

Session 3 Measuring the impacts of mining: Environmental, Ecological, and Economic Perspectives

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MINING PHILIPPINES 2023



Towards a Transformative and Sustainable Mineral Resources Development for Climate Action

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Measuring the Impacts of Mining: Environmental, Ecological, and Economic Perspectives

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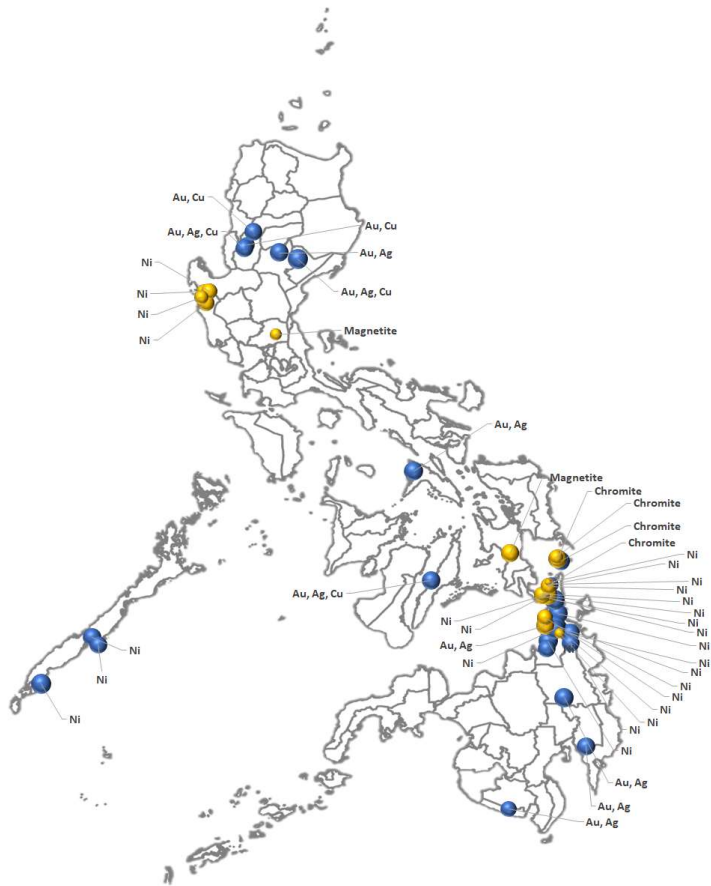
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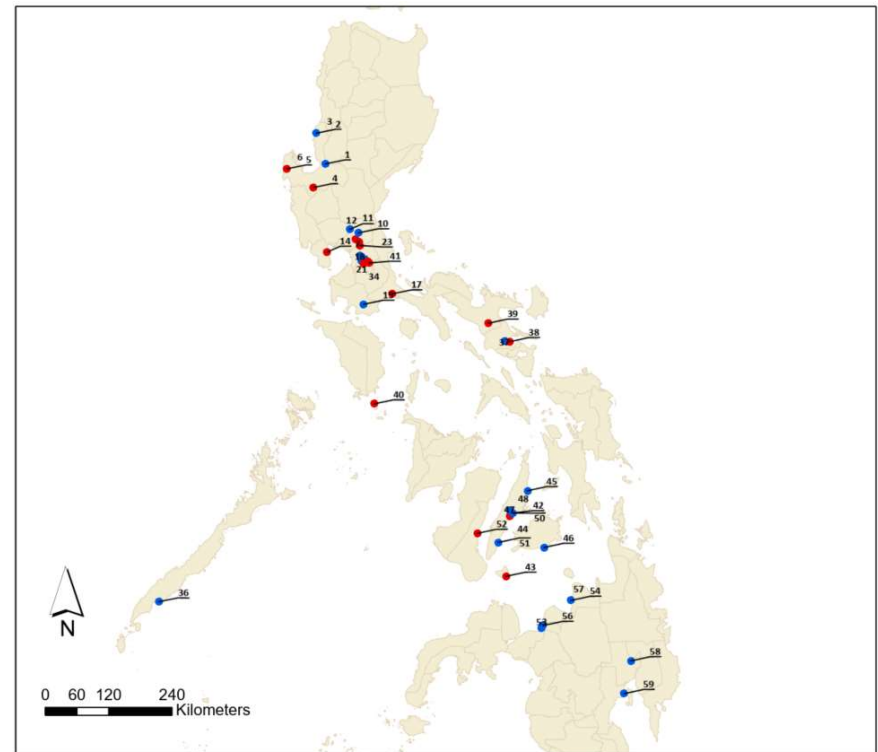
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Indicative locations of Metallic and Non-Metallic Mining Operations

Large-scale Metallic Mining Operations



Large-Scale Metallic Mining Operations

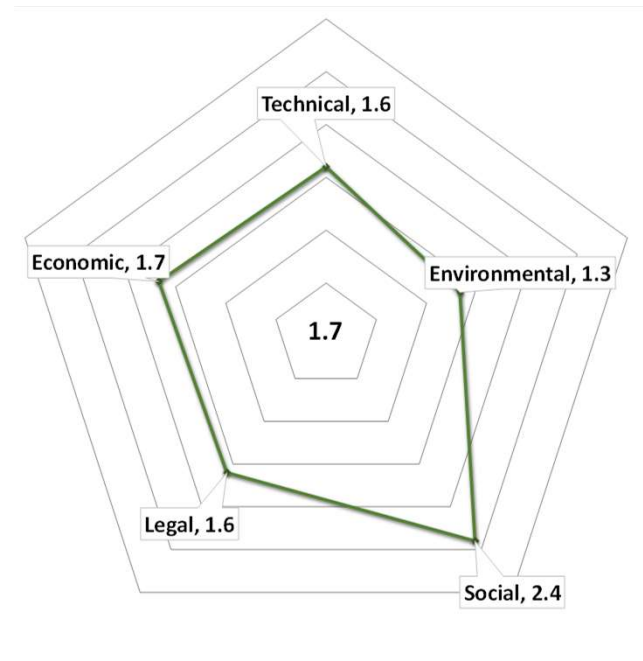


Impact Assessment vs. Impact Evaluation

Impact Criteria	Impact Assessment	Impact Evaluation
Timing and Purpose	Before or during the implementation; predictive, forward looking; prospective	After implementation, actual effects; retrospective; achievement of intended goals
Data Collection	Surveys, lit review, modeling, expert consultation	Surveys, randomized control trials, before-and-after comparisons, control group comparisons
Research Design	Prospective, focus on potential causal relationship, scenario analysis or modeling	Establish causal relationship between intervention and observed outcomes
Focus on Attribution	Considers potential impact; it does not aim to attribute observation to intervention; understanding of possible effects	Seeks to attribute changes or impacts to the intervention by comparing outcomes of intervention group with those of a control group
Use and Reporting	Inform decision-makers about potential impacts for the design and planning of intervention	Report the effectiveness, efficiency and unintended consequences of completed interventions.

Aspects Mining Operation for Impact Assessment/Evaluation

- **Technical framework** (mining operations): comprehensive assessment to enhance the sustainability, technical efficiency, and environmental performance of quarry operations
- **Legal framework**: comprehensive investigation into the compliance of quarry operations with existing substantive and procedural rules and regulations
- **Environmental framework**: change in environmental conditions vis a vis pre-mining operations as contained in EIA i.e., change in flora and fauna, geomorphic changes and impact on quality of environmental assets e.g., water, soil, vegetation etc. Incorporates climate change risks
- **Social framework**: Social and demographic changes i.e., health, education, social welfare services, housing and utilities, livelihood and employment and cultural heritage (social capital), and poverty
- **Economic framework**: economic contributions, its financial sustainability, economic efficiency, contribution to the economic welfare of the communities, and accounting of benefits and costs (BCA)



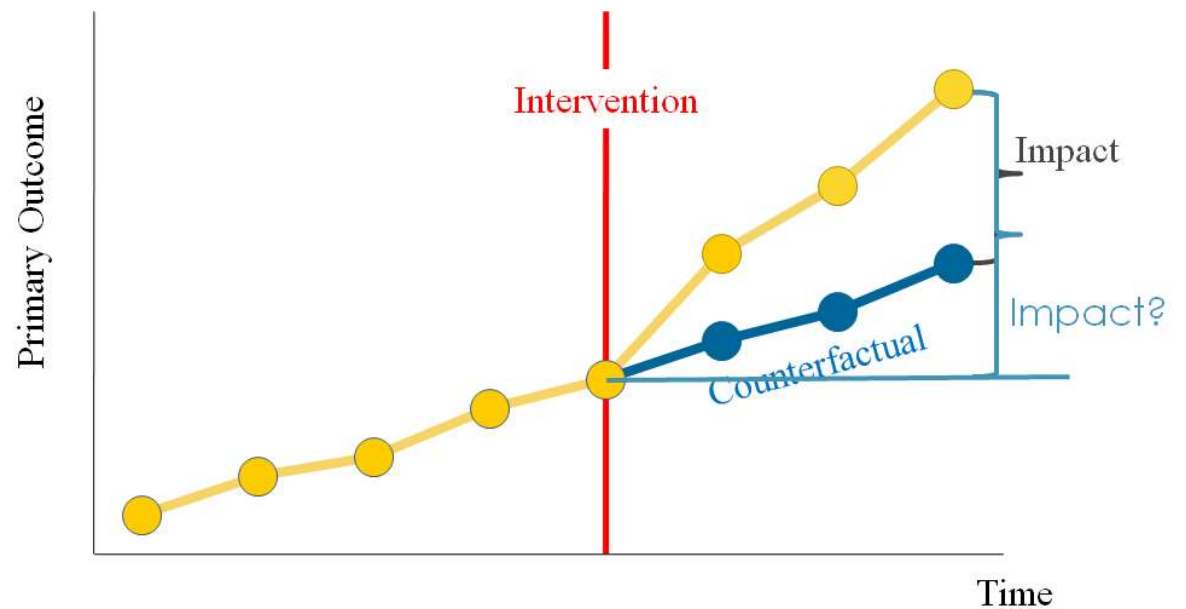
Impact Evaluation Framework

•Process Evaluation

- **Factual analysis** – knowing what happened, to whom, where, in what magnitude
- Project components
- Taxes and royalties paid
- Mechanisms for planning, budgeting and monitoring

•Impact Evaluation

- **Counterfactual analysis** – comparing what happened to the beneficiaries against what happened to a comparison group – those identical to beneficiaries but did not receive program benefits



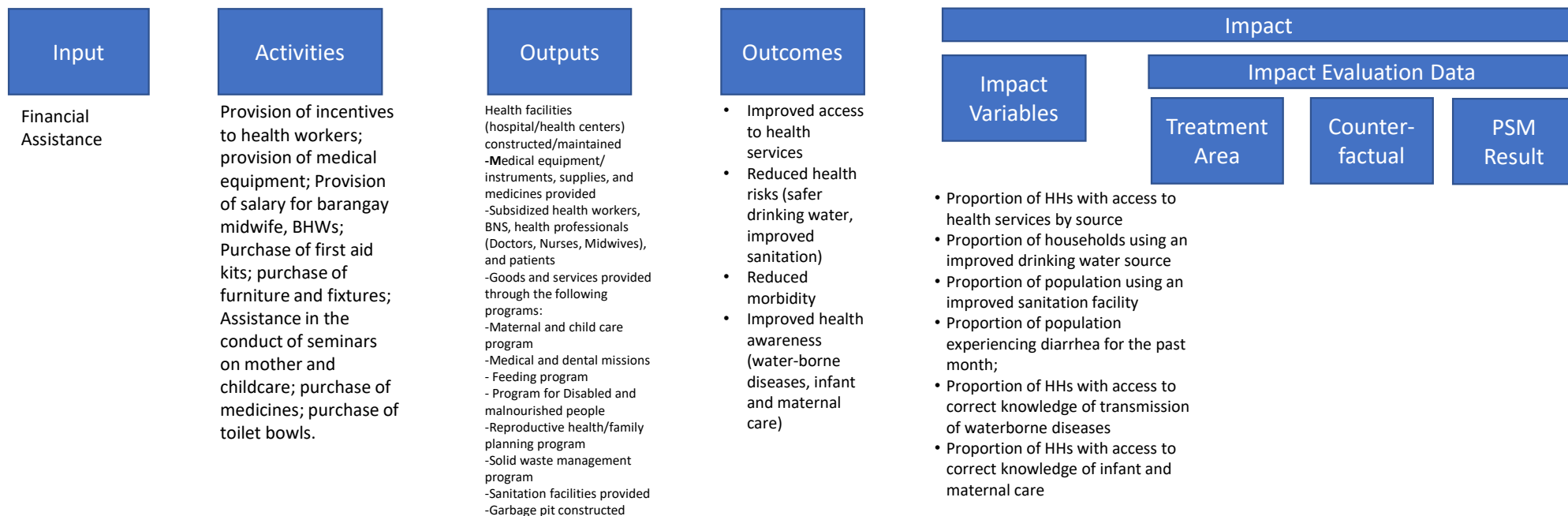
SDMP Goals

Development of a self-reliant community with enhanced capability to develop, manage and implement social development programs in a sustainable manner:

1. Human Resource Development and Institutional Building
2. Enterprise Development and Networking
3. Assistance to Infrastructure Development and Support Services
4. Access to Education and Educational Support Programs
5. Access to Health Services, Health Facilities and Health Professionals
6. Protection and Respect of Socio-Cultural Values

Assistance to Health Services, Health Facilities and Health Professionals

Objective(s): Achieve overall improvement in the living conditions and health of the host and neighboring communities; each individual has access to information and services that will bring about health and well being; emphasizing the need to provide accessible and acceptable health services through the participatory strategies such as health education, training of barangay health workers, community building and organizing.



Assumptions: Project inputs are available, adequate and delivered on time.

Community hospital/health center is functional/open; There is an adequate number of health professionals to meet local need; Intended beneficiaries are aware of and avail of the health facilities, goods and services offered; The supply of medicines and medical supplies is adequate to meet the local need

Patients follow the advice of health professionals; Patients have money to buy prescribed medicines or medical supplies or treatment; Patients take or utilize the medicines or medical supplies offered; Beneficiaries use the sanitation facilities; Beneficiaries participate in solid waste management program.

Findings of Impact Evaluation: Assistance to Health Services, Health Facilities and Health Professionals

Access to Health Services

Source	SS	df	MS	Number of obs	=	2,335
Model	32.7785833	3	10.9261944	F(3, 2331)	=	48.99
Residual	519.866385	2,331	.223022902	Prob > F	=	0.0000
				R-squared	=	0.0593
				Adj R-squared	=	0.0581
Total	552.644968	2,334	.236780192	Root MSE	=	.47225

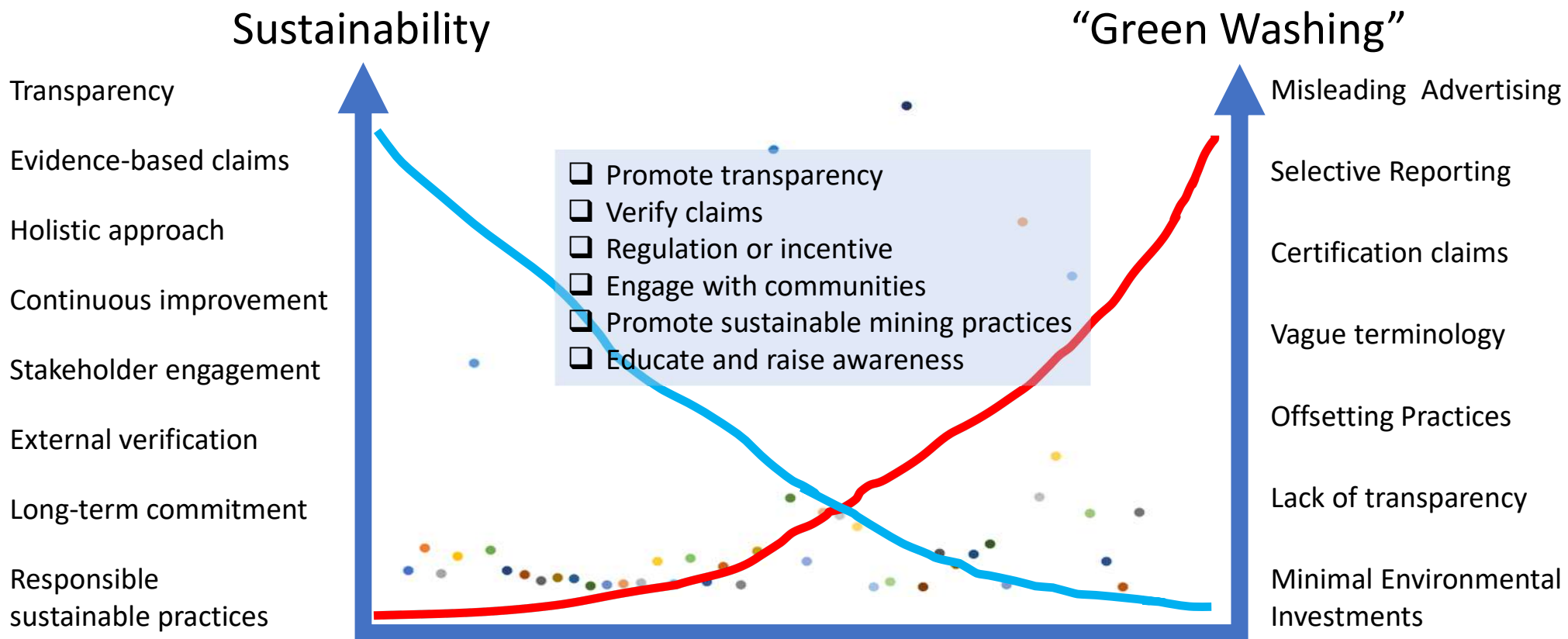
AccHlthServ	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
treat	.1974311	.0283958	6.95	0.000	.1417475 .2531146
year	-.0130736	.0270879	-0.48	0.629	-.0661925 .0400453
treat_year	.0676527	.0392363	1.72	0.085	-.009289 .1445944
_cons	.5097403	.0190276	26.79	0.000	.4724274 .5470531

Assistance for Toilet Facilities

Source	SS	df	MS	Number of obs	=	2,596
Model	11.7303544	3	3.91011813	F(3, 2592)	=	15.93
Residual	636.382126	2,592	.245517796	Prob > F	=	0.0000
				R-squared	=	0.0181
				Adj R-squared	=	0.0170
Total	648.112481	2,595	.249754328	Root MSE	=	.4955

SanToilet	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
treat	.1186441	.0275064	4.31	0.000	.0647073 .1725809
year	-.0400616	.0275064	-1.46	0.145	-.0939984 .0138752
treat_year	.0246533	.0389	0.63	0.526	-.0516248 .1009314
_cons	.4360555	.01945	22.42	0.000	.3979164 .4741945

Mining and its Environmental and Climate Change Impacts



Scope and Coverage

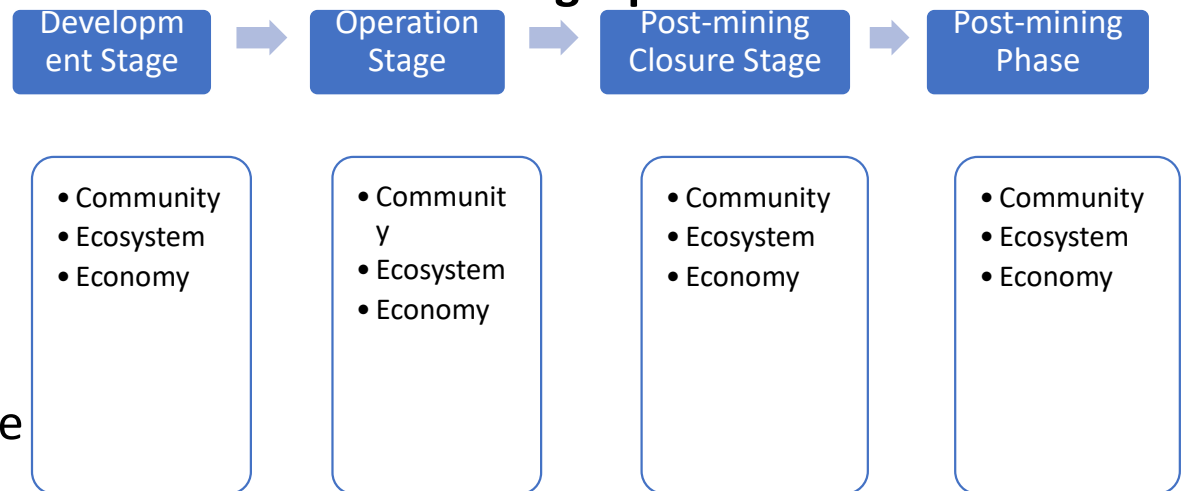
- **MINING** and **MINERAL PROCESSING**
sometimes can be blurred because these two sectors are closely related and often overlap in terms of their activities.
- Scale: Artisanal, Small-scale mining, Large-scale mining
- Commodity: Metallic and Non-metallic
- Mining Operation Methods: Open-pit, bench, underground

Impact Analysis Framework

Aspects for Evaluation

- Social Development Management Program
- Mining Operation
 - Pre-Development Phase
 - Development Phase
 - Commercial Operation Phase
 - Post-mining Closure Phase
 - Post-mining Phase

Phases of Mining Operations



Corporate Natural Capital Accounting (UK)

The logo for eftec, featuring the word "eftec" in a bold, blue, lowercase sans-serif font.The logo for rspp, featuring the letters "rspp" in a blue box next to the text "giving nature a home" in a smaller, blue, lowercase sans-serif font.The logo for PwC, featuring the letters "pwc" in a bold, black, lowercase sans-serif font, with a small graphic of three stacked bars in orange, yellow, and red above the letters.

DEVELOPING CORPORATE NATURAL CAPITAL
ACCOUNTS

Guidelines

For the Natural Capital Committee

January 2015

The Corporate Natural Capital Accounting (CNCA) framework was developed for the UK Natural Capital Committee (eftec, 2015) and, while it aligns with SEEA, it provides an approach for developing natural capital accounts for managers of natural capital assets, where the key purpose is to assist private organisations to monitor and measure the health and value of natural capital

Source: Meney, K., Pantelic, L., Cooper, T and Pittard, M. (2023). Natural Capital Accounting for The Mining Sector: Beenup Site Pilot Case Study. Prepared by Syrinx Environmental PL for BHP, Jan 2023.

Natural Capital Protocol (by Natural Capital Coalition)

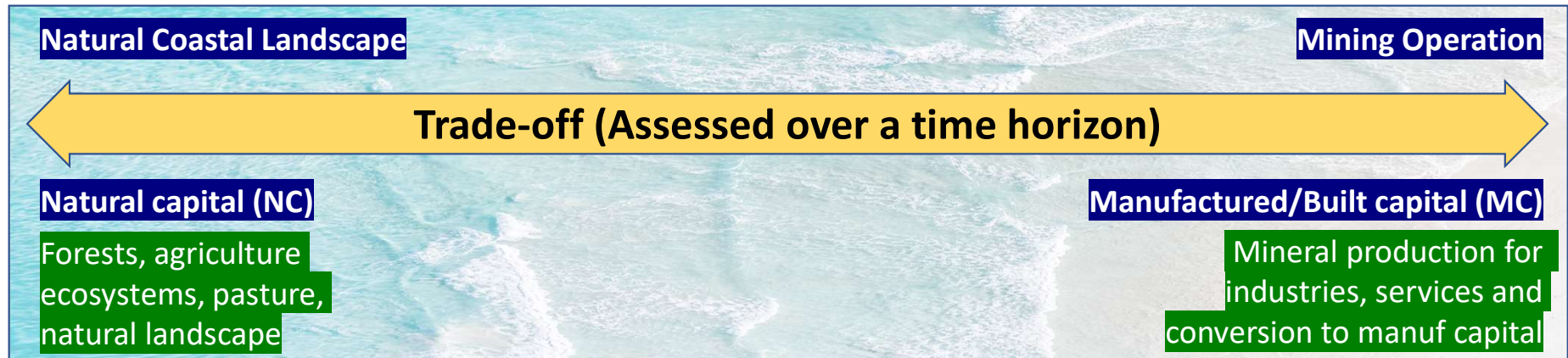


Source: https://capitalscoalition.org/capitals-approach/natural-capital-protocol/?fwp_filter_tabs=guide_supplement

Recommendations

- **Benefit Cost Analysis**
 - Ex-Ante Impact Assessment: Trade-off analysis of land use options prior to mine development
 - Ex-Post Impact Evaluation: Evaluate goals and causal factors of program or project
- Natural capital accounting in mining operations
- Impact evaluation of whole mining operations

BCA Framework



Benefits of Natural Capital (B_{NC})

- Financial private benefits
- Societal benefits:
 - Economic, Environmental

Costs (C_{NC})

- Financial private costs
- Societal costs

Net Benefit(NB_{NC}) = $B_{NC} - C_{NC}$



Benefits of Mining (B_{MC})

- Financial private benefits
- Societal benefits:
 - Economic, Environmental

Costs (C_{MC})

- Financial private costs
- Societal costs

Net Benefit (NB_{MC}) = $B_{MC} - C_{MC}$

Incremental Net Benefit of Reclamation = $(NB_{MC}) - (NB_{NC})$, applied discount rate, NPV, IRR, BCR