

Sustainable Minerals Roundtable

Partial Table of Draft Indicators and Measures for Prioritized Ranking

Domain – <i>Category</i> - Indicator	Priority Ranking (1-3) within each Domain	What it Measures
USE MONTREAL C&I FOR MAINTAINING LONG-TERM SOCIO-ECONOMIC BENEFITS: INDICATOR CATEGORIES		
<i>Employment and Community Needs</i>		
Direct and total employment and income in energy and mineral sectors		Measures direct and indirect employment and income
Per capita income in resource communities		Measures annual per capita income in resource dependent areas vs. other areas
Average wages in mineral and energy resource sectors		Measures income from resource sector in dollars
Other income to community from resource sector (royalties, contributions, in dollars and in kind)		Measures dollars community has to acquire goods and services
Injury rates and occupational disease rates attributable to mining		Measures injury and fatality rates on the job and occurrence of occupational illnesses
Disease rates due to resource activity in resource-dependent communities		Measures health effects on people in the community
Dependency of a community on the minerals/energy activity		It measures direct and indirect income; employment and tax revenue derived from the particular industry (mining, minerals or energy) as a percentage of the total

The degree to which a community is dependent on a resource that would be impacted by the mining/minerals/energy activity		Measures could be acres of land, animal unit months or miles of streams.
<p>Labor expenditures:</p> <ul style="list-style-type: none"> • Labor expenditure/\$GDP for the entire United States economy • Labor expenditure/\$GDP produced by the mining industry • Labor expenditure/unit of output (tons or ounces) produced by the mining/minerals/energy industry 		This measures productivity of labor and allows us to compare the mining industry with the general economy.
<i>Production and Use</i>		
Value and Volume		Measures overall benefits
Use and E&M per capita and per dollar		
Degree of Recycling and Reuse		Measures materials retained in economic system
Net trade balance in energy, minerals		Need a long-run measure
Diversity of Mining Products Usage-Percent of mining products in use per sector		Measures trends in mining product use by sector
Diversity of Mining Products Usage Percent of mining-derived energy used per sector		Measures trends in mining-derived energy use by sector
Percent of available substitute non-mining products in use per sector		Measures trends in substitute non-mining product use by sector
Relative sector knowledge of mining product use and sources		Measures trends in knowledge of mining product use and sources by sector; (1) Percent of survey base with knowledge of proportion of products in use that are derived from mining products; (2) Percent of survey base with knowledge of the relative source of mining-derived products in use.

Relative public knowledge of mining-derived energy use and sources		Measures trends in mining-derived energy use by sector; (1) Percent of survey base with knowledge of proportion of energy used that is mining-derived; (2) Percent of survey base with knowledge of the relative source of mining-derived energy used.
<i>Recreation and Tourism</i>		
Old mine sites and towns and current mining operations		Measures economic contribution of mining other than commodity
<i>Investment [link to capacity maintenance; distribution & refining]</i>		
Dollars spent annually on exploration (see Productive Capacity and Employment above)		
Dollars spent on buildings, infrastructure, pollution control equipment etc (typically called capital expenditures)		Measures dollars spent on buildings, infrastructure, pollution control equipment etc. (typically called capital expenditures).
Capacity and grid of energy delivery systems		This indicator measures carrying capacity versus usage for power, natural gas and petroleum
Petroleum and metal refinery capacity		It measures the petroleum and metal refining capacity in the United States and the usage of that capacity
Dollars invested on research and development		It measures the dollars spent on research and development by government, universities and private industry
Investment in ecosystem enhancement and restoration		It measures the dollars spent on ecosystem enhancement and restoration projects
Investment in the community		It measures the dollars invested in community facilities and programs
Investment in education		This measures the dollars spent/donated to provide technical education to current and future employees

<i>Cultural, Social and Spiritual Needs</i>		
<i>Archeology (Pre-historic)</i> - Number of archeology sites (pre-historic) that are eligible for the National Historic Register that are within the proposed plan boundary. As a subset of that number, the number of archeology sites (pre-historic) that are eligible for the National Historic Register that are within the proposed plan boundary and that will be collected and documented because they would have been disturbed by the mining operations.		This measures the number of sites, whether they are protected or disturbed and, for sites to be disturbed, it documents knowledge gained regarding the site(s)
Sacred Sites for Indigenous People		It measures the number and location of Traditional Cultural Properties and describes why they are considered sacred
<i>Historic Sites</i> - Number of archeology sites (historic) that are eligible for the National Historic Register that are within the proposed plan boundary. As a subset of that number, the number of archeology sites (historic) that are eligible for the National Historic Register that are within the proposed plan boundary and that will be collected and documented because they would have been disturbed by the mining operations.		This measures the number of sites, whether they are protected or disturbed and, for sites to be disturbed, it documents knowledge gained regarding the site(s). This could include historic mining sites.
<i>Environmental Justice</i>		
The percentage of households below the poverty line in mining dependent counties versus the percentage of households below the poverty line for non-mining dependent counties		It measures the percentage of households below the poverty line in mining dependent counties versus the percentage of households below the poverty line for non-mining dependent counties
The percentage of population by minority group, in mining dependent counties versus the percentage of population by minority group for non-mining dependent counties		It measures the percentage of population by minority group, in mining dependent counties versus the percentage of population by minority group for non-mining dependent counties
PRODUCTIVE CAPACITY [across the life-cycle]		
<i>Resources</i>		
Access to Federal Lands		Measures availability of federal lands for mineral/energy exploration and production.

Permits		Measures the ratio of permits issued to permits applied for
Sterilization of Resources		Measures trend over time of the area of built infrastructure
Identified Resources - Technically extractable		Measures future materials supply potential
Reserves – Known		Measures current working inventory
Resources Left Behind/Bypassed		Measures percent of mineral left in the ground
Stocks in Use		Measures above ground resources
<i>Production (Extractive) Capacity</i>		
Idle Capacity as it Relates to Total Capacity		Measures the extent of idle capacity that can be utilized
Minerals Produced by Co-and By-product production		Measures the web of dependency
National Supply Mix of Mineral Commodities and Energy - current imports and current production		Measures the extent to which demand is met by domestic production
<i>Processing Capacity</i>		
Transportation Capacity – Oil and Gas Pipelines		Measures kilometers of usable pipeline and pipeline under construction
Transportation Capacity – Electricity Transmission Lines		Measures kilometers of usable electricity transmission lines and transmission lines currently under construction
Transportation Capacity – Mineral-based Construction Materials (sand, gravel and cement)		Measures the proximity of sand and gravel operations and cement kilns to population centers
<i>Use Capacity</i>		
Consumption of Mineral Commodities and Energy Over Time		Measures changes in consumption
Energy Choices – Consumption		Measures energy capacity over time
Value of energy use/dollar produced from the mining sector		Measures energy expended in dollar terms to produce \$1.00 of output (for example, copper) in constant dollar terms

LEGAL AND INSTITUTIONAL FRAMEWORK		
<i>Extent to which the legal framework (laws, regulations, guidelines, legal decisions, etc.) supports sustainable practices for energy and mineral/materials systems over the life cycle, including the extent to which it provides for:</i>		
Clear property rights (including mineral rights and secure land tenure), recognition of customary and traditional rights of indigenous people, and a means of resolving property disputes by due process		Measures the climate of property rights, stability and consistency of property rights regime, presence of delineated property rights by property type, areas of settled and unsettled law. National scale is statutes, case law and rulemaking affecting property rights. State and local counterpart legislation.

<p><i>Economic framework: Extent to which the economic framework (economic policies and measures) supports sustainable practices for energy and mineral material systems over the life cycle.</i></p>		
<p>3a. Investment and taxation policies that recognize the long-term nature of investments and permit the flow of capital in and out of the energy and mineral/material sectors in response to market signals, non-market economic valuations, and public policy decisions to meet the short- and long-term demands for the goods and services provided by energy and mineral/materials.</p> <p>3b. Degree to which international energy and mineral/material trade and competition affects domestic sustainability.</p> <p>3c. Degree to which international energy and mineral/material trade and competition impact sustainable practices in and viability of those sectors.</p> <p>3d. Degree to which government trade policy and tariffs for energy and mineral/materials impact sustainable practices in and viability of those sectors.</p> <p>3e. Full cost (direct and opportunity)¹ of compliance with legal requirements throughout the lifecycle of energy and mineral/materials.</p> <p>3f. Extent of enforcement of regulation in the US relative to other producing nations on a scale of 1 (substantial less) to 10 (substantially more).</p>		<ul style="list-style-type: none"> ○ Average time from application for permits until issuance, by type of operation. ○ Number and type of permits by geopolitical unit and land ownership category. ○ Scope of regulation in the US relative to other producing nations on a scale of 1 (substantial less) to 10 (substantially more). ○ Extent of enforcement of regulation in the US relative to other producing nations on a scale of 1 (substantial less) to 10 (substantially more).

¹ See glossary

<p><i>Capacity to conduct and apply research and development aimed at improving energy and mineral materials management and the delivery of energy and mineral materials across the life cycle, including capacity to:</i></p>		
<p>5a. Develop a scientific understanding of energy and mineral material systems' characteristics and functions.</p> <p>5b. Develop methodologies to measure and integrate environmental and social costs and benefits into markets and public policies and to reflect energy and mineral material depletion, discovery, recycling, reuse, and remanufacture in national accounting systems across the resource and production life cycles.</p> <p>5c. Discover and develop new technologies and assess the environmental, social, and economic consequences associated with the introduction of new technologies.</p> <p><i>5d. Predict impacts of energy and mineral/material systems on geologic systems, for example, impacts of pumping water or reinjecting produced waters.</i></p>		<p>Measures the human resources available for sustainable resource management over the life cycle</p>
<p>SOIL AND WATER QUALITY</p>		
<p><i>Emissions indicators</i></p>		
<p>Quantity of pollutant/Quantity of output (for all three waste types -- need to define)</p>		<p>This indicator shows the pollution generated per unit of commodity produced by the sector.</p>
<p>% Share of pollution / % Share of value of output (for all three waste types)</p>		<p>Measures the contribution of the M&E sector to total pollution relative to its contribution to economic output</p>

Percent of Green Power usage per sector		The indicator will be calculated based on data on energy use by type for each sector. The types will include (not necessarily limited to) hydro, coal, diesel, nuclear, LPG, LNG, wind, geothermal, solar. "Sectors" will include 1-digit SIC codes and more detailed disaggregations by sector as desired. These data will also be the basis for estimating air pollution emissions for indicator A.1
Reclamation		
Area reclaimed/reclamation scheduled		Measures acres and percent of disturbed land that has not been reclaimed according to criteria identified in approved reclamation plans
Number of abandoned mine sites reclaimed in current year/number of abandoned mine sites (from baseline inventory)		Measures pace of abandoned mine reclamation
Number of abandoned mine sites with environmental problems that were reclaimed this year/number of abandoned mine sites with environmental problems (from baseline inventory)		Measures pace of abandoned mine reclamation
Mineland Reclamation Quality as a Proportion of Baseline Capacity		What it measures: (numerator) Number of mines NOT notified by state or federal regulatory agencies that they are deficient in their reclamation with respect to at least one of a set of quality criteria that may include: (1) surface stability; (2) soil as growth medium; (3) vegetation production; (4) vegetation cover; (5) surface water availability; (6) surface water quality. (denominator) number of mines engaged in reclamation.

<i>Ambient environmental indicators</i>		
Number of permitted ² mine sites where groundwater is contaminated / total number of permitted mines		What it measures: Share of permitted mine sites with degraded groundwater due to mining. Degraded sites will be those identified by the regulatory agencies
Number of permitted mines causing downstream water quality problems relative to total number of permitted mines		What it measures: Number of permitted mine sites downstream from which water quality is either degraded or improved, relative to the total number of permitted mine sites. Rivers are considered degraded if they exceed applicable water quality standards, riparian zones (which include aquatic habitat) are degraded due to flow changes, water quality, or other mine-related causes. Rivers will be considered improved if water quality or riparian zone quality exceeds the pre-mining levels due to mining activity or reclamation
Number of 5 th code hydrological unit watersheds with mines that have water quality problems / Number of 5 th code hydrological unit watersheds with mines		Trend over time in prevalence of watersheds harmed by mining
Share of permitted sites with land contamination; not superfund		What it measures: Share of permitted sites with land contamination resulting from mining relative to total number of permitted mine sites. Contaminated sites are those identified by the appropriate regulatory agencies as such
Share of all industrial sites with land contamination; not superfund		What it measures: Share of industrial sites with land contamination relative to total number of industrial sites. Contaminated sites are those identified by the appropriate regulatory agencies as such.
Share of permitted mine sites around which groundwater withdrawal for mining causes problems		What it measures: Number of permitted mine sites where regulatory agencies have determined that groundwater withdrawal is causing problems, total number of permitted mine sites

² “Permitted” mine sites, for the purposes of these indicators, include active sites, inactive sites, and closed mines. The only mines not in the “permitted” category are abandoned mines.

Water Management in Mining		
Water recycling in mining		What it measures: Water use in the mining operation over a defined period of time (one year) relative to water withdrawn from the environment (from surface sources, groundwater, or impounded water) during the same time period.
Net groundwater withdrawal/per unit of Level of production and per mining unit		What it measures: Water withdrawn from groundwater less water injected into groundwater over a period of time (one year), relative to minerals production and to mining units.
Effort (Note: It may be appropriate to move two of these into the “legal and institutional framework” section and one into the “long-term socioeconomic benefits” section, rather than including these here. For each of the three indicators below, we suggest where else they might be placed.)		
Investment in research on minimizing and mitigating environmental impacts of mining.		What it measures: Expenditures on research

<p>Private and public expenditure to minimize environmental harm from mining, total and as a share of total expenditure</p>		<p>What it measures: For the private sector, this indicator will show the amount of private sector expenditures on reducing environmental harm and that expenditure related compared to total private expenditures. This will have to distinguish capital from operating costs. These data will be aggregated from individual mine data and may be aggregated as much or as little as useful (e.g. differentiating sub-sectors within the mining industry). For the public sector it will show expenditure on superfund restoration that is not reimbursed by the private sector and any other public subsidies for environmental protection. It will not include administrative costs and enforcement costs of environmental regulation, which are covered by indicator E.3.</p> <p>The logic of this is to identify the costs to the economy of requiring internalization of environmental costs of mining. This indicator should be compared with the benefits to the economy of “clean” or “sustainable” mining, lest it be implied that we are not getting anything in return for these expenditures. Valuing the benefits would be virtually impossible in an indicators system (rather than as a research project). However this indicator might be compared with previous indicators on emissions trends, adequacy of reclamation, and so on, to get a rough idea.</p>
<p>Public expenditure to administer and enforce environmental regulations in mining</p>		<p>What it measures: This indicator shows the % of public sector expenditures on enforcing environmental regulations compared to total number of permitted mines.</p>