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White Paper

Mapping Mining to the Sustainable Development Goals: An Atlas

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About the Columbia Center on Sustainable Investment

The Columbia Center on Sustainable Investment (CCSI), a joint center of Columbia Law School and the Earth Institute at Columbia University, is the only university-based applied research center and forum dedicated to the study, practice, and discussion of sustainable international investment worldwide. Its mission is to develop practical approaches for governments, investors, communities, and other stakeholders to maximize the benefits of international investment for sustainable development.

About the UNDP

UNDP partners with people at all levels of society to help build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone. On the ground in more than 170 countries and territories, we offer global perspective and local insight to help empower lives and build resilient nations.

About the UN Sustainable Development Solutions Network

UN Secretary-General Ban Ki-moon launched the UN Sustainable Development Solutions Network (SDSN) to mobilize global scientific and technological expertise and to promote practical problem solving for sustainable development, including the design and implementation of the Sustainable Development Goals (SDGs). Following their adoption, the SDSN is now committed to supporting the implementation of the SDGs at local, national, and global scales. The SDSN aims to accelerate joint learning and help to overcome the compartmentalization of technical and policy work by promoting integrated approaches to the interconnected economic, social, and environmental challenges confronting the world. The SDSN works closely with United Nations agencies, multilateral financing institutions, governments, the private sector, and civil society.

About the World Economic Forum

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation. The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

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Foreword

The 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) represent the world's plan of action for social inclusion, environmental sustainability and economic development. It is our shared belief that the mining industry has an unprecedented opportunity to mobilize significant human, physical, technological and financial resources to advance the SDGs.

Mining is a global industry and is often located in remote, ecologically sensitive and less-developed areas that include many indigenous lands and territories. When managed appropriately, it can create jobs, spur innovation and bring investment and infrastructure at a game-changing scale over long time horizons. Yet, if managed poorly, mining can also lead to environmental degradation, displaced populations, inequality and increased conflict, among other challenges.

By mapping the linkages between mining and the SDGs, the aim of this Atlas is to encourage mining companies of all sizes to incorporate relevant SDGs into their business and operations, validate their current efforts and spark new ideas. Success will also require substantial and ongoing partnership between governments, the private sector, communities and civil society, and we hope the Atlas spurs action that will leverage the transformative power of collaboration and partnership between the mining industry and other stakeholders. In addition to mining companies, our intention is that the Atlas will be useful for:

- National governments across all relevant ministries – mining, development, finance, environment, infrastructure and others – as a catalyst to further align mining policies with national development plans and to engage more systematically with industry and local governments to leverage investment for sustainable development
- Local governments, communities, development agencies and civil society organizations to support programmes and efforts to help unlock the mining sector's potential to contribute to a sustainable future and as a stimulus for increased inclusive dialogue and cooperation
- Existing and future multistakeholder dialogue forums at the mine site level and the country level as a foundation to integrate the role of mining into the broader discussion of sustainable development and national plans to achieve the SDGs.
- Universities and learning institutions – as a
- Source of ideas and opportunities to convene and coordinate education, research and professional development that address mining and the SDGs.

The Atlas is intended as an introduction to the many linkages between mining and the SDGs and complements other resources on the role of mining and the private sector in sustainable development. Many of these resources were reviewed during the development of the Atlas and are listed at the end of each chapter. The United Nation's (UN) SDG indicator framework offers further opportunity to explore how the mining sector can align its actions and reporting.

We have incorporated comments received during the public consultation period from January to April 2016 into this final version of the Atlas. The response was overwhelmingly positive and we thank everyone who participated. Several consultation events were organized during this period, and they are listed in the "Acknowledgements" section. We reviewed every suggestion and have included as many as possible.

Finally, we would like to thank all of the experts and institutions who shared their knowledge and the reviewers who provided their expertise and feedback. The core team and the reviewers are noted in the "Acknowledgements" section.

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Executive Summary

In September 2015, the 193 United Nations (UN) member states adopted “Transforming our world: the 2030 Agenda for Sustainable Development”, which includes a set of Sustainable Development Goals (SDGs) for 2015-2030. The agenda provides a successor framework for the Millennium Declaration and the Millennium Development Goals (MDGs) that covered the period from 2000-2015. The SDGs represent the world’s comprehensive plan of action for social inclusion, environmental sustainability and economic development. Meeting the SDGs by 2030 will require unprecedented cooperation and collaboration among governments, non-governmental organizations, development partners, the private sector and communities.

Achieving the SDGs will require all sectors and stakeholders to incorporate the SDGs into their own practices and operations

This Atlas maps the relationship between mining and the SDGs by using examples of good practice in the industry and existing knowledge and resources in sustainable development that if replicated or scaled up could make useful contributions to the SDGs. It presents a broad overview of opportunities and challenges to demonstrate the actual and potential contributions of the mining sector to the achievement of the SDGs – from exploration through production and eventually mine closure. Mining companies, their staff, management and boards are the primary audience for the Atlas. It is especially relevant for existing mines, whose operations can be adjusted in line with this Atlas to contribute to the SDGs. The Atlas is also intended to advance the conversation about how mining companies, working both individually and collaboratively with governments, communities, civil society and other partners, can help to achieve the SDGs.

The Atlas has a chapter for each of the SDGs focusing on the contribution the mining industry can make to that goal and identifying opportunities for how mining companies can collaborate with other stakeholders and leverage resources to address the SDGs. Each chapter also includes case studies from which to draw in building innovative, systematic and sustained collaborative efforts.

The Atlas is based on desktop research and interviews with over 60 global experts from industry, civil society, governments, academia, international organizations and financial institutions conducted between June and August 2015. Companies will see initiatives they are already implementing or participating in, some may find new ideas to support implementation and others will discover new linkages between their existing work and the SDGs. Civil society and communities may find

ideas that support new partnerships or inform useful policy reforms. National and local governments may see opportunities to link policies, regulatory activity and funding to the SDGs. The Atlas aims to facilitate three outcomes:

- 1) *Increased understanding* of how the SDGs and mining relate to one another
- 2) *Awareness-raising* of opportunities and challenges that the SDGs pose for the mining industry and its stakeholders and how they might address them
- 3) *Multistakeholder dialogue and collaboration* towards the achievement of the SDGs

Some overall conclusions that can stimulate further debate and research include:

The mining industry has the opportunity and potential to positively contribute to all 17 SDGs.

The mining industry can impact positively and negatively across the SDGs. Mining can foster economic development by providing opportunities for decent employment, business development, increased fiscal revenues, and infrastructure linkages. Many of the minerals produced by mining are also essential building blocks to technologies, infrastructure, energy and agriculture. Historically, however, mining has contributed to many of the challenges that the SDGs are trying to address – environmental degradation, displacement of populations, worsening economic and social inequality, armed conflicts, gender-based violence, tax evasion and corruption, increased risk for many health problems, and the violation of human rights. In recent decades, the industry has made significant advances in mitigating and managing such impacts and risks, by improving how companies manage their environmental and social impacts, protect the health of their workers, achieve energy efficiencies, report on financial flows, and respect and support human rights.

Importantly, mining companies’ positive contributions to the SDGs include both improvements toward the SDGs and the corresponding targets above the baseline, as well as preventing or mitigating negative impacts on the SDGs and corresponding targets. Throughout the Atlas, both baseline improvements as well as mitigating steps are considered to be contributions to the SDGs.

While the mining industry is diverse, the scope and nature of typical mining activities highlight some common opportunities to leverage and contribute to the SDGs.

Opportunities for mining companies to positively contribute are found across all of the goals and individual companies will need to do the analysis to understand how their business can make an impact. A company’s specific actions and opportunities will depend on the local social, political and economic context, the mineral resource, the phase of mining activities (exploration, development, extraction or closure), and the input received from local communities and other stakeholders through formal dialogue and engagement.

For companies seeking to align their operations with the SDGs, the goals relating to social inclusion, environmental sustainability and economic development are a useful starting point:

Environmental Sustainability:

Mining activities typically cause impacts on land, water, the climate and the flora, fauna and people that depend on these resources:

- **SDG6 – Clean Water and Sanitation, and SDG15 – Life on Land:** Mine development requires access to land and water, presenting significant adverse impacts on lands and natural resources that can be mitigated or avoided.
- **SDG7 – Energy Access and Sustainability and SDG13 – Climate Action:** Mining activities, are energy and emissions intensive, presenting opportunities for greater efficiency as well as expanding access to energy.

Social Inclusion:

Mining can significantly impact local communities, bringing economic opportunities, but also challenges relating to livelihoods and human rights:

- **SDG1 – End Poverty, SDG5 – Gender Equality and SDG10 – Reduced Inequalities:** Mining generates significant revenues through taxes, royalties and dividends for governments to invest in economic and social development, in addition to opportunities for jobs and business locally. Mining companies can take an inclusive approach by working with communities to understand the mines' actual and potential positive and negative impacts. Companies can also support participatory local decision-making processes regarding the mining operations, the equitable allocation of benefits and the resolution of grievances, and identify and expand opportunities to strengthen the voice and influence of marginalized groups, including women, to ensure that inequalities are reduced, rather than reinforced, by the economic opportunities a mine may bring.
- **SDG16 – Peace, Justice and Strong Institutions:** Mining can contribute to peaceful societies and the rule of law by preventing and remedying company-community conflict, respecting human rights and the rights of indigenous peoples, avoiding illicit transfers of funds to public officials or other persons, ensuring transparent reporting of revenue flows, and supporting the representative decision-making of citizens and communities in extractives development.

Economic Development:

Mining can have a local, regional and national impact on economic development and growth that can be leveraged to build new infrastructure, new technologies and workforce opportunities.

- **SDG8 – Decent Work and Economic Growth:** Mining can generate new economic opportunities for citizens and members of local communities, including jobs, training, and business development relating to mining operations, associated service providers, or new local economies linked to the mine.
- **SDG9 – Infrastructure, Innovation and Industrialization and SDG12 – Responsible Consumption and Production:** Mining can help drive economic development and diversification through direct and indirect economic benefits and by spurring the construction of new infrastructure for transport, communications, water and energy. Mining also provides materials critical for renewable technologies and the opportunity for companies to collaborate across the supply chain to minimize waste, and to reuse and recycle.

Achieving sustainable development is challenging and the mining industry must ramp up its engagement, partnership and dialogue with other industry sectors, government, civil society and local communities.

To realize the full potential for contributing to the achievement of the goals, mining companies must continue to work to integrate changes into their core business and, along with the mining industry as a whole, bolster collaboration, partnership and meaningful dialogue with government, civil society, communities and other stakeholders.

Major Issue Areas for Mining and the SDGs



Figure 1: Mining and the 17 SDGs. A selection of most major issue areas where mining may have an impact (positive or negative) on each of the 17 goals. Readers are referred to the individual chapters and diagrams for each goal for a detailed and more comprehensive discussion. Icons adapted from <http://www.globalgoals.org/>. Abbreviations: EIDs = emerging infectious diseases; OSH = occupational safety and health; TVET = technical, vocational, and educational training; CCS = carbon capture and storage; IFFs = illicit financial flows; FPIC = free, prior, and informed consent; PPPs = public-private partnerships.

Adapted from Global Goals (www.globalgoals.org)



Mining and Poverty Eradication (SDG1)



Integration into Core Business

Pay taxes and royalties

- Publicly disclose details of payments to governments
- Use arms-length rule transfer pricing

Leverage local procurement

- Develop local supplier capacity
- Strengthen local value chains

Champion Inclusive employment

- Facilitate equitable access to employment opportunities
- Offer training and apprenticeship programs

Preserve land access

- Begin land access planning early in projects
- Fully restore resettled communities

Collaboration and Leverage

- Collaborate to leverage resources for poverty alleviation
- Support non-mining livelihood options
- Broaden implementation of anti-poverty strategies via CDAs



Mining and Zero Hunger (SDG2)



Integration into Core Business

Explore synergies with agriculture

- Manage water resources transparently
- Minimize land take
- Share infrastructure benefits with agricultural community

Keep farmland pollution-free

- Conduct baseline and ongoing geochemical surveys
- Monitor water quality and soil fertility regularly

Collaboration and Leverage

- Strengthen watershed management
- Partner with the agricultural sector
- Support programs to reduce childhood malnutrition and hunger



Mining, Good Health, and Well-Being (SDG3)



Integration into Core Business

Champion occupational health and safety

- Promote workplace health
- Establish rigorous workplace health and safety monitoring and reporting
- Focus on road safety

Combat Tuberculosis and HIV/AIDS

- Reduce silica dust
- Run HIV/AIDS education, prevention and counseling programmes

Offer and encourage preventative care

- Screen for NCDs
- Provide healthy canteen food options and good hygiene protocols
- Prevent toxic emissions to the environment

Increase mental health awareness

- Approach health holistically
- Set up confidential counseling programs
- Regularly test for drug and alcohol use and abuse

Collaboration and Leverage

- Support community health programmes
- Participate in response to and recovery from epidemics
- Train community health workers
- Recognize and strengthen traditional medicinal practices



Mining and Quality Education (SDG4)



Integration into Core Business

Assess and upgrade the local skills base

- Routinize skills baseline assessments and gap analyses
- Sponsor apprenticeships, scholarships, and graduate programmes

Train and educate the workforce

- Train workforce in technical and management skills
- Ensure training opportunities are made available to employees at all levels and across all backgrounds

Collaboration and Leverage

- Link academic programmes with TVET
- Collaborate with universities to design curricula
- Participate in classrooms and workshops
- Work with schools to keep children in school
- Train for sustainable livelihood opportunities beyond mining



Mining and Gender Equality (SDG5)



Integration into Core Business

Offer equal opportunities for women

- Recruit more women
- Pay women and men equally
- Promote more women to visible leadership positions
- Adopt, where possible, flexible schedules for accommodating childcare

Practice gender inclusion across the business and project life-cycle

- Offer gender-specific PPE
- Provide gender-sensitive career development planning
- Incorporate perspectives of women, men, and children in community-related decisions
- Include men and women in negotiations

Collaboration and Leverage

- Make social investments gender-inclusive
- Offer educational scholarships for women
- Remain vigilant against gender-based violence
- Establish gender-sensitive grievance mechanisms
- Provide women's health monitoring



Mining, Clean Water, and Sanitation (SDG6)



Integration into Core Business

Conserve and recycle water

- Recycle and/or recover metals from wastewater
- Reduce water consumption
- Use alternative water sources (greywater, seawater)

Monitor water quality

- Monitor water sources both near-mine and downstream
- Involve the community in monitoring and share water data openly

Manage water holistically

- Align with government water management policies
- Integrate technical, social, economic, and political water concerns
- Identify high-value water areas
- Maintain long-term water balance throughout projects
- Incorporate water reporting and disclosure

Collaboration and Leverage

- Support potable water and sanitation planning and infrastructure
- Clearly delineate watershed management responsibilities
- Share benefits of water infrastructure
- Explore co-financing arrangements
- Support local capacity-building in water and sanitation management



Mining and Affordable, Clean Energy (SDG7)



Integration into Core Business

Improve Energy Efficiency

- Undertake energy audits
- Improve energy infrastructure maintenance
- Reduce energy demand onsite

Incorporate renewable energy

- Deploy off-grid wind, solar, or geothermal power
- Diversify power sources for reducing outages
- Replace diesel generators

Collaboration and Leverage

- Support local energy initiatives
- Integrate into rural electrification schemes
- Share benefits of energy infrastructure
- Explore co-financing arrangements



Mining, Decent Work, and Economic Growth (SDG8)



Integration into Core Business

Communicate opportunities and limits of mining

- Provide decent work
- Catalyze indirect and induced employment
- Clearly communicate the capital-intensive nature of mining

Drive economic growth with local procurement

- Diversify local economies
- Make bidding accessible to local contractors
- Train local suppliers how to meet corporate supply requirements

Collaboration and Leverage

- Collaborate with local chambers of commerce, finance institutions and NGOs
- Establish business incubators
- Work with local suppliers to build capacity and increase product quality
- Connect suppliers with external markets
- Collaborate to end child labor



Mining, Industry, Innovation, and Infrastructure (SDG9)



Integration into Core Business

Support local procurement

- Upgrade expertise of local suppliers
- Improve quality of locally produced goods
- Provide support to local suppliers to service the mine

Share Infrastructure

- Explore co-funding arrangements with governments
- Share rail, road, power, water, ICT infrastructure
- Harness economies of scale and economies of scope

Collaboration and Leverage

- Use business profile to create horizontal linkages
- Use convening power to create clusters
- Promote domestic research and development initiatives



Mining and Reduced Inequalities (SDG10)



Integration into Core Business

Anticipate inequality-related risks

- Be sensitive to local wage disparities
- Establish baseline welfare statistics before mining

Champion inclusivity

- Train, recruit and employ marginalized populations
- Include excluded groups in local procurement and supply chains

Collaboration and Leverage

- Work with local partners to target social investments to marginalized populations
- Encourage participatory budgeting in local communities, especially of mining revenues



Mining and Sustainable Cities, Communities (SDG11)



Integration into Core Business

Mine unconventional deposits

- Re-mine tailings
- Mine urban waste (urban mining)
- Pair metals recycling and waste energy reclamation

Plan land use carefully

- Plan land use with the life-of-mine in mind
- Reclaim mines into parks
- Develop cultural heritage management plans
- Anticipate unplanned urbanization

Collaboration and Leverage

- Share workforce requirements and planned operations early so local authorities can assess adequacy of local services
- Collaborate with local authorities to develop green space, including decommissioned mines



Mining and Responsible Consumption, Production (SDG12)



Integration into Core Business

Minimize resource use and waste

- Minimize use of water, energy, land, chemicals
- Minimize production of waste, effluent, emissions
- Re-purpose waste rock

Incorporate life cycle thinking

- Analyze mineral and chemical products across sourcing, transport, storage, use, production
- Extend responsible sourcing to suppliers

Collaboration and Leverage

- Collaborate inter- and intra-industry to develop and report against materials management codes
- Engage consumers about mining and connect the consumer with raw materials



Mining and Climate Action (SDG13)



Integration into Core Business

Reduce Emissions

- Improve energy efficiency
- Use renewable energy
- Use low-emission fuels
- Align with INDCs
- Measure and report direct, indirect, and product-related emissions

Build climate change resilience

- Plan for climate change impacts on mines and communities
- Strengthen emergency response plans
- Model climate-related environmental impacts

Recognize climate change in planning and investment

- Use scenario planning to inform views on climate and energy risks and opportunities
- Use climate projections in design and placement of operations and infrastructure
- Adopt corporate climate change, carbon management and disclosure policies
- Use shadow carbon prices to inform portfolio evaluation and investment decisions
- Include climate change on the board agenda

Collaboration and Leverage

- Participate in climate-related R&D and pilots (emissions trading, CCS projects)
- Engage in intra- and cross-industry climate dialogues
- Publicly support carbon pricing



Mining and Life Below Water (SDG14)



Integration into Core Business

Incorporate life under water into impact assessments

- Properly dispose of tailings/waste
- Assess social and environmental impacts on fishing- and marine-base livelihoods
- Map breeding grounds and migration routes of underwater species

Approach seafloor mining cautiously

- Protect marine life
- Minimize habitat disturbance
- Conduct sensitivity analyses in understanding short- and long-term impacts

Collaboration and Leverage

- Collaborate with local authorities to establish conservation areas and marine reserves
- Develop multistakeholder coastal zone management plans



Mining and Life on Land (SDG15)



Integration into Core Business

Achieve net positive or no net loss impact

- Apply mitigation hierarchy to minimize impact
- Avoid impacts to critical habitat
- Offset biodiversity impacts

Preserve ecosystem services

- Recognize dynamic nature of habitats
- Conduct comprehensive baseline and follow-up environmental impact assessments

Collaboration and Leverage

- Support projects that link communities and biodiversity
- Encourage and participate in landscape level planning
- Restore historic habitats and engage in reforestation and anti-poaching efforts
- Collaborate in research initiatives



Mining, Peace, Justice and Strong Institutions (SDG16)



Integration into Core Business

Prevent and preempt conflict

- Listen and respond early to stakeholder concerns
- Establish formal and accessible complaint and grievance mechanisms
- Participate in conflict-free mineral certification schemes

Respect indigenous rights and FPIC

- Implement human rights impact assessments
- Extend high standards to security contractors
- Incorporate both regulatory requirements and local community objectives and sentiments into decisions

Collaboration and Leverage

- Publicly report project-related payments country-by-country and project-by-project
- Conduct transfer pricing of intra-company transactions via arms-length rule
- Facilitate peaceful working environment and good community relationships
- Promote the rule of law



Mining and Partnerships for the Goals (SDG17)



Integration into Core Business

Mobilize financial resources and technology

- Make data on payments to governments transparent
- Build data collection and statistical analysis capacity
- Transfer technologies to host countries
- Engage in public-private partnerships

Share geo-data

- Transfer unused exploration data over to national authorities
- Improve national knowledge of mineral wealth
- Facilitate trust with government and communities

Collaboration and Leverage

- Dialog actively with governments, civil society, and development partners
- Strengthen coordination between initiatives
- Join with bottom-up grassroots movements and top-down leadership initiatives
- Apply SDG indicators



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