

Steering projects in support of sustainable development

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Early stakeholder engagement in Sierra Leone

Current trends in Corporate Social Responsibility (CSR) in the mining sector are strongly influenced by the International Finance Corporation and the International Council of Mining and Metals.

These organisations emphasise sustainable community development, promoting the following main objectives:

- Catalysing economic and social change in areas with limited opportunities for development.
- Increasing communities' strength and effectiveness to ensure the viability of development interventions.

- Helping communities participate in decision making to achieve long-term control over their development.
- Developing programs that can continue without support from mining projects, long term (i.e. after mining closure).

While mining companies acknowledge these trends in policies, identifying and executing projects in line with these principles is more difficult to realise.

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Steering projects in support of sustainable development (continued)

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Lalit Kumar, Senior Social Consultant, has over 15 years of experience in social impact assessment, social management, resettlement planning, stakeholder engagement, baseline studies, monitoring and evaluations in the context of mining and infrastructure projects. For the past few years he has been engaged more extensively with reviews, auditing and due diligence for international financial institutions, specifically in the context of Equator Principles. Lalit has worked in Africa, South Asia, the Middle East, Russia/CIS, South America and Europe.



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Hilde van Vlaenderen, Principal Consultant, heads the social team in the SRK UK office and has over 25 years of expertise in social research, community development and stakeholder engagement. She currently specialises in managing teams that conduct social impact assessments, programs for stakeholder engagement and resettlement processes. Hilde advises clients on developing corporate social responsibility programs and stakeholder engagement. The majority of her work has been conducted in Africa and the CIS countries.



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Working with clients and projects, the SRK UK team has identified several challenges facing sustainable community development programs:

- According to international standards, community development programs should be based on local needs. Communities, however, do not necessarily have this perspective; instead they consider mining companies as ongoing providers. As such, local demands/expectations are not easily translated into sustainable projects.
- The socio-economic viability of many towns and settlements may be entirely linked to mining operations, and their survival after closure is often doubtful. Sustainable development in such context is difficult.
- In many countries, national, regional and local governments expect mining companies to contribute to infrastructure development. Increasingly, mining agreements include these commitments. But infrastructure development without assurance of maintenance does not lead to sustainable development.
- Community development projects are generally included in the operational phase of a mining project, where the company and community collaborate closely in employment, training, procurement and community assistance. But community development is rarely adequately linked to closure and post closure planning.
- Mining companies lack experience in the human resources required for implementing sustainable interventions.

In conclusion, although mining companies have adopted the language of sustainable community development, at the project level there is important work to be done to put these ideas into practice, taking into account the real local socio-economic opportunities and constraints.

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Environmental and Social Impact Assessments (ESIAs) look at the impacts of proposed projects, and there is often a tendency to focus narrowly on adverse biophysical impacts. But projects have benefits too, particularly economic benefits, and few competent professionals have the expertise to identify and assess benefits. Since 2005, SRK consultants in Cape Town have managed Economic Impact Assessments (EclAs) to inform ESIAs. EclAs examine the microeconomic and macroeconomic impacts of a project, considering payment of taxes, royalties and wages, procurement and employment. These direct impacts create larger ripple effects in the economy through added employment, through service providers (indirect effects) and downstream expenditure on goods and services (induced effects). Quantifying indirect and induced effects can demonstrate the hidden value of projects, but it is a challenge. SRK employs input-output models or Social Accounting Matrices (SAM) to derive multipliers and quantify economic benefits. For example, we estimated

Evaluating project costs and benefits



Fertile soil in the riparian zone of the Congo River is used for urban agriculture in Brazzaville

that direct investment in a coal mine in Limpopo Province, South Africa, would indirectly contribute a further 20% of the investment to national GDP, while indirect employment generated by the project would equal the number of people directly employed at the mine.

Aside from benefits, projects can also have negative impacts on the economy if they jeopardise existing businesses. Cost Benefit Analysis (CBA) provides a tool to determine the net economic effect of a project and helps to identify whether it has a net positive effect, and then identify the most cost-effective option. SRK recently used CBA to help a cash-strapped municipality in the Western Cape, South Africa, prioritise spending on coastal management by comparing the value of environmental benefits to the financial cost of the measures.

Similarly, SRK's economists quantify the "free" natural resources affected by a project. Also referred to as ecosystem goods and services, natural resources have a tangible but often neglected economic value. Quantitative valuation

methods, such as replacement cost and contingent valuation, can translate the value of environmental resources in financial terms. This is becoming increasingly important for projects that emit carbon and/or limit carbon sequestration, with regulators and lenders expecting such accounting. For a large mining project in a tropical environment where it was projected that thousands of hectares of pristine rainforest would be stripped, it was estimated the social cost of additional carbon released to the atmosphere was ~15% of standard project benefits (e.g. balance of trade contribution, taxes, royalties, payroll, etc.). The EclA also determined the value or opportunity cost of lost forest products, estimated at over half of projected mine income. "Monetising" environmental goods and services that might be lost as a result of a project has its critics but allows a fairer comparison of project costs and benefits and helps to facilitate sustainable development.

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Is early stakeholder consultation sometimes too early?



Engaging traditional authorities early in a mining project in the Democratic Republic of Congo

VASSIE MAHARAJ

Vassie Maharaj, Associate Partner and Principal Consultant in SRK Johannesburg, has been involved in stakeholder engagement, communication and raising awareness since 1998. She has led numerous stakeholder and government consulting processes for Environmental and Social Impact Assessments and environmental permitting in South Africa, other African countries, Yemen, and Indonesia. Her experience spans projects for mining, industrial, and oil and gas sectors, and for government policy development, environmental awareness and capacity building programs. It includes working within specific in-country legislative requirements, international standards and good practice guidelines, across cultural and language boundaries, and using innovative techniques to enhance meaningful participation by all levels of stakeholders.



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Effective stakeholder engagement requires communicating with stakeholders early in the decision-making process to foster constructive relationships, provide opportunities for collaboration and facilitate stakeholder's ability to participate early in decisions that may affect their lives. Providing proactive and transparent information to stakeholders early also reduces risks of rumour, speculation, misinformation and media sensationalism. However, releasing incomplete or unverified information too early in a process can have the opposite effect. The premature release of information can generate inaccurate perceptions, fears and expectations and often expose companies to public mistrust, outrage and fear, anti-development campaigns, government scrutiny and negative press.

SRK believes that while early engagement is the correct principle, not all stakeholders need to be engaged early, or at the same time, or to the same level of detail. In our experience, early stakeholder engagement is most effective when rigorous stakeholder

analysis produces a clearer understanding of the level of their interest and influence. The earlier stakeholders with a high level of interest and/or influence are included in an engagement process, the more likely it is significant issues can be addressed and opportunities for partnering and collaboration identified, and this should be an explicit objective of engagement with such stakeholders.

SRK's recent experience on two controversial projects in South Africa demonstrates the importance of determining which stakeholders to engage early and what information to disclose. These projects included the development of engineering solutions to the acid mine drainage (AMD) challenge produced by potential acid decant from historic underground gold mines in the Johannesburg area, and the development of a stakeholder engagement plan to deploy South Africa's carbon capture and storage (CCS) strategy.

In both of these projects, SRK identified stakeholders with a high level of interest and influence to establish Stakeholder Committees and engage

Exploring the adoption-implementation disconnect



them at key project milestones. In the AMD project, the composition of a committee purposefully involved environmental activists and whistleblowers to leverage their creativity and passion for the cause in finding a solution to the AMD challenge.

Similarly, deploying CCS in South Africa, which involves injecting carbon into the sub-surface, is controversial because of its perceived similarities with fracking. Having acknowledged that stakeholders should be involved as early as possible, key stakeholders in government, industry and NGOs were engaged to gather their views and perceptions on CCS, its impacts and likely stakeholder concerns and improve understanding of CCS.

In these complex and controversial projects, early engagement with selected stakeholders focused on ensuring a clear understanding of the project objectives. It minimised the risks of derailing the project and increased the likelihood of partnerships in decision making.

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Adopting the Performance Standards (PS) of the International Finance Corporation (IFC) is a condition of project financing arrangements with Equator Principles Financial Institutions. Auditing compliance with these standards has highlighted a disconnect between corporate commitments and operational implementation.

Much of SRK's auditing experience throughout Africa is based on regular loan agreement audits for financial institutions, with these results:

- Clients take longer to comply than considered reasonable by the financial institutions. The gap between complying with in-country legal standards and the IFC PS often requires additional human and financial resources to complete action plans within reasonable timeframes.
- If organisations do not internalise IFC PS requirements, their action plans do not cover the full spectrum of activities required across line functions. IFC PS responsibilities normally fall on Health Safety Environmental and Community (HSEC) staff but the work exceeds their mandate to facilitate implementation. Given the broad nature of the standards, implementation should apply across all line functions.
- HSEC and line function staff often learn of IFC PS commitments only at the first performance audit, where the importance of the employee's role as an internal stakeholder is downplayed. Commitments are rarely communicated or incorporated into policies, procedures and systems until two to three audits have been completed.

The following actions can strengthen implementation of IFC PS commitments and bridge the adoption-implementation gap. The first audit should focus on corporate strategy and top management's adoption of the IFC PS. Detailed action plans should be developed with personnel to develop buy in. Action plans should be practical and achievable and developed with resourcing, responsibilities, and

timeframes in mind. Early on, companies should provide training for affected staff to facilitate an understanding of the commitments, as well as to identify the gaps between legal and IFC PS compliance, the business imperative for adopting IFC PS, and resources vital to implementing the action plan.

Governance and change management are often as important as technical advice. Vital to successful implementation of the IFC PS requirements is strong organisational leadership to communicate and carry out the commitments made at the top, through the hierarchy for integrated implementation at all levels and across all line functions.

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BRIONY LIBER

Briony Liber, Associate Partner and Principal Environmental Consultant in SRK Johannesburg, has 15 years' experience in environmental assessment,



working predominantly in the mining sector in Africa. She has also worked on projects in Brazil and the Dominican Republic. Briony has project managed many ESAs for large mining and linear infrastructure projects, undertaken social auditing and reviews of mining projects measured against in-country regulatory requirements and good international industry practice (GIIP). Briony has also been responsible for conceptualising, implementing and managing corporate social investment projects, maintaining environmental and social management systems and stakeholder relationships. She currently manages SRK's Johannesburg Environmental Department.

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Energy and ICT infrastructure planning and assessment

For projects of regional significance, strategic assessment in upfront planning is essential. SRK South Africa used this approach in a long-haul fibre optic data cable and a solar energy photovoltaic plant.

In 2011 FibreCo Telecommunications appointed SRK Johannesburg to undertake environmental studies for the prefeasibility and feasibility phases of a 4 000km fibre-optic network. South Africa's heartland is deficient in fibre-optic infrastructure to meet the growing demand for connectivity between major population centers and the outside world. FibreCo's open-access approach is revolutionary: The model increases cost efficiencies and connectivity to global services and reduces environmental disruption because it allows multiple operators to share a cable.

SRK considered the most appropriate corridors, along with institutional, environmental and social sensitivity challenges. After ruling out rail and electrical options, SRK identified sensitive biophysical, social and cultural environments, and geotechnical conditions. Early identification of sustainability issues, allowed FibreCo to anticipate environmental and social risks and push a national agenda, ensuring national government buy-in.

In 2012, with power shortages and government's need for independent

power to generate renewable energy, SRK completed an EIA of a solar power plant in the Northern Cape Province. The project, covering 700 hectares, is one of the country's largest solar photovoltaic plants.

Despite the benefits of renewable energy, solar projects face major challenges, especially the Department of Energy's (DoE) requirement that only projects generating 75MW be considered in the solar bid. Subsequent negotiations produced an integrated assessment of the entire project, meeting DoE's authorisation requirements. SRK's team aligned the various departments' time-frames to expedite the process.

The project, located within the sensitive Succulent Karoo Ecosystem Program, needed careful environmental screening. Specialists recommended adjustments to the project to protect areas like the rare Red Lark dune habitat. Considering its scale, SRK investigated and ruled out the project's potential impact on agriculture and mineral resources.

SRK's approach in the initial stages, as evidenced in substantial case studies, reinforces our ability to shepherd clients through complicated authorisation processes and inform the project's environmental soundness.

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Since becoming a democratic state in 1994, South Africa's policy makers have systematically strengthened the country's environmental policy framework. South Africa's environmental laws guiding natural resources management and pollution prevention are world class; however, the lack of capacity, shortage of skills and limited understanding of sustainable development have undermined the government's ability to implement these laws.

Environmental Impact Assessments (EIAs) used to assess and manage environmental and social impacts have proven inadequate in guiding development over large geographic areas with sensitive environments. The 2010 Environmental Management Frameworks (EMF) Regulations designed to address this challenge require government authorities to compile information and maps of particular geographic areas where development threatens natural and cultural resources.

SRK South Africa has been involved in developing the EMF tool with government institutions at national,



The PV array is planned for dry, flat landscape near Aggeneys in the Northern Cape

Developing decision-making tools for integrated land use planning in World Heritage Sites



Country estates encroach on the Cradle of Humankind World Heritage Site situated to the north of Johannesburg, South Africa

provincial and local levels. In 2008 SRK Johannesburg prepared an EMF and Strategic Management Plan for the Cradle of Humankind World Heritage Site (COH WHS). In 1999 UNESCO declared the 47,000 hectare COH WHS a world heritage site due to its complex paleontological and palaeoanthropological attributes. The site holds some of the oldest hominid fossils dating back 3.5 million years, owing to the dolomitic karst landscape. This built on SRK's work in 1999 to demarcate land use zones for the COH WHS.

Located approximately 50 km northwest of Johannesburg, the COH WHS has experienced increasing development, mainly from country estates and tourism-related uses. Managing land use change has proven difficult as the site falls within the jurisdiction of numerous government authorities. This has led to a lack of coordination between institutions, as one government agency rejects and another approves permission for the same project. In addition, the COH WHS is owned by private landowners, contributing to conflict over development and legal challenges to land use change.

The EMF was formulated to help build a vision for development at heritage sites and a common understanding of environmental issues through extensive engagement with stakeholders including landowners, authorities, non-governmental and community based organisations, property developers and businesses. Based on available literature and data and specialist analysis, SRK prepared a report on the current state of the environment, highlighting potential areas of conflict between sensitive environments and development. This information was mapped using GIS to ascertain zones of high cultural, water and ecological sensitivity to compile land use guidelines for decision making on future development. Once promulgated, authorities and developers will be required to consult the EMF to determine if a proposed project occurs in a sensitive area and what specialist investigation is needed for an EIA. If applied optimally, the EMF can contribute to sustainable development of the area.

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Darryll Kilian is a Partner and Principal Environmental Consultant at SRK Johannesburg with 21 years' project experience in environmental and social impact assessment (ESIAs), strategic planning and policy development and due diligence in the natural resources, mining, industrial and transport sectors in southern, east and west Africa. He has an excellent understanding of ESIs conducted to meet national legal requirements and international good practice standards. Darryll holds a Master's Degree in Environmental and Geographical Science and is registered as an Environmental Assessment Practitioner in South Africa.



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Lyn Brown is a Principal Environmental Scientist at SRK Johannesburg with 19 years' experience including impact assessment and strategic projects. SRK assignments include infrastructure EIAs, environmental planning and reporting on South Africa's attainment of United Nations sustainability targets. Previous experience in the non-governmental sector focused on environmental governance and management in the water and mining environment. Lyn is professionally registered with a Masters in Environmental Science.



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Andy Li, Ph.D, is a senior environmental consultant with 12 years' experience in environmental engineering. Prior to joining SRK China, Andy was an environmental engineer with an international consulting firm, responsible for contaminated site remediation and landfill closure/ Brownfield redevelopment in the New Jersey-New York area of the U.S. He has extensive experience with water/ wastewater treatment design, water distribution systems, storm water management systems, and geographic information systems (GIS). Andy's current focus is on environmental due diligence reviews, environmental compliance and impact assessment on mining, mineral processing, refining, and smelting in China and Greater Asia.



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Donald Gibson is a Partner and Principal Consultant at SRK in Johannesburg. He advises clients on the sustainability aspects of development projects in the natural resources and infrastructure sectors in Africa and is facilitating Nedbank Capital's Sustainable Business Awards. Donald is involved in policy advisory work on sustainable development for government departments, and advises companies on sustainability mainly in the transport, logistics, construction, mining, food and beverage and petrochemicals industries. On the Faculty at the University of Pretoria's Gordon Institute of Business Science (GIBS), he lectures on sustainability and corporate responsibility for the MBA and corporate education programs.



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A snapshot of the current environmental situation in China



AMD exfiltration from the tailings storage facility at a gold mine in northern China

SRK China has conducted numerous environmental due diligence projects in China's mining industry. Based on our site observations, some major environmental issues are either not covered by current Chinese Environmental regulations or not dealt with properly due to a lack of law enforcement.

Site contamination assessment has not been required in China, yet poor materials handling, leakage and spills, which would potentially contaminate groundwater and soils if not properly contained, is widely observed on projects. Without any regulations to restrict pollution, groundwater and soil contamination will continue and the remediation costs for site cleanup will be high.

Acid Mine Drainage (AMD) is not covered by any regulations. A simplified test conducted by a certified lab generates some test leachate from the waste rock or tailings samples. Depending on the analysis of the

leachate (mostly heavy metals), the waste rock or tailings are considered hazardous or general waste. In some mines, tailings are considered general waste and no anti-infiltration measures are installed; however, AMD is often observed at the toe of tailings storage facilities (TSFs).

According to Chinese regulations, any TSF discharging waste water shall have a discharge point with various controls installed – real time water quality monitors, alarm systems, emergency back-up ponds. SRK China has observed only very few TSF's with properly installed controls at the discharge points.

Bond payments for mine site rehabilitation are necessary to obtain a mining license in China. During environmental due diligence studies, SRK is provided with bond payment receipts, however the amount of payment is often insufficient to complete rehabilitation – most of the time being 60% to 80% short.

Beyond-compliance sustainability strategy in Africa



Usually, Chinese mine sites lack a comprehensive stormwater management system to control surface runoff, and soil erosion is a big problem. There are no regulatory guidelines in China for sedimentation pond design and swale design (sizing, spacing, slopes, and lining types). In most cases, poorly maintained and under-sized swale systems are observed on sites.

A land disturbance registry was established by Chinese Land Reclamation Regulation in 2011. This live documentation system records any land disturbance areas during the mine operation. However, at most mine sites, no operational data is collected at all.

In 2013, China's election year, the new government announced that environmental protection will be a higher priority on the political agenda, and therefore, we look forward to more regulations and efforts to mitigate these environmental problems.

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While beyond-compliance strategies designed to meet international standards do not always appear to make commercial sense, increasingly companies have trouble justifying a business-as-usual approach. With globalisation and the financial crisis, business is recognising the strategy's benefits, and the need to manage risk more proactively, particularly in Africa.

At Cornell University, Professor Stuart Hart's research shows that beyond-compliance sustainability activities offer financial and other payoffs. Particularly, innovation, internal change management and skills development, new product and market development, stakeholder collaboration and corporate social responsibility trump traditional measures of resource efficiency, pollution prevention and product stewardship.

Based on our project experiences in Africa, SRK shares this perspective. Despite competent environmental legislation in some countries, African environmental and social governance is weak; government and civil society often cannot hold companies to account. Combining this with social complexity, political uncertainty, financial and reputational risk, more developers are applying a beyond-compliance approach, to encourage project financing, or facilitate mergers and acquisitions.

If stakeholders do not fully understand the business benefits, while corporate

decision makers settle on meeting minimum requirements, they can miss the opportunity to begin projects on a solid footing, using proactive risk management and 'future-proofing' their developments.

However, some companies are committed to moving beyond compliance. SRK's work with such a West African company revealed numerous reasons for this decision. First, shareholders are pressuring the company to improve management to lower capital costs, cement their positive reputation and manage risk proactively. Second, they faced significant risks and uncertainty, including legacy rehabilitation and closure liabilities, while civil war and human rights abuses produced neighbouring community activism and engagement. A beyond-compliance approach helped manage these risks. They plan to expand operations, rehabilitating ecosystems, and developing supporting infrastructure and services to improve their complex operating environment.

Pursuing a beyond-compliance approach makes good business sense because it reduces risks and costs, builds collaborative partnerships with stakeholders, encourages innovation and skills development, and achieves company success.

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Listening to community perspectives in a village in the Democratic Republic of Congo

Skills needed when implementing an environmental management system

Implementing an environmental management system (EMS) can be a tough mission, even for a consultant with experience in about 20 EMSs at mines and processing plants, and who has reviewed environmental management at several mines worldwide.

Environmental management is usually not the highest priority at a mine, and, achieving ISO14001 certification is an additional requirement to mine personnel's day to day responsibilities.

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Richard Evans, MSc, Pr Sci Nat, has experience completing EMS, ESIA and due diligence projects. Based in SRK Sweden, he has worked on projects in Africa, South America, Saudi Arabia and the Nordic region. Richard gained practical experience working on site with operational staff implementing ISO14001 environmental management systems (EMS) for some of the world's major mining companies, such as Anglo Platinum, De Beers and Lonmin. Richard has been very successful in assisting companies achieve ISO14001 certification and their environmental management goals.



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Consequently, getting personnel committed can be a challenge for those trying to implement new management systems and enable a change in behavior. This is exacerbated as mine staff are under pressure to achieve production and meet health and safety targets.

The challenge for the environmental consultant is to bring mine personnel on board in achieving the mine's EMS goals. A successful EMS project mainly depends on: 1) the level of commitment from mine management; 2) continuity and the presence of the consultant on site; 3) capacity of environmental personnel; 4) involvement of all mine personnel; 5) appreciation by the consultant of the challenges facing the mine; and 6) the consultant's social skills. EMS work is thus as much about building relationships as it is about implementing a program.

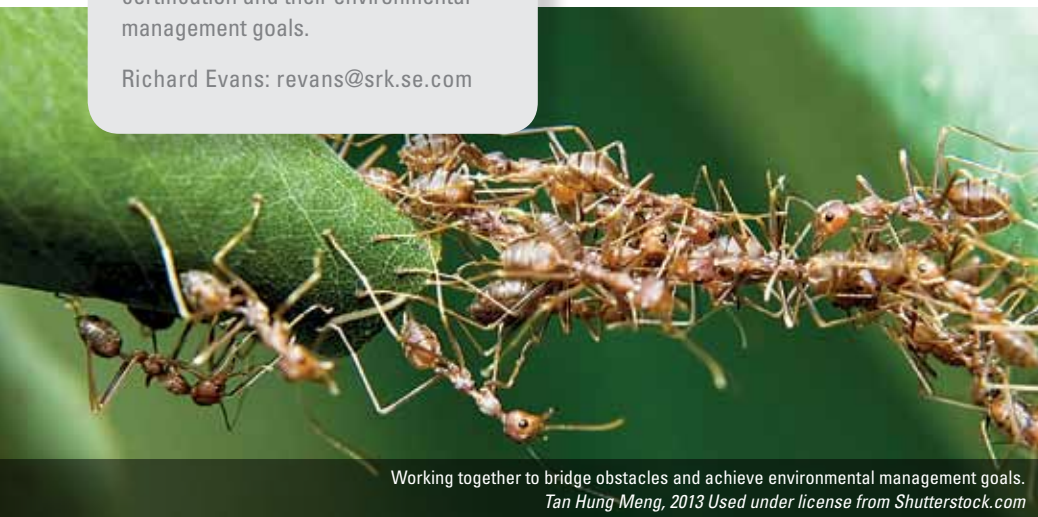
Environmental management work is tricky because it emphasises technical and social skills in challenging environments, where environmental issues may not be at the top of a mine's agenda. Consultants are, first and foremost, interacting with people and will require empathy and patience as well as assertiveness and persistence to achieve results.

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Air quality impacts traditionally receive less attention in Environmental Impact Assessment (EIA) studies since most mines are located in relatively sparsely populated areas. However, in more densely populated countries, an increasing number of mines are situated near residential areas, and most mines create residential development to support their economic activities. Therefore, assessing air quality impacts is under more scrutiny as regulators and the public question potential air quality impacts and mitigation measures during the project development phase.

Mines affect air quality by generating both gaseous emissions and particulate matter (PM). However, unless the site involves captive power generation or a smelter, gaseous pollutants are less likely to be of significance. In contrast, PM emissions from earth moving, material handling, and process activities are significant due to the large volumes of emissions they generate. Most PM emissions in the mining industry are fugitive emissions, i.e. they are not confined to a stack or vent. Fugitive emissions are harder to control



Working together to bridge obstacles and achieve environmental management goals.
Tan Hung Meng, 2013 Used under license from Shutterstock.com

Air quality impact assessment



Haul roads: important fugitive particulate matter emission sources

since conventional control methods do not necessarily apply.

The first step in assessing air quality impacts is collecting representative and accurate baseline data. Since dispersion of air pollutants is mainly governed by meteorological conditions, it is important to establish a meteorological station on site to collect data of sufficient quantity and quality. One of the pitfalls is using meteorological data from existing stations nearby. While these data sources are convenient, they may not be representative or adequate for the project's purposes. Wind is one of the most critical parameters in estimating air quality impacts. A 5° error in wind direction can cause more than 100% error in the results. Wind can vary significantly over short distances due to changing topography. Therefore, representativeness of the existing meteorological stations should be assessed before using them. Often, existing meteorological data will need to be augmented with on-site meteorological data to improve accuracy. The minimum requirement for an on-site

meteorological monitoring program is one-year of hourly meteorological data with 90% data recovery. Since time is of essence, try to establish a reliable, high-quality program with reliable monitoring equipment, regardless of cost. A baseline PM monitoring program is also needed to measure different PM size classifications and the heavy metal content.

The second important parameter is projected PM emission rates. Estimating the fugitive PM emission rates accurately may be difficult since they are highly variable due to meteorological conditions and mining activity rates. The emission factors used rely mostly on empirical relations based on activity types and rates, climatological factors, and material conditions. Several agencies and organisations, such as USEPA, European Union etc., have developed emission factors that can be used to develop mine site-wide emission inventories for use in air quality impact assessment.

Atmospheric dispersion models bring different factors together to estimate the ambient air quality impacts. Models

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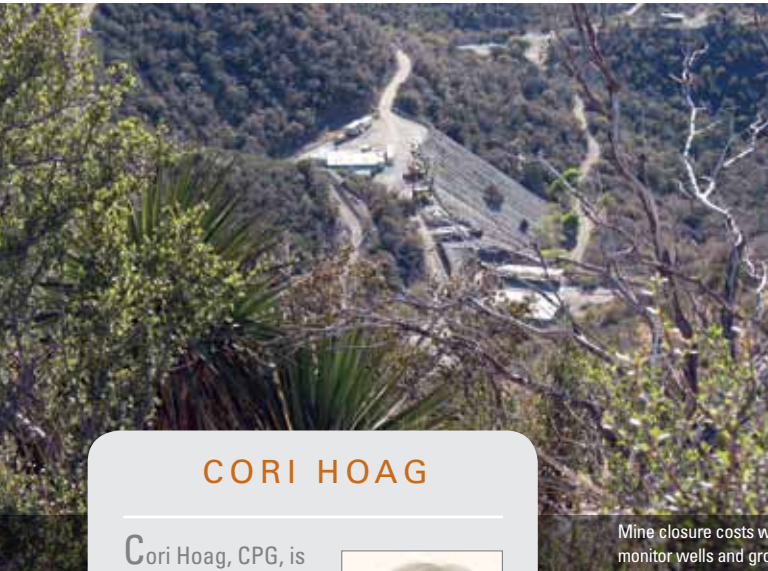


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available today from USEPA, Australia, and Germany can handle complex terrain conditions and are based on advanced atmospheric boundary layer turbulence and scaling concepts to improve accuracy of the dispersion estimates. While even the best air quality dispersion modelling studies involve uncertainties, they can be invaluable tools in the EIA studies and mine planning. The uncertainties in the study can be improved using accurate and representative input data which can be collected through site specific studies.

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Section 20 of the NI 43-101: Reporting requirements from exploration to feasibility



Mine closure costs will include the closure activities for tailings impoundments. Baseline studies include the installation of monitor wells and groundwater sampling events to characterise the hydrogeologic regime

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The National Instrument (NI) 43-101 is a standard of disclosure developed by the Canadian securities regulatory agencies for mineral projects. Section 20 of a NI 43-101 technical report summarises the available environmental information related to the project; the Qualified Person (QP) then discusses the potential material impacts. Topics required include a summary and discussion of: 1) environmental studies and material impacts; 2) mining waste management, environmental monitoring and water management during and after operations; 3) permit requirements and status, plus bond requirements; 4) potential social or community requirements and plans, plus the status of previous agreements; and 5) the expected mine closure requirements and costs.

These criteria apply to all phases of the project in NI 43-101 reports, from the grass-roots exploration stage through to feasibility and operations. The Section 20 criteria for each stage of project development are outlined as follows.

- Exploration and/or Mineral Resource. Summarise drilling permit requirements and constraints on surface disturbance. Identify any potential environmental hazards or historic liabilities, such as historic shafts, waste rock dumps or tailings.
- Scoping (Preliminary Economic Assessment) Study. Include a conceptual evaluation of the environmental setting, noting potentially significant conditions or permitting constraints. At this stage, baseline studies may be in progress, but an Environmental Impact Statement (EIS) has not been initiated. Include a conceptual plan for managing and mitigating the identified issues and a description of the permit program requirements, timelines, and expected costs.
- Pre-feasibility Study (PFS). Evaluate project impacts based on results of the baseline studies in the draft EIS or the initial permitting process. Include a detailed permitting schedule, discussing studies to be completed.

Uranium fuel supplier's sustainable development and stewardship program



Describe community outreach efforts, potential community/social impacts and mitigations. Complete a conceptual closure plan and costs, based on geochemistry, geotechnical and hydrologic data. Describe environmental plans and monitoring programs in place.

- Feasibility Study (FS). Typically, the environmental permit acquisition is at an advanced stage and the EIS has been submitted, although not necessarily approved. Summarise the results of scientific and environmental-related engineering studies; plans and monitoring programs to manage water, wastes, air quality; and impacts to the environment and community. Describe the company's community outreach efforts and sustainable development approach. Include a detailed evaluation of all pertinent environmental and permitting requirements, estimated environmental costs for startup, operations, and closure, and a schedule for obtaining the operating license.

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The World Nuclear Association (WNA) has developed a program for Uranium Stewardship and Sustainable Development. It defines Uranium Stewardship as "a program of action based on continued commitment to ensure uranium and its by-products are managed in a safe, environmentally responsible, economically and socially acceptable manner." Uranium Stewardship entails building partnerships throughout the life cycle of materials to ensure their production, use and disposal are consistent with global sustainable development. An essential element of Uranium Stewardship is sharing management systems and best practices within and across industry sectors.

The Republic of Kazakhstan has been an important source of uranium for more than fifty years and is now the world's leading uranium producer.

A French low-carbon energy producer requested SRK Kazakhstan to assist them in auditing their uranium fuel supplier's compliance with WNA's Uranium Stewardship program. Their supplier is a uranium mining operation in Kazakhstan.

A mining engineer and an environmental consultant from SRK visited the mining operation as part of a Joint Evaluation, which also included specialists from the client's technical department.

The team evaluated the mining operation's compliance with the Uranium Stewardship guidelines,

and measured its ability to conduct its business both within WNA's guidelines and Kazakhstan's laws and regulations relevant to sustainable development, environmental and social impact, health and safety management, and social responsibility.

The findings of the SRK team were incorporated in the Joint Evaluation team report on Uranium Stewardship.

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ZARINA UALIYEVA

Zarina Ualiyeva, PhD, AIEMA, is a Licensed Environmental Engineer and has over ten years of experience working on environmental audits, due diligence studies, third party reviews and managing ESIs. She takes on large-scale industrial projects, mainly mining and mineral processing, to meet local environmental permitting requirements and international guidelines. Zarina's experience includes overall management of the EIA process, air emissions modelling, waste & water management, environmental programs management, methodology of ecological calculations and environmental studies for technical project documentation and regulatory approval. Her experience extends to projects in Kazakhstan, Ukraine, Georgia, and West Africa.



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Site visit of Uranium enterprise as part of Stewardship Program and Sustainable Development, Kazakhstan

A pioneering community empowerment initiative in South Africa

Mining is a transient activity, prompting critics to doubt the ability of the industry to live up to ambitious claims of sustainability, especially in the communities that host or neighbour the mines and feel the impacts of mining activities. Many former mining towns in Africa and around the world have declined dramatically following mine closure, with crumbling infrastructure, weak social services, economic stagnation and elevated levels of unemployment.

In South Africa, SRK has been working closely with Anglo American Platinum and a multi-disciplinary group of advisors to develop and launch a ground-breaking community empowerment and development

initiative. This initiative seeks to facilitate real and sustainable community development that will outlast local mining at four of the company's South African operations and in distant areas contributing labour to these mines. The initiative complements broader community engagement and development programs facilitated by the company in host and labour sending areas.

The initiative, dubbed "Alchemy" consists of the following key elements: community shareholding in Anglo American Platinum (making the participating communities the third-biggest Anglo American Platinum shareholder); a guaranteed minimum flow of funds, irrespective of dividend levels; community-managed local development trusts; an integrated planning process that builds lasting partnerships with government, business and civil society; and a commitment to ongoing and inclusive engagement.

Alchemy has evolved over a period of several years and members of the SRK Johannesburg social team have been involved since early 2009. Contributions included social baseline research and strategic and operational advice to financial, legal and organisational design activities. The SRK team has also led an extensive stakeholder engagement program, leading to the establishment of the local Alchemy development trusts.

The initiative has shown the value of a multi-year project development program involving a client and selected specialist advisors. This approach has enabled SRK and others to participate from concept to implementation, adding value for all parties involved.

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TIM HART

Tim Hart is a social and human development specialist, with 40 years of experience. He has worked extensively in South and Southern Africa, and on projects in Asia and South America. Much of his work has been in the mining sector. Tim has acted as a senior advisor to mining companies on issues of social and community development, seeking to leverage real and sustained social and economic progress in communities impacted by mining. In this context he has assisted clients to optimise social investment through improved internal management practices, and durable development partnerships outside the mine.



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The scope of environmental and social (E&S) input to multi-disciplinary due diligence studies has changed radically in the last decade. In the past, the scope was often undefined but now the terms of reference for E&S input can run to several pages. This trend can be partly attributed to the increasing complexity of environmental law (international and national), the advancement of standards by development financiers (including the Equator Principles and IFC Performance Standards), and the proliferation of corporate social responsibility initiatives. It can also be attributed to the modern reality that E&S matters can materially affect the value of assets.

A growing number of projects are delayed or cannot progress beyond the feasibility stage because of E&S matters. In some cases, this can be attributed to impacts of high significance that cannot be prevented or adequately mitigated. More often, however, this is because E&S matters have been handled inappropriately. Investors know this and seek to ensure

Changes to environmental and social input into due diligence studies



adequate specialist investigations have been undertaken to define baseline conditions and impacts, that local communities and other stakeholders are effectively engaged, and the requirements of regulatory authorities are satisfied.

Cases where operating mines or mineral processing plants are forced by regulatory authorities to shut down for a few days or even several months are also on the rise. Persistent failures to comply with discharge criteria or significant pollution incidents are usually the causes. The shutdowns have material impacts on the productivity and financial performance of the operations. Substantial capital expenditure may be required for obtaining the technology needed to bring the operations back into compliance.

It is essential to understand historical environmental liabilities, especially when they could potentially cost hundreds of millions of dollars. Such liabilities and a lack of confidence in permitting or community relationships

could influence or even stop a deal, in the case of mergers and acquisitions.

SRK's extensive experience in undertaking due diligence for a variety of commodities worldwide shows the following aspects require particular investigation during an E&S due diligence:

- Compliance with regulatory requirements.
- Effective, on-going stakeholder engagement.
- Appropriate impact assessment leading to implementable management plans.
- Historical liabilities (if relevant).
- Costs of managing key E&S issues and of closure.
- E&S management systems, especially corporate will and sufficient human and financial resources to ensure E&S issues are effectively addressed during the life of the project.

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Fiona Cessford, MSc, Corporate Consultant (Environment), has worked in SRK's UK and South African offices for the last 14 years.



She specialises in environmental and social (E&S) due diligence studies. Working globally, Fiona helps companies seeking to raise finance and to integrate E&S studies into their project development process with the aim of meeting host country, corporate, investor and international standards. Fiona has also managed large impact assessments and advised on integrated pollution control, water management and legal compliance.

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Jane Joughin, Corporate Consultant (Environment), MSc, PrSciNat, has over 20 years of experience undertaking ESIA's as part of project feasibility studies



and applications for environmental approvals, environmental compliance auditing of existing operations and due diligence reviews. Most of her ESIA and auditing experience has been gained on large-scale mining projects, smelting operations and infrastructure projects. Jane worked in SRK's Johannesburg office for several years and is now based in SRK's Cardiff office.

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JENNY LANCASTER

Jenny Lancaster is a Senior Environmental Scientist in SRK's Johannesburg office. She has over 10 years' experience in research, training and consulting in ecology and biodiversity. Jenny's consulting work has focused on coal mining, where she concentrates on compiling and managing multi-disciplinary EIA projects and has served as independent environmental control for construction phase activities for mines and industry. Jenny has a Doctorate in the Socio-Ecology of small mammals from the University of Witwatersrand, and is registered with the South African Council for Natural Scientific Professionals.



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EMILY ROBINSON

Emily Robinson, MSc, AIEMA, joined SRK UK in 2006 and specialises in preparing and managing ESIA's to meet local environmental requirements and guidelines from major financial lenders. Her ESIA experience is varied and includes projects in North and West Africa, Central Asia, the United States and South America. Her work in these diverse areas is complemented by providing environmental and social inputs to due diligence reviews of mining projects and operations across a range of commodities. Emily also prepares closure plans in cooperation with project engineers as part of project feasibility studies.



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The energy-biodiversity-water nexus in the coal mining environment



Passive wetland system under construction at an opencast colliery in Mpumalanga

Extracting coal can often have significant environmental impacts including altered landscapes, lowered air quality and deterioration of water resources by extracting clean water, decanting dirty water and Acid Mine Drainage (AMD). While advances in mining techniques have reduced many negative impacts traditionally associated with coal mining, the paradox exists: industry needs clean water for its processes while the same processes adversely affect the quality and quantity of clean water. Additionally, coal-rich areas in South Africa are often located in water stressed areas or where wetlands and river courses are already over-utilised or degraded. The nexus is thus: it takes a significant amount of water to mine coal and generate energy, and it takes a significant amount of energy to supply and treat water for these operations.

As a result of this nexus, the coal mining industry needs a two-pronged approach for water management: minimise the volume of water extracted, polluted and discharged into

the environment through reuse and recycling, and: manage water impacts using strong management controls through monitoring, mitigation and offsets.

SRK is working with our mining clients to improve their water management strategies, aiming to reduce demand through efficiency and technology, using lower quality and recycled water, where possible. Dirty mine water can be treated and reused in various ways by active methods (water treatment plants) and passive methods, like passive wetland systems. The treated water can be used within the mining area for beneficiation and processing plants, dust suppression, fire control and reused as potable water. The eMalahleni Water Treatment Plant is an example of a successful partnership with Anglo American Thermal Coal and BHP Energy Coal South Africa (BECSA) joining forces to treat an excess of 130 million m³ of dirty water stored underground, to the benefit of the local municipality and community by ensuring the supply of potable water.

Environmental and social management at exploration



After rehabilitation

This has set the standard for many mines in the area to investigate water treatment options, minimising the risk of decant while reducing the effect of AMD.

Passive wetland systems may provide benefit to ecosystem services by reinstating wetland functions like water purification, flood attenuation, erosion control and water storage. These functions may have been destroyed and/or are no longer functioning at their full capacity due to mining activities. Passive wetlands can thus be considered a type of offset, and offset projects should consider ecosystem services as a central concept.

The challenge is to manage and limit the impact of mining on water resources and energy needs while still providing sufficient coal to meet power demands. This goal can be achieved by integrating water policy, planning and management within the mine planning to encourage conservation, motivate innovation and ensure sustainable use of the water resource.

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A trend is growing for exploration companies to be “custodians of value” for their projects. While demonstrating technical value has always been a driver of funding for exploration projects, prospective investors are increasing the pressure to provide environmental and social value as they gradually place more weight on these aspects when making their investment decisions.

The main early social management and stakeholder engagement actions that may enhance a project proponent’s social licence to operate throughout the life of mine include:

- Identifying and analysing stakeholders to assess and respond to local expectations and concerns.
- Analysing traditional land tenure arrangements to prepare fair and acceptable compensation strategies, avoiding resentment for damage to assets.
- Identifying local decision-making structures and relationships to develop effective stakeholder engagement and collaboration methods, which are accepted by the broader local community and which will facilitate any potential future ESIA process.
- Providing information that is timely, transparent and sufficiently comprehensive to avoid the spread of false information that can lead to conflict.
- Developing a culturally acceptable grievance mechanism to ensure the grievances of local communities are

addressed promptly, avoiding the build up of tension.

- Making short-term commitments for community development projects to build trust and goodwill.

With respect to environmental management, following guidelines, such as the E3 plus excellence in environmental stewardship toolkit, can help a company move beyond compliance with local permitting requirements and provide added value. Starting environmental monitoring during exploration to assess seasonally variable conditions, such as climate, water resources and biodiversity, can dramatically save time in the later stages of project development. In addition, collecting environmental and social data means sensitive areas and risks can be identified early in the project design process, so project proponents can “design-out” environmental risks or proactively manage unavoidable risks to best advantage.

Early exploration projects provide the opportunity to implement good environmental and social standards, to set the scene for a license to operate, and to minimise the development of environmental problems and negative stakeholder attitudes that can be challenging and costly to alter retroactively.

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Engagement with stakeholders during development of an iron ore project in Sierra Leone

Closure modelling: reaping the benefits of forward planning

Traditionally, mining companies have based their budgets for closure and rehabilitation on unconditional performance bonds lodged with the Department of Mines and Petroleum (DMP), Western Australia. This can leave companies unprepared for the cost of closing a mine site, as bonds only provide for a portion of rehabilitation costs. In July 2011, the DMP and the Office of the Environmental Protection Authority (OEPA) jointly issued *Guidelines for Preparing (A) Mine Closure Plan*. These guidelines describe the new standards required for closing mine sites, which will apply to both existing

and new mining operations in the future. Among the key changes is a requirement to include estimates of mine closure costs as part of the Mine Closure and Rehabilitation Plan to be submitted to Government in support of the project approvals process. The closure cost estimates must be supported by information on the costing method and assumptions on the financial processes used. The Standardised Reclamation Cost Estimation (SRCE) model, developed by SRK, has proved to be an invaluable tool in this respect, useful to consider various “what if” closure scenarios and for the estimation of closure costs.

Karara Mining Limited (KML) engaged SRK Consulting to develop a preliminary cost estimate for establishing and managing rehabilitation and mine closure for the Greater Karara Project. Conceptual reclamation and closure methods were used to evaluate the various components of the mining operations and the SRCE was used to estimate closure costs. KML mine personnel provided user input data describing the physical layout, geometry, dimensions of the project components, AutoCAD and GIS information. Along with this data, the model used first principle methods to estimate quantities, productivities, and work hours required for various closure tasks, and cost data based on 2011 standardised industry unit costs for labor, equipment and materials. The model is reviewed and updated on a 6-monthly basis. By using this methodology, KML developed an increasingly accurate estimate of closure costs that will reflect changes over the life of the project and will help the company fulfill the requirements of the new Closure guidelines.

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LUKE ESPREY

Luke Esprey PhD (Modelling) is a Senior Hydrologist with 15 years of diverse experience. Starting his career as a research scientist, Luke developed modelling skills, in particular, non-linear parameter estimation, model calibration, verification and testing, for projects in South Africa and Australia. Subsequently, Luke moved into applied hydrology, working on projects relating to water management, stormwater control and flood mitigation, water resources and water allocation planning, catchment yield modelling and water specialist studies on environmental projects. In addition, Luke has experience in mine closure and rehabilitation, including research in post-mining rehabilitation and consulting projects in South Africa and Australia.



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Driven by high oil prices and advances in technology, previous predictions of peak oil appear premature. New exploration frontiers are being opened, and the increasing focus on unconventional resources (e.g. shale gas) is heralding unprecedented changes in the global oil and gas landscape.

The environmental risks are generally well known and management and control measures have been developed to minimise or avoid these risks. Nevertheless, the industry faces unique environmental and technological challenges, as well as heightened stakeholder awareness, which require special skills and technical know-how in environmental management.

In the offshore environment, underwater noise generated by exploratory seismic surveys has been the subject of much debate, in particular the impact on marine mammals that rely entirely on underwater communication for survival, but also the impact on populations of commercial species targeted by local fisheries. Impacts depend on exposure to sound levels and the auditory sensitivity

Environmental management of upstream oil and gas projects



of species, which can vary greatly between similar animal groups. Sound exposure levels at different distances from the sound source (airguns used in seismic surveys) are predicted through sophisticated underwater sound propagation modelling, which is determined by sound output levels and various environmental parameters.

Impacts can range from interference with communication and masking of natural underwater sounds, to behavioural responses, auditory injury or mortality. Soft-starts (a slow build-up of sound output levels over time) is designed to minimise potential impacts on species such as whales and has been widely adopted by the oil and gas sector.

Similarly, oil spill and discharge dispersion modelling can predict the fate of routine discharges such as drilling wastes (cuttings and drilling fluids) and processing wastes (produced water/sand) and accidental oil spills caused by surface accidents or subsea well blow-outs during offshore drilling. Potential impacts on the benthic environment, water column biota and the coastline are identified and

assessed based on the modelled results. Modelling and an understanding of risks can help determine the required level of emergency preparedness.

For projects on land, environmental concerns mimic those for other onshore industrial activities, although the newer technologies, such as advances in hydraulic fracturing, have introduced impacts that are not yet fully understood. Stakeholder engagement for 'scare factor' projects is often extremely complex and requires careful management to facilitate stakeholder comprehension and manage perceptions.

SRK has an excellent understanding of the key issues, technologies and international industry practice in upstream projects, and the obligations imposed by international conventions and regulations, such as the London Convention and MARPOL 73/78. These apply across all jurisdictions and SRK's industry experience in southern Africa is readily transferrable.

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Chris Dalgliesh is a Partner and Principal Environmental Consultant with SRK in Cape Town, with over 20 years of experience, primarily in Southern and West Africa, and South America. He directs Environmental and Social Impact Assessments (ESIAs) compliant with Equator Principles and IFC Performance Standards. Chris works across many sectors, including oil and gas, and regularly provides high level review of ESIAs. He is interested in working with clients to find solutions to environmental challenges early in the project cycle. Chris's background in economics gives him insight into the financial constraints clients must consider.



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Warrick Stewart, MSc, MSAPI, is a Principal Environmental Scientist based in SRK's Port Elizabeth office, South Africa. Warrick has more than 13 years of experience in systematic biodiversity and environmental planning, environmental policy and strategy development, strategic environmental assessment, integrated mine closure, impact assessment and permitting, and due diligence. He has completed projects in South Africa, Suriname, Greece and Romania. Warrick's experience spans the utilities, industry, housing, commercial, biodiversity, tourism and public service sectors in coastal, tropical, subtropical, temperate and Mediterranean ecosystems.



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EKATERINA MARAKANOVA

Ekaterina Marakanova joined the Moscow office of SRK Russia in April 2011. Ekaterina has a background in environmental issues and she has been involved in environmental and social impact assessments for the past 5 years. Her areas of specialisation in both areas include the pursuit of social-economic baseline studies, stakeholder engagement and social impact assessments. Ekaterina has experience in applying the international requirements of such organisations as the International Financial Corporation, World Bank Group and the European Bank for Reconstruction and Development to her projects.



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Assessing viable and sustainable land use options for mine closure in Suriname



Caramacca, one of the three sites at which the Integrated Closure Plan framework process and tools is being piloted in Suriname

SRK was appointed by Suralco LLC, a subsidiary of Alcoa, the world's largest miner of bauxite and refiner of alumina, to work closely with Alcoa staff in preparing an Integrated Closure Plan (ICP) for its landholdings and concessions located in the Commewijne, Marowijne and Para Districts of Suriname. The ICP included numerous phases and involved SRK specialist skills from the US, UK and South African practices.

A Decision Tree charted the overall phases of the project with decision nodes triggering adaptive management. Key tools were developed using the ICP framework process, including a Preliminary Land Use Viability Assessment Tool (PLUVAT); Reforestation Index (RI); Stakeholder Engagement Plan (SEP); and Water Quality Objectives (WQO) Criteria. The key deliverables of the

ICP include preliminary and detailed closure plans designed to return the disturbed areas to productive and sustainable future use. The process allows for transparent engagement and reporting with relevant stakeholders.

The effectiveness of the process and the assessment tools are being verified at three pilot sites. The tools are designed to integrate and address legal, land use, stakeholder and technical closure issues and to develop detailed/executable closure plans.

A key component of the ICP was identifying and assessing viable and sustainable post-closure land uses. Assessing land use options is essential for engaging stakeholders and planning engineering. A PLUVAT tool was applied to systematically screen land uses based on technical, biophysical, social or economic criteria.

Social and economic baseline studies for Udokan Project



The PLUVAT assessment considered geotechnics, geochemistry, social factors, economics, engineering and biodiversity.

Using PLUVAT, SRK identified potentially viable land uses and developed draft Conceptual Land Use Plans for each site to illustrate the spatial configuration options. Land use guidelines were developed to accompany the Plans and inform stakeholders of appropriate uses within each category, for instance suitable densities of residential development, heavy or light industry.

The Conceptual Land Use Plans were used to facilitate discussion with stakeholders and obtain government support to proceed with planning. Once completed, the final Land Use Plans will inform the detailed engineering closure designs and their implementation.

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In 2010 SRK Russia started work on the Udokan Copper Project, the biggest copper deposit in Russia, located in the Kalarsky District of the Zabaikalye Region. The sparse population settled near the Baikal-Amur railway in the 1970-1980s, with an expectation of industrial development, including the proposed Udokan Project. Currently, the population density is extremely low and youth are leaving, due to lack of employment opportunities, making social issues a critical aspect of the environmental and social impact assessment (ESIA) currently being undertaken by SRK.

The SRK team carried out an environmental and social scoping study and developed detailed terms of reference for the baseline studies, including the social baseline study. Stakeholder engagement was integral to these studies.

The social studies collected data on history, macro- and microeconomics, demography, public health, land use, living standards, social and transport infrastructure, culture and indigenous peoples and the area's main social problems. Social data obtained from secondary sources (statistics, historical data, requests to state bodies and organisations) showed significant discrepancies from official data, which is quite common for Russia. These discrepancies complicate analysis.

Therefore, data was partly checked during interviews with locals, our primary data source. But, primary sources are not always reliable either. For example it became clear the reindeer population estimates may be overstated. So specifying data through interviews can only marginally help companies estimate compensation for reindeer breeders.

The data showed the standard of living in project region is low; approximately 17% of the population has an income below subsistence. Natural resources, although significantly diminished in the last 30 years, still play an important role: almost all local people hunt, fish and collect mushrooms or berries for subsistence. Although the district has potential for industrial development, more than 70% of the district is subsidised.

The baseline studies showed about 500 Evenks (indigenous people) live in Kalarsky District, but few of them hunt and keep reindeer. SRK observed a tendency to degrade traditional cultures, including the nearly complete loss of the Evenk language.

The collected data and baseline studies will be used in the ongoing ESIA for the Udokan Project, along with continuing stakeholders engagement.

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Settlement in the Project area, Kalarsky District, Russia

Implementing a successful environmental management plan

To implement a successful environmental management plan, consider three things:

- Know what is in your plan: Presumably, you know what commitments have been made in your environmental management plan. But do you know what other commitments have been made in other documents associated with your plan? Are they consistent with what is in your plan? Too often multiple, sometimes conflicting, commitments are made by different people in different documents during the rush to permit or develop a project. If your environmental management plan has not resolved these conflicts before implementation, it may not be possible to do so. Developing a register of environmental obligations that documents all of the commitments made for the project early in the planning stages can

reduce the potential for overlaps and conflicts. It can also help identify gaps that may exist in your management measures.

- Make sure your plan is practical: Environmental plans look great on paper. You have identified key issues, defined actions to mitigate environmental risks, laid out a clear schedule and budget and it appears that all the angles are covered. But it is important to ask, “Is this plan something that we can actually implement on the ground?” Your plan has to be sensible and realistic for the specific circumstances. You need to consider what technical, economic, and human resources will be needed to execute the plan. For example, you cannot promise to sample every monitoring location every week if your project isn’t adequately staffed.

While conceptualising plans, it’s easy to lose touch with the realities of real-world work conditions. Things will go wrong. Design your plan to be practical and adaptable.

- Review and revise your plan constantly by using evaluation tools: A good environmental management plan should be a living document. Initially, the plan needs to be designed to achieve your goals based on the information available. As you implement the plan and document the results, pay attention to how tasks are executed and how effective they are. This information can then be used to determine how effective the plan is at achieving the goals. Then you can adapt the plan as needed. One of the most important aspects of a strategic plan is to be able to evaluate your success with measurable metrics. Make what works your standard practice and adjust the elements that aren’t working well. Write and implement your environmental plan with continual improvement in mind.



Ecosystem services are the benefits derived from services within ecosystems that contribute to people’s well-being. If no one benefits from the ecosystem, there is no ecosystem service. Ecosystem services include provisioning (food, freshwater, medicine), regulating (erosion control, flood protection), and cultural services (sacred sites, tourism, recreation), all of which are underpinned by supporting services. Natural resource projects equally depend on these services.

The need to “maintain the benefits from ecosystem services” is one of the new objectives of the 2012 IFC Performance Standards – resulting in a major change in approach to managing environmental and social risks and the impacts of projects. Project proponents seeking funding from international financial institutions must now identify impacts on priority ecosystem services, and apply the mitigation hierarchy to avoid, minimise and lessen impacts on these ecosystem services.

To effectively manage risks and impacts, assessing ecosystem

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Incorporating ecosystem services into ESIA's - a case study from the Republic of Congo



Examples of benefits that ecosystems provide to people in the Sintoukola Project area

services should be integrated into the ESIA process. The typical activities that occur during the ESIA scoping phase need to be adapted and, while meeting with affected stakeholders, relevant ecosystem services should be systematically identified and prioritised. Once priority ecosystem services have been identified, ESIA practitioners and affected stakeholders should define the scope of the baseline data collection to ensure suitable information is collected to enable the impacts on ecosystem services to be assessed.

SRK UK was commissioned to undertake an ESIA for the Sintoukola Project (Republic of Congo), which is located in a sensitive bio-physical and social setting. SRK and the client worked closely to incorporate ecosystem services into the ESIA process.

Greater emphasis was placed on scoping activities to ensure the ESIA process adequately addressed project risks and impacts. Stakeholder engagement involved identifying current ecosystem services within

the project area. In addition, a series of reconnaissance studies were conducted for the key disciplines (biodiversity, natural resource use, cultural heritage, social, water), to identify cross-cutting issues needing to be linked between the bio-physical and social studies. This helped define an integrated baseline program which incorporated the benefits of existing ecosystem services to local communities. A workshop held with baseline specialists was key to evaluating the impacts and developing management measures. This enabled data sharing across multiple disciplines and ensured impacts on ecosystem services were described and mitigated in an integrated manner.

Overall, impacts on ecosystem services were appropriately addressed within the ESIA; in addition, opportunities were identified to further improve the integration of ecosystem services for future projects.

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LOUISE BLAND

Louise Bland, Senior Consultant, Environment, has eight years of experience in preparing and managing ESIA's for large-scale mining and infrastructure developments following in-country regulations and international guidelines. This includes undertaking ESIA scoping studies, liaising with project engineers, managing and coordinating baseline studies, stakeholder engagement, impact assessment reports, and developing environmental and social management programs. Recently, Louise co-managed the Sintoukola Potash Project, full time.

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ROWENA SMUTS

Rowena Smuts, MSc Conservation Biology, Senior Consultant-Environment, has 15 years of combined experience in the conservation, environment and mining related fields, primarily in Africa. She was employed by SRK Johannesburg between 2002 and 2006. She then worked for the Washington-based NGO Conservation International for 5.5 years as a program manager and then as their mining engagement advisor. Rowena joined SRK's Cardiff office in April 2012.

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MARIA INES VIDAL

María Ines Vidal, a Principal Environmental Scientist, is head of the Environmental Department at SRK Chile. With 22 years of experience in environmental and social baseline, impact assessment and management, she understands local and international permit requirements. María Ines' experience includes environmental audits and environmental and social reviews as part of Due Diligence projects. She has experience in different types of mining environments through projects in Chile, Peru, Argentina, Bolivia and Colombia. As a project manager, María Ines manages groups of local and international specialists and liaises with both the client's project leaders and the local environmental authorities.



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MARK LISKOWICH

Mark Liskowich, P.Geo, is a SRK Practice Leader based in Saskatoon, Saskatchewan with over 20 years' experience in the exploration and mining sectors.



He has participated in and managed feasibility studies and environmental assessments associated with these studies for various mining clients and commodities. Mark has worked on exploration projects, on operating, inactive and abandoned mines, gaining expertise in local and international environmental management, environmental auditing and due diligence, project permitting, licensing, public and regulatory consultation and project management. Mark has authored many Technical Instrument 43-101 compliant reports as a Qualified Person.

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Generating the project information required for an ESIA is a growing challenge



Working on the project description for an ESIA

Regardless of the jurisdiction, a good project description is critical to any environmental and social impact assessment study.

Detailed project background information included in the ESIA is mostly extracted from the information generated during the engineering prefeasibility and feasibility studies. However, acquisition of some critical background information may not usually be included in the engineering scope, nor is it part of the scope covered by the environmental consultant. Obtaining this information may require more detailed engineering studies.

Information that is usually difficult to obtain are the details related to the construction phase, input sources, quantification of inputs and wastes, volumes and physicochemical

characteristics of liquid waste, details of the sanitary facilities, details of the hydraulic infrastructure required to support the project's infrastructure, as well as specific data required to calculate atmospheric emissions.

SRK's office in Chile has addressed the development of project descriptions from two perspectives: firstly, as the environmental consultant developing the ESIA; and secondly, from the engineering perspective. When writing the project description, gaps within the information provided by engineering are often identified. This leads to a request for and generation of more detailed information, and thus a delay in the final report. However, from the engineering group's view, often the environmental consultant developing the ESIA requests information lying beyond the engineer's initial work scope.

Fully integrate project engineers and environmental/social practitioners



This gap has made generating the information required for an ESIA a separate task with additional scope for both the engineering and environmental groups. This issue becomes especially relevant when a client pursues environmental permitting at a prefeasibility level.

Once the complete requirements of the project description section are fully known, it is possible to identify and list them in a timely manner. With regular interaction between the engineering and the environmental work groups, it is possible to include these requirements within the work scopes of each party, and generate the information in a sufficient and timely manner. As environmental consultants, we are currently trying to highlight these requirements and specify them in our work proposals.

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Most mining projects follow a typical pattern of evolution. The project begins with a scoping study, followed by a prefeasibility and a feasibility study before moving into detailed design. From an engineering perspective, this process has not changed significantly for decades, with the exception of adding a focus on environmental considerations at each level when these studies are completed to satisfy regulatory bodies, such as NI 43-101 or JORC.

From an environmental perspective, as mining companies began engaging environmental and social practitioners earlier in their project's development, more and more project managers followed suit to satisfy the increasing regulatory requirements for environmental/social programs or for project approvals.

However, industry still seems to struggle with fully integrating the engineering studies and the environmental and social programs into a single project and project team. More often than not, we see two parallel programs running, one focused on engineering and one focused on environmental/social studies. If initiated at more or less the same time, these programs typically require the same length of time to complete; however, the initiation of the environmental/social programs are either delayed or lag engineering studies. As a result, there is often a delay in the project's initiation while environmental programs are completed.

Combining these disciplines of often opposing focus into the same project team, with lots of interaction through regular project meetings, allows for a consistent level of attention to the appropriate areas of concern on both the engineering and the environmental/social aspects of the project. Significant changes to the project's engineering occur throughout the engineering studies. Many of these changes have significant implications to current and planned environmental/social programs, or require additional studies to be completed. Inadequate or no input into these changes from the environmental/social practitioners can result in project delays at the end of the engineering process, while additional information is gathered to address any environmental or social implications the engineering changes call for.

One aspect that sets SRK apart from many of our competitors is the ability and, indeed the preference, to field a fully integrated team of engineers and environmental/social practitioners, thus eliminating the potential for tasks within one project being completed by multiple companies in isolation of each other. Having a fully integrated team saves valuable time in the overall project schedule and helps capture the appropriate level of environmental/social data necessary to support the project's engineering and, ultimately, the regulatory requirements to advance to production.

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SRK and client host a community Picnic to discuss Remediation Plans for a nearby abandoned uranium mine

Efficient data capture and paperless workflows with GPS

Consultants often use handheld GPS technology to capture simple point information in the field, cross-referencing additional information recorded on a field notebook and field map. The GPS, notebook and map data require time-consuming integration back in the office.

With improvements in GIS/GPS technologies, SRK Australia has developed paperless workflows/ techniques, using cloud or server based technologies to capture data more

JASON BELTRAN

Jason Beltran has over 12 years' experience in the GIS industry. His expertise in GIS project management includes implementing procedures for digital map creation and best practices in GPS field mapping. He currently manages all GIS data within SRK, developing systems using ESRI's ArcServer technology to publish and share digital mapping data across the organisation. Since joining SRK, Jason has worked on projects that require map production for publicly released reports, providing technical GIS support and database administration for smaller junior miners. With experience designing geological maps, he works on analytical GIS projects, like Viewshed analysis and floodplain mapping.

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efficiently in the field and upload it in real-time. This workflow revolves around running ESRI's ArcPad™ software on a tablet or PDA device and, if an internet connection is available, ESRI's secured, cloud-based system, ArcGIS Online. Preprogramed validation rules and customised data templates dramatically streamline the capture and improve data accuracy.

Our in-house workflow was used effectively on a mine closure project for mapping the distribution of potentially acid-forming materials on the surface of a waste rock dump. The field geologist used a PDA running ArcPad to map the dump's surface onto air photos uploaded daily to ArcGIS Online. The geochemist in the office, used the data in real-time to direct the field geologist's on-going mapping for optimal results.

In remote areas, consultants use database checkout on a laptop running ArcGIS. Synchronising data from the laptop, teams can work simultaneously on the same database, incorporating new or changed data daily.

The field mapping workflows that SRK has developed greatly improve the efficiency and accuracy of field-based data collection. They improve the quality of the work with faster delivery, using a system that is suitable for all disciplines that require mapping.

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Town of Vijus, Peru

SVS Ingenieros (SRK's Peru based subsidiary) has been performing environmental studies for the mining and energy sectors in Peru since 1992 and social studies since 2000. The company has carried out these studies for over 50 clients, including large, medium and small mining companies.

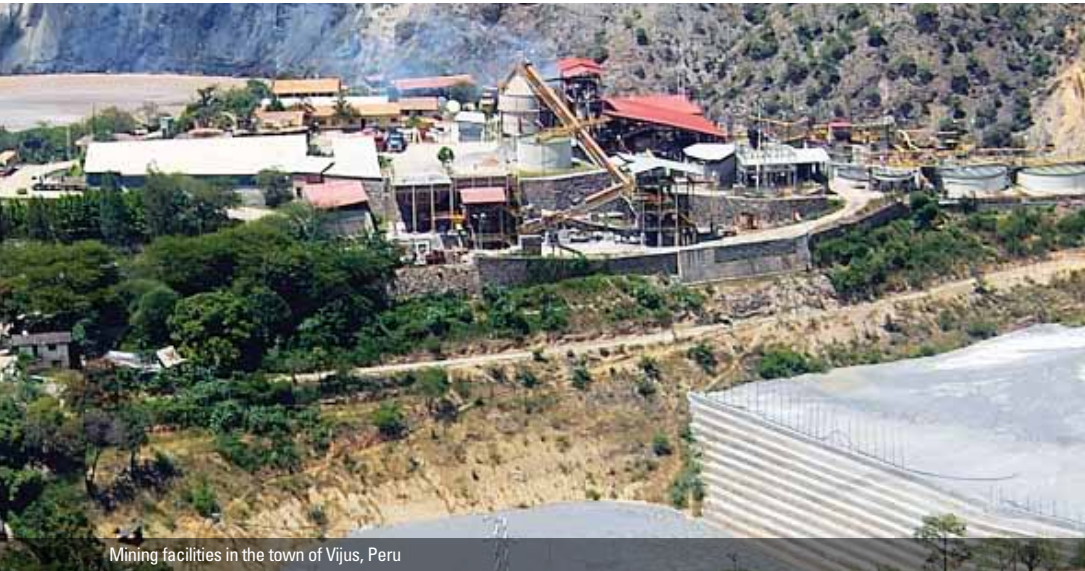
Corporate Social Responsibility has gained major importance in Peru, especially in mining, petroleum and energy companies, not only because of potential impacts on the environment, but also because of their effects on culturally and socially different populations. Realising this, companies examined their role as "change agents", and encouraged stakeholders, locals and state authorities to join in the process.

An early example is Vijus, a remote agricultural community in the north of Peru with a population of 100 in 1981. In 1983, as Compania Minera Poderosa (Poderosa) started mining nearby, their presence encouraged people to migrate to Vijus to find jobs. The town grew in a haphazard way, with



Mapping using the Tablet GPS

Stakeholders and social responsibility in Peru



Mining facilities in the town of Vijus, Peru

poorly-built houses, no basic services, no government presence or social organisation.

Poderosa responded by providing water, sewage and electricity services, sharing services they'd installed in their mining camp. When Poderosa opened its Social Resource office, a new stage of community relations began: the company encouraged and financed programs to help the populace recognise and address their problems, seek solutions, and plan and execute long-term projects for sustainable development.

Soon, the state installed local authorities, schools and health services, with the mining company's help. Poderosa helped organise the people of the surrounding areas into Community Development Committees (CODECOs). Through awareness and training, the people themselves democratically elected representatives. With the newly-organised Vijus population and Poderosa involved, change was taking place. CODECO

committees joined with local authorities to develop projects – "Strengthening Community Organisation", and "Promoting Economic Development". These programs involved Poderosa, district municipal authorities and local organisations in new strategic alliances, this time with community leaders from CODECOs actively participating. The process, now recognised by a municipal resolution, legitimised and empowered their community organisation.

Poderosa's social responsibility programs allowed Vijus, 2007 population 1352, to become organised and get services by itself, whether or not the mining company continues working in the area.

SVS's contribution to this process has been to follow up these changes, registering them in the social studies carried out over a decade. This allowed Poderosa to progressively improve their social policies.

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Manuela de la Peña is a Social Anthropologist with SVS Ingenieros/SRK Peru. She has over 30 years of professional experience working in the country's rural and urban areas. She evaluates development projects and conducts sociocultural studies. Since 2000, Manuela completed more than 40 Social Impact Assessments as part of Environmental Impact Assessments, conducted workshops, and participated in round-table discussions and Public Audiences.



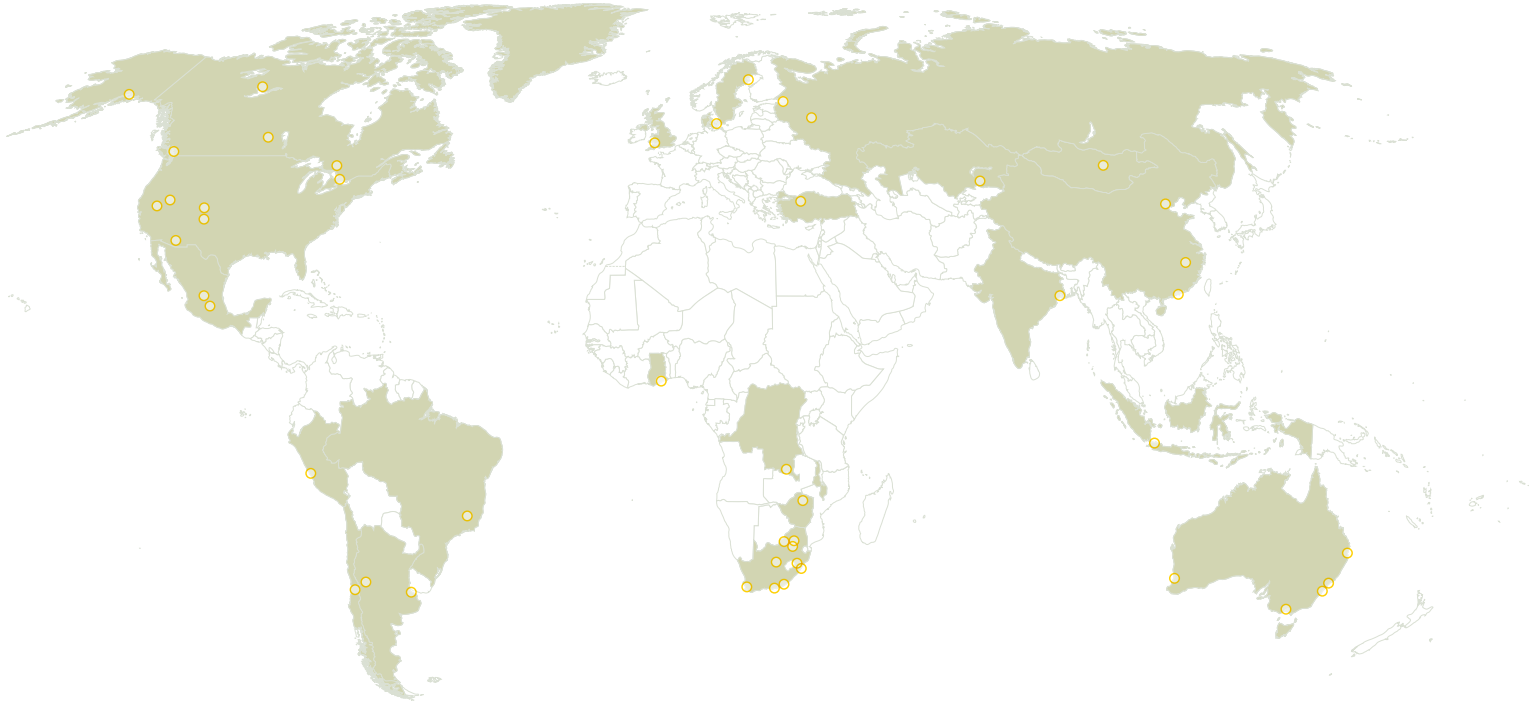
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