integrated thinking' as a way of breaking down internal silos and reducing duplication. It improves the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital.

http://integratedreporting.org/resource/international-ir-framework/

DEVELOPER: THE INTERNATIONAL INTEGRATED REPORTING COUNCIL (IIRC)

SUPPORTERS: THE INTERNATIONAL INTEGRATED REPORTING COUNCIL (IIRC)

USERS: N/A

Extractive Company Use: Anglo American (Kumba Iron Ore), ArcelorMittal

Data Inputs Required: Revenue ($), production (tonnes/PJ etc), sales volumes (tonnes/PJ etc), energy consumption (GJ), water consumption (m3), no. of safety incidents, work hours, investment in employee housing and training schemes etc.

Method of Quantification

» Monetary (i.e. revenue ($), expenditure ($), unit cost - $/tonne) and quantitative (i.e. safety – lost-time injury frequency rate, environment – energy consumption (GJ)

» Depending on indicator company reports, quantification method involves collecting relevant internal data as outlined above and including intensity rates or absolute numbers within reporting.

Rating System

Popularity ★ ★ ★

Quality ★ ★ ★

Extractives Potential ★ ★ ★

STRENGTHS	WEAKNESSES
» Provides clear set of guiding principles and elements » Internationally recognised	» Focussed on corporate reporting (lag indicator) » Time and labor intensive if undertaking for the first time

TOTAL IMPACTS TOOL 8:
NATURAL CAPITAL PROTOCOL

NATURAL CAPITAL COALITION

NATURAL CAPITAL TOOL

Intended Client
Industry

Level of Analysis
Industry

Projection/Actual
Projection

Impact Type
Total impacts

Complexity
Low

Cost
Free

Comparability
Low

Overview
The Natural Capital Protocol is a framework designed to help generate trusted, credible, and actionable information for business managers to inform decisions. The Protocol provides a standardized framework to identify, measure, and value impacts and dependencies on natural capital.

http://naturalcapitalcoalition.org/protocol/

DEVELOPER: THE NATURAL CAPITAL COALITION

Extractive Company Use: None identified (Shell participated in pilot program)

Data Inputs Required: Need to identify and understand natural capital impacts and drivers. Criteria to complete a materiality assessment needs to be established. Based on the aforementioned relevant data (as determined by the user) then needs to be collected.

Method of Quantification
» Quantification neutral (i.e. doesn't promote the use of specific tools or quantification methods, framework only)

Training Available

Yes

Adaptability

Yes, can be used by extractives at a high level (currently only two sector guides have been created for apparel, and food and beverage)

Rating System

Popularity ★☆☆

Quality ★☆☆

Extractives Potential ★☆☆

STRENGTHS

- Provides a standardised process that is also flexible in the choice of measurement and valuation approaches
- Builds on existing tools, guides, methods and techniques to identify, measure and value natural capital

WEAKNESSES

- It doesn't necessarily produce results that are comparable within or between different businesses or applications
- Time and labor intensity dependent on level of detail user is striving for. Multi stakeholder team required to deliver best outcome.

TOTAL IMPACTS TOOL 9: SYSTAIN'S ESTELL

NATURAL, SOCIAL, PHYSICAL, FINANCIAL,

Intended Client

Industry

Level of Analysis

Industry

Projection/Actual

Actual

Impact Type

Total Impact

Complexity

Medium

Cost

No information

Overview

Systain's estell used by The Otto Group and Siemens Group has measured and valued the use of natural capital covering all major activities of the groups. The scope includes downstream activities, environmental and social hot spots. The Otto Group uses estell, an extended multi-regional input output model covering 45 regions and 130 sectors, to gain transparency on the impacts caused by business activities.

http://estell-en.systain.com/

DEVELOPER: SYSTAIN

SUPPORTERS OTTO GROUP (SYSTAIN IS THE CONSULTING ARM OF THE OTTO GROUP AND ESTELL IS THEIR PROPRIETARY TOOL)

USERS: OTTO GROUP, SIEMENS GROUP

Extractive Company Use: No cases identified

Data Inputs Required: The inputs to Estell are supply of purchasing volume figures by product group and country of manufacturing from your controlling system along with the supply of sales figures.

Method of Quantification

- Qualitative (Estell outputs the environmental impact per product category, the environmental stress in the supply chain, and a sustainability impact scorecard).

Comparability
Medium

Training Available
Yes

Adaptability
Designed for industry in general, including

Rating System

Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

- Full transparency about the environmental impacts in the supply chain, own locations and customers.
- Preparation of a customized environmental P&L account and way for natural capital accounting.
- Provides a basis for sustainability and integrated reporting. This includes suggesting measures for impact reduction, particularly environmental pollution.
- Strong risk assessment tools for current and potential suppliers.

WEAKNESSES

- Geographical limitation to 48 countries
- Limited number of success stories

TOTAL IMPACTS TOOL 10:
GLOBAL ENVIRONMENTAL MANAGEMENT INITIATIVE'S (GEMI)

NATURAL, SOCIAL, PHYSICAL, FINANCIAL,

Intended Client
Industry

Overview

The Global Environmental Management Initiative's (GEMI) Metrics Navigator™ is a tool to help organizations develop and implement metrics that provide insight into complex issues, support business strategy and contribute to business success. The tool presents a thorough, six-step process to select, implement and evaluate a set of "critical few" metrics that focus on an organization's success. Each step of the tool provides guidance in the form of a worksheet, series of questions or checklist.

http://gemi.org/metricsnavigator/

DEVELOPER: THE GLOBAL ENVIRONMENTAL

Level of Analysis

Industry

Projection/Actual

Projection

Impact Type

Total impact

Complexity

Medium

Cost

Free

Comparability

Medium

Training Available

No

Adaptability

Designed for industry in general, including extractives

SUPPORTERS: 3M, ABBOT, ANHEUSER-BUSCH INC, ASHLAND INC, BRISTOL-MYERS SQUIBB COMPANY, BNSF RAILWAY COMPANY, CADBURY SCHWEPPES PLC, CARNIVAL CORPORATION, THE COCA-COLA COMPANY, CONAGRA FOODS, DELL INC., THE DOW CHEMICAL COMPANY, DUKE ENERGY, DUPONT, EASTMAN KODAK COMPANY, ELI LILLY AND COMPANY, FEDEX, GLAXOSMITHKLINE, HP, INTEL CORPORATION, JOHNSON & JOHNSON, JOHNSON CONTROLS INC, JOHNSON DIVERSEY INC, KOCH INDUSTRIES INC, KRAFT FOODS INC, MERCK & COMPANY, MIRANT CORPORATION, MOTOROLA INC, NOVARTIS CORPORATION, OCCIDENTAL PETROLEUM CORPORATION, OWENS CORNING, PFIZER INC, PROCTER & GAMBLE, ROCHE, SCHERING-PLOUGH CORPORATION, THE SCOTTS COMPANY, SMITHFIELD FOODS, SOUTHERN COMPANY, TEMPLE-INLAND,

USERS: T3M, ABBOT, ANHEUSER-BUSCH INC, ASHLAND INC, BRISTOL-MYERS SQUIBB COMPANY, BNSF RAILWAY COMPANY, CADBURY SCHWEPPES PLC, CARNIVAL CORPORATION, THE COCA-COLA COMPANY, CONAGRA FOODS, DELL INC., THE DOW CHEMICAL COMPANY, DUKE ENERGY, DUPONT, EASTMAN KODAK COMPANY, ELI LILLY AND COMPANY, FEDEX, GLAXOSMITHKLINE, HP, INTEL CORPORATION, JOHNSON & JOHNSON, JOHNSON CONTROLS INC, JOHNSON DIVERSEY INC, KOCH INDUSTRIES INC, KRAFT FOODS INC, MERCK & COMPANY, MIRANT CORPORATION, MOTOROLA INC, NOVARTIS CORPORATION, OCCIDENTAL PETROLEUM CORPORATION, OWENS CORNING, PFIZER INC, PROCTER & GAMBLE, ROCHE, SCHERING-PLOUGH CORPORATION, THE SCOTTS COMPANY, SMITHFIELD FOODS, SOUTHERN COMPANY, TEMPLE-INLAND, TYSON FOODS, WYETH

Extractive Company Use: No cases identified

Data Inputs Required: The inputs to GEMI Metrics Navigator are 6 steps of logical thinking and worksheets that are completed by including the organizational internal processes.

Method of Quantification

» Qualitative (GEMI Metrics Navigator provides the non-financial metrics that complement traditional financial measurement systems to help businesses achieve long-term success and evaluate business opportunities).

Rating System

Popularity	★★★
Quality	★★☆
Extractives Potential	★★☆

STRENGTHS

» 6 steps that are easy to follow to determine the essential non-financial success factors

» Provides the essential factors for sustaining business success complementing financial metrics

» Can be applied at any organizational level

WEAKNESSES

» The output is as good as the thinking logic that went into it.

TOTAL IMPACTS TOOL 11:

True Price™

NATURAL, SOCIAL, PHYSICAL, FINANCIAL,

Intended Client
Industry

Level of Analysis
Industry

Projection/Actual
Actual

Impact Type
Total impact

Complexity
Medium

Cost
n/a

Comparability
Medium

Training Available
Yes

Adaptability
Designed for industry in general, including extractives

Overview

The true price of a product reflects the visible as well as the hidden costs of its production, so called externalities. It is defined as the sum of the retail price and the unpaid environmental and social costs, like water use and under payment.

http://trueprice.org/services/what-do-we-do/true-price/

DEVELOPER: TRUE PRICE

SUPPORTERS: AKZONOBEL, CNV INTERNATIONAL, DELOITTE, DSM, EY, ICCO, IDH, FMO, NCDO, RABOBANK, OXFAM NOVIB GROW CAMPAIGN, PRICEWATERHOUSECOOPERS, NATURAL CAPITAL COALITION,

USERS: SCHIPHOL GROUP, ROYAL DSM, ABN AMRO, ROYAL BAM N.V., UNEP, ACHMEA, AKZONOBEL, TONY'S CHOCOLONELY, HIVOS

Extractive Company Use: No cases identified

Data Inputs Required: External costs and benefits to the community

Method of Quantification

» Quantitative (True Price outputs the real price of products including hidden costs).

Rating System

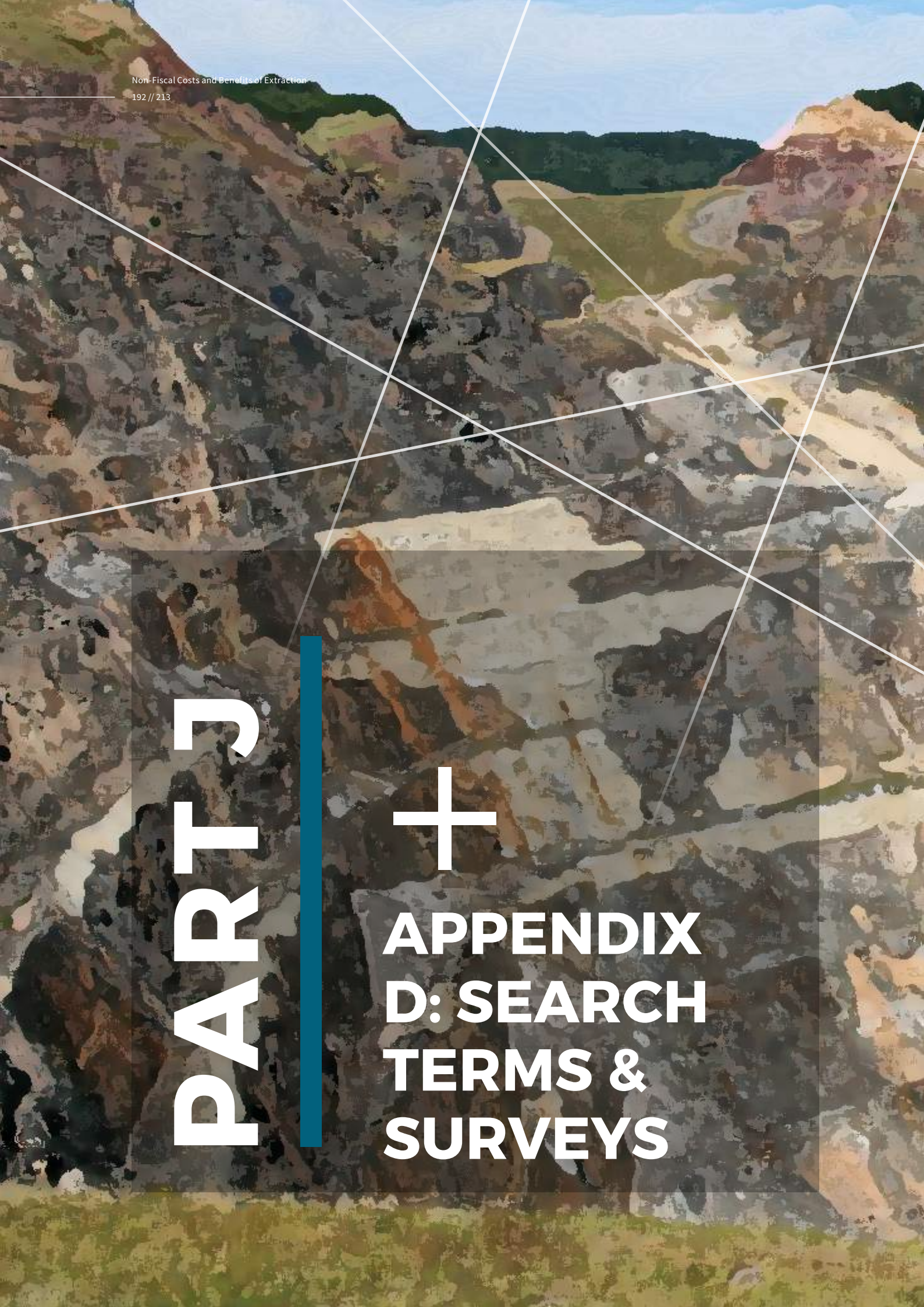
Popularity	★★☆
Quality	★★★
Extractives Potential	★★★

STRENGTHS

» n/a

WEAKNESSES

» n/a



PART 7

+ APPENDIX D: SEARCH TERMS & SURVEYS

SEARCH TERMS & SURVEYS

PART A

Search 1.1. //

Natural capital - extractives

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Biodiversity OR "natural capital" OR (environment or environmental) OR ecosystem OR landscape OR air OR water OR ("Greenhouse Gas" OR GHG)"

Search 1.2. //

Natural capital - business

- "Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Biodiversity OR "natural capital" OR (environment*) OR ecosystem OR landscape OR air OR water or Green House Gas / GHG

Search 1.3. //

Social capital[1] - extractives[1]

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: (Extractive OR Extraction OR Extract) OR Mining OR ("Oil and gas" OR "Oil" OR "Gas" OR LNG OR "liquefied natural gas")
- Term 3: Social OR "social impact" OR "social return" OR employment OR jobs OR conflict OR (culture OR cultural) OR community OR governance

Search 1.4. //

Social capital - business

- Term 1: Measuring OR (valuing OR valuation OR value) OR (quantify OR quantification) OR (Tool OR Method)
- Term 2: Business OR Industry OR Company
- Term 3: Social OR "social impact" OR "social return" OR employment OR jobs OR conflict OR (culture OR cultural) OR community OR governance

STAKEHOLDER SURVEY

PART B

Measurement of the Non-Fiscal Costs and Benefits of Extraction: Survey for NRGI Project

Non-Fiscal Costs and Benefits of Extraction Project

Calling all who have an interest in the social and environmental impacts of the extractive sector. The Natural Resource Governance Institute (NRGI) is gathering information on the various tools and methodologies used by governments, extractive companies, multilaterals, donors, academics, consulting companies and civil society organisations to measure the non-fiscal costs and benefits of the extractive sector.

Project Background
The extraction of natural resources can generate substantial fiscal revenues for a country through royalties, taxes, levies and other income to the state. At the same time, extractive activities produce a range of positive and negative economic, social, institutional, environmental, political and cultural impacts for a diverse range of local, regional, national and global stakeholders.

When assessing the net impact of proposed extractive projects, or the performance of existing extractive projects, these "non-fiscal costs and benefits" are rarely subjected to the same level of measurement as fiscal revenues.

Questionnaire

Please fill out this questionnaire if you have an interest in the social and environmental impacts of the extractive sector. You may be working in academe, industry, a civil society organisation, a multilateral organisation or donor, a consulting company, or a government agency with responsibility for extractive projects.

The purpose of the questionnaire is to gather information on tools and methods to assess the non-fiscal costs and benefits of extraction. This may include tools and methods that assess the various forms of 'capital' that are impacted by extractive projects, such as natural capital, social capital, political capital, financial capital, physical capital, human capital, cultural capital and spiritual capital.

We are also looking to identify others who are working on tools, methods and best-practice frameworks to measure non-fiscal impacts in the extractive sector. The questionnaire should only take about 10 minutes to complete. By completing the questionnaire, you'll help the research team identify which tools and methods are being used by the global community so that we can incorporate existing methods into our review of current practice.

Participation in this questionnaire is voluntary. Your responses will be kept confidential and reported at an aggregated level. If you have any questions about the questionnaire or the project, please contact Dr Tim Grice on the details below

Important: Throughout this questionnaire, we refer to the 'non-fiscal' costs and benefits of extractive projects. Non-fiscal costs and benefits include the various forms of 'capital' that are impacted by extractive projects, such as natural capital, social capital, political capital, financial capital, physical capital, human capital, cultural capital and spiritual capital.

1. Form your experience, how effective are the following stakeholders when assessing the non-fiscal costs and benefits of existing extractive projects?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

2. Form your experience, how effective are the following stakeholders in taking non-fiscal impacts into account when evaluating whether new extractive projects should be approved?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

3. Do you know of any government agencies, extractive companies, multilaterals, donors, civil society organisations or other groups who are working on ways to better quantify the non-fiscal costs and benefits of extractive projects? Please list in the box below, or move to the next question if you can't think of any.

Important: Throughout this questionnaire, we refer to the 'non-fiscal' costs and benefits of extractive projects. Non-fiscal costs and benefits include the various forms of 'capital' that are impacted by extractive projects, such as natural capital, social capital, political capital, financial capital, physical capital, human capital, cultural capital and spiritual capital.

1. Form your experience, how effective are the following stakeholders when assessing the non-fiscal costs and benefits of existing extractive projects?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

2. Form your experience, how effective are the following stakeholders in taking non-fiscal impacts into account when evaluating whether new extractive projects should be approved?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

3. Do you know of any government agencies, extractive companies, multilaterals, donors, civil society organisations or other groups who are working on ways to better quantify the non-fiscal costs and benefits of extractive projects? Please list in the box below, or move to the next question if you can't think of any.

4. Do you know of any tools, methodologies or frameworks that measure the non-fiscal costs and benefits of extractive projects? Please provide details below, or move to the next question if you can't think of any.

5. Can you think of any countries who effectively measure or manage the non-fiscal costs and benefits of extractive projects? If so, which countries, and why do you think these countries measure or manage non-fiscal costs and impacts of extractive projects effectively? Please provide details below, or move to the next question if you can't think of any.

6. Can you think of any examples of regulatory or legislative mechanisms that provide for the measurement of the non-fiscal impacts for extractive projects? Please provide details below, or move to the next question if you can't think of any.

7. In your opinion, why are government agencies effective/ineffective in how they evaluate the non-fiscal costs and benefits of extractive projects?

The questions in the final part of the survey ask you about the measurement of impacts across various forms of 'capital'. A capital is a stock of something of value that can be enhanced or depleted.

The capitals that are used in this survey are:

- Natural capital - includes the stocks and flows of environmental resources such as land, agricultural resources, water and air
- Social capital - includes societal structures, institutions and groups, and the relationships between them
- Political capital - includes the existence and effective functioning of governance institutions
- Cultural and spiritual capital - includes local culture, traditions, heritage sites, languages, spiritual beliefs and religions
- Human capital - includes knowledge, skills, wellbeing and motivation
- Physical capital - includes built or manufactured assets such as roads, airports, water systems and telecommunications infrastructure
- Financial capital - includes income and other revenues

8. Looking at the capitals below, how effectively are positive and negative impacts being measured in the extractive sector?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Natural capital	◯	◯	◯	◯	◯
Social capital	◯	◯	◯	◯	◯
Political capital	◯	◯	◯	◯	◯
Cultural and spiritual capital	◯	◯	◯	◯	◯
Human capital	◯	◯	◯	◯	◯
Physical capital	◯	◯	◯	◯	◯
Financial capital	◯	◯	◯	◯	◯

NRGI PRIORITY COUNTRY QUESTIONNAIRE

PART C

Measurement of the Non-Fiscal Costs and Benefits of Extraction: NRGI Priority Country Questionnaire

Greetings NRGI team,

This brief questionnaire is part of the project to assess approaches to measuring the 'non-fiscal' costs and benefits of extraction.

The first part of the questionnaire is to gauge the relative importance of the different types of non-fiscal impacts across NRGI priority countries.

The second part of the questionnaire is to gather information about the governance and capacity in place to assess non-fiscal impacts in NRGI priority countries.

By completing the survey, you'll help the research team identify which non-fiscal impacts should be prioritised when identifying methods and tools for quantification, and how these methods and tools could be applied in NRGI priority countries.

If you have any questions about the survey or the project, please contact me directly on the details below, or Nicola Woodroffe who is overseeing the project.

Best regards,

Dr Tim Grice
E: tim@leapfrogi.com
S: dr.tim.grice

Measurement of the Non-Fiscal Costs and Benefits of Extraction: NRGI Priority Country Questionnaire

Measurement of the Non-Fiscal Costs and Benefits of Extraction: NRGI Priority Country Questionnaire

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Best regards,

Dr Tim Grice
E: tim@leapfrogi.com
S: dr.tim.grice

Measurement of the Non-Fiscal Costs and Benefits of Extraction: NRGI Priority Country Questionnaire

Introduction

The questions in this first part of the survey ask you to rate the extent to which extractive projects in your NRGI Priority Country will have a positive or negative impact on various forms of 'capital'.

A 'capital' is a stock of something of value that can be enhanced or depleted. The capitals that are used in this survey are natural capital, social capital, political capital, cultural and spiritual capital, human capital, physical capital and financial capital.

For impacts under each of these capitals, you will be asked to indicate the extent to which you think extractive projects in your NRGI priority country will result in a positive or negative impact on a scale of -100 (very negative) to +100 (very positive).

Your Name, Role and NRGI Priority Country

Please fill in your name, role and NRGI priority country in the boxes below.

1. Your name

2. Your role at NRGI

3. Which NRGI priority country are you evaluating in this survey?

NRGI Priority Country Impact Assessment

4. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of natural capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Air quality	☐	☐	☐	☐	☐	☐	☐	☐	☐
Climate change / greenhouse gas emissions	☐	☐	☐	☐	☐	☐	☐	☐	☐
Water consumption (use of water by extractive projects)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Water pollution (riverine or deep sea tailings, or sediment run-off / disposal)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land and soil	☐	☐	☐	☐	☐	☐	☐	☐	☐
Agricultural resources	☐	☐	☐	☐	☐	☐	☐	☐	☐
Forest reserves	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mineral reserves	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wetlands and coastal areas	☐	☐	☐	☐	☐	☐	☐	☐	☐
Biodiversity	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to natural capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of social capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Trust and goodwill between stakeholders	☐	☐	☐	☐	☐	☐	☐	☐	☐
Collaboration between stakeholders, including sharing of practical, financial, intellectual, or professional resources	☐	☐	☐	☐	☐	☐	☐	☐	☐
Leadership structures of stakeholder groups	☐	☐	☐	☐	☐	☐	☐	☐	☐
Civil engagement and contribution to community life (e.g., volunteering, political participation)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to social capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

6. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of political capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Capacity of state agencies who regulate the extractive sector	☐	☐	☐	☐	☐	☐	☐	☐	☐
The governance framework for the extractive sector, including policy, acts, standards and regulations	☐	☐	☐	☐	☐	☐	☐	☐	☐
Governance practices around transparency	☐	☐	☐	☐	☐	☐	☐	☐	☐
Citizen voice / inclusion in the extractive sector	☐	☐	☐	☐	☐	☐	☐	☐	☐
Prevalence of corruption	☐	☐	☐	☐	☐	☐	☐	☐	☐
Management of land rights issues	☐	☐	☐	☐	☐	☐	☐	☐	☐
Professionalism / behavior of police and security forces	☐	☐	☐	☐	☐	☐	☐	☐	☐
Concentration of power	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to political capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

7. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of financial capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Fiscal revenue (royalties, taxes and levies, and other revenues to the state)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Funding to regional or local groups for community development projects	☐	☐	☐	☐	☐	☐	☐	☐	☐
Direct income, rental payments, equity or investment dividends to landowners	☐	☐	☐	☐	☐	☐	☐	☐	☐
Direct income at the local level (e.g., local content such as employment and procurement of goods and services)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Indirect income at the local level (e.g., flow-on effects from positive economic impacts, increases in government services)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Direct income at the national level (e.g., local content such as employment and procurement of goods and services)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Indirect income at the national level (e.g., flow-on effects from positive economic impacts, increases in government services)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Savings and investments for future generations	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to financial capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

8. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of physical capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Transport infrastructure (road, rail, tram, airport)	☐	☐	☐	☐	☐	☐	☐	☐	☐
Power infrastructure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Water and sewerage infrastructure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Telecommunica-tions and internet services	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other urban infrastructure and public spaces	☐	☐	☐	☐	☐	☐	☐	☐	☐
Physical plant and manufacturing infrastructure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to physical capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

9. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of human capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Knowledge, skills and abilities	☐	☐	☐	☐	☐	☐	☐	☐	☐
Work experience	☐	☐	☐	☐	☐	☐	☐	☐	☐
Health and nutrition	☐	☐	☐	☐	☐	☐	☐	☐	☐
Individual self-esteem and wellbeing	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to human capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

10. To what extent do you think extractive projects in your country will result in positive or negative impacts to the following forms of cultural and spiritual capital?

	VERY NEGATIVE IMPACT		NEGATIVE IMPACT		NEUTRAL IMPACT		POSITIVE IMPACT		VERY POSITIVE IMPACT
	-100	-75	-50	-25	0	+25	+50	+75	+100
Traditional culture, values and practices	☐	☐	☐	☐	☐	☐	☐	☐	☐
Access to areas and sites of cultural/spiritual significance	☐	☐	☐	☐	☐	☐	☐	☐	☐
Use of traditional languages	☐	☐	☐	☐	☐	☐	☐	☐	☐
Traditional religions and spiritual beliefs	☐	☐	☐	☐	☐	☐	☐	☐	☐
Looking at the above impacts to cultural and spiritual capital, what do you think the impact will be for future generations?	☐	☐	☐	☐	☐	☐	☐	☐	☐

11. Looking at the capitals below, how effectively are positive and negative impacts being measured in the extractive sector?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Natural capital	◯	◯	◯	◯	◯
Social capital	◯	◯	◯	◯	◯
Political capital	◯	◯	◯	◯	◯
Cultural and spiritual capital	◯	◯	◯	◯	◯
Human capital	◯	◯	◯	◯	◯
Physical capital	◯	◯	◯	◯	◯
Financial capital	◯	◯	◯	◯	◯

12. How important is it to measure the impacts of extractive projects across the different capitals?

	Not important	Slightly Important	Moderately important	Important	Very important
Natural capital	◯	◯	◯	◯	◯
Social capital	◯	◯	◯	◯	◯
Political capital	◯	◯	◯	◯	◯
Cultural and spiritual capital	◯	◯	◯	◯	◯
Human capital	◯	◯	◯	◯	◯
Physical capital	◯	◯	◯	◯	◯
Financial capital	◯	◯	◯	◯	◯

13. How difficult or easy do you think it is to measure the impacts of extractive projects across the capitals?

	Very difficult	Difficult	In between	Easy	Very easy
Natural capital	◯	◯	◯	◯	◯
Social capital	◯	◯	◯	◯	◯
Political capital	◯	◯	◯	◯	◯
Cultural and spiritual capital	◯	◯	◯	◯	◯
Human capital	◯	◯	◯	◯	◯
Physical capital	◯	◯	◯	◯	◯
Financial capital	◯	◯	◯	◯	◯

NRGI Priority Country Governance and Capacity Assessment

The second and final part of the questionnaire gathers information on the governance framework for assessing non-fiscal costs and benefits in your chosen NRGI priority country. This part of the survey also asks you to assess the in-country capacity in place to conduct and review assessments of non-fiscal impacts.

14. Please list the governance agencies (ministries, departments, authorities, regulators) who are responsible for extractive sector governance in your NRGI priority country:

15. Overall, how effective are these government agencies when assessing the non-fiscal costs and benefits of existing extractive projects?

Not important	Slightly Important	Moderately important	Important	Very important
◯	◯	◯	◯	◯

16. Do these government agencies adequately take non-fiscal impacts into account when evaluating whether or not a new extractive project should be approved?

Not at all	Not enough	Not sure	Somewhat	Very much so
◯	◯	◯	◯	◯

17. In your opinion, why are these government agencies effective/ineffective in how they evaluate the non-fiscal costs and benefits of extractive projects?

18. What are the relevant legislative instruments (e.g., policies, acts, legislation) that govern how non-fiscal impacts are monitored for existing extractive projects in your country?

19. What are the relevant legislative instruments (e.g., policies, acts, legislation) that govern how non-fiscal impacts are assessed and taken into account in the approval process for new extractive projects in your country?

20. In your opinion, do these legislative instruments (e.g., policies, acts, legislation) adequately incorporate non-fiscal impacts into the governance of extractive

Not at all	Not enough	Not sure	Somewhat	Very much so
○	○	○	○	○

21. In your opinion, why are these legislative instruments adequate/inadequate in the way that they incorporate the non-fiscal impacts of extractive projects?

22. Form your experience, how effective are the following stakeholders when assessing the non-fiscal costs and benefits of existing extractive projects?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

23. Form your experience, how effective are the following stakeholders in taking non-fiscal impacts into account when evaluating whether new extractive projects should be approved?

	Very ineffective	Ineffective	Somewhat effective	Effective	Very effective
Governments and regulators	◯	◯	◯	◯	◯
Extractive companies	◯	◯	◯	◯	◯
Local communities and landowners	◯	◯	◯	◯	◯
Multilateral and donor organisations	◯	◯	◯	◯	◯
Civil society organisations	◯	◯	◯	◯	◯

24. What level of stakeholder capacity exists within your NRGI priority country to directly assess non-fiscal impacts (i.e., carry out an assessment of the social and environmental impacts of an extractive project)?

	Very weak capacity	Weak capacity	In between	Strong capacity	Very strong capacity
State / national government	◯	◯	◯	◯	◯
Regional / local government	◯	◯	◯	◯	◯
Consultants	◯	◯	◯	◯	◯
Academia	◯	◯	◯	◯	◯
Extractive Companies	◯	◯	◯	◯	◯
National civil society organisations	◯	◯	◯	◯	◯
Local communities near extractives projects	◯	◯	◯	◯	◯

25. What level of capacity exists within your NRGI priority country to review and comprehend social and environmental impact assessments (i.e., a social and environmental impact assessment conducted by a third-party)

	Very weak capacity	Weak capacity	In between	Strong capacity	Very strong capacity
State / national government	◯	◯	◯	◯	◯
Regional / local government	◯	◯	◯	◯	◯
Consultants	◯	◯	◯	◯	◯
Academia	◯	◯	◯	◯	◯
Extractive Companies	◯	◯	◯	◯	◯
National civil society organisations	◯	◯	◯	◯	◯
Local communities near extractives projects	◯	◯	◯	◯	◯

26. Is there anything else that you 26 would like to add?

Thank you for your time completing the questionnaire.

Please click the 'done' button below.

If you have any questions about the survey or the project, please contact me directly on the details below, or Nicola Woodroffe who is overseeing the project.

Best regards,

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S: dr.tim.grice

MEASURING THE NON-FISCAL COSTS AND BENEFITS OF EXTRACTION

JULY 2017

PREPARED FOR

The Natural Resource Governance Institute

AUTHOR

Dr Tim Grice