

Clémence McNulty (née Grasset)

Principal Consultant, Sustainability & Climate Change



Clémence McNulty is a Principal Consultant within ERM's Sustainability and Climate Change practice based in Cape Town.

Clémence supports clients to develop, quantify and deploy integrated corporate sustainability strategies along their value chains and throughout their asset lifecycle. Clémence leverages financial modelling and value analysis skills to help clients understand the business case for sustainability, evaluate non technical risks tied to decisions such as capital project development or asset divestment, and to articulate and evaluate the socio-economic impacts stemming from their activities.

Clémence has extensive experience of the energy, mining and utilities value chains and planning for regulatory, stakeholder and technical driven changes to business models. She has a strong understanding of the role of systems and the challenges associated with change management in relation to large scale business transformation from her prior experience supporting IT implementation projects within Accenture. From her past experience as a strategy consultant, Clémence has deep skills in opportunity assessment, valuation, economic/ financial modelling, scenario analysis and strategic planning as well as operating model design, and is adept at developing C-suite and Board level communications to motivate organisational change to deliver sustainability.

Clémence holds an Msc in Environmental Change Management from Oxford University and a Bsc (Hons) in Business Administration from the University of Bath. She previously worked as a Strategy Consultant for Accenture, in their London and Cape Town offices, focused on the Energy and Resources sectors.

Fields of Competence

- Corporate strategy development, including strategic planning and financial valuation/ modelling (including Crystall Ball)
- Sustainability strategy development across social, economic and environmental dimensions and aligned to global best practice (eg. Global Reporting Initiative GRI)
- Sustainability reporting
- Risk management
- Asset/ mine closure planning/ provisioning
- Scenario planning
- Operating model design
- Broad based black economic empowerment/ transformation strategy
- Communications – C-suite/ Board Level presentations to enable change

Education

- Msc Environmental Change Management, University of Oxford, UK, 2009
- Bsc (Honors) Business Administration, University of Bath, 2003
- French Scientific Baccalaureate (with international option in English), Lycée International de St Germain en Laye, France, 1999

Languages

- French, native speaker
- English, native speaker
- Spanish, advanced speaker

Key Industry Sectors

- Energy – oil & gas
- Mining
- Utilities – both regulated and liberalised (water, electricity and gas)
- Retail/ fast moving consumer goods
- Health
- Construction

Key Projects

Carbon impact assessment, SA Taxi, 2015 - 2016.

Project Manager

SA Taxi wished to understand the potential carbon impacts of their activities. ERM supported them to define the mitigation scenarios that could be considered and compiled a model to estimate achieved mitigation against reference cases. Clémence coordinated the analysis, reviewed the model and assumptions and presented findings to the client and their stakeholders.

Social Impact Measurement, Transnet, 2014-2015.

Systems & Strategy lead

Transnet wished to measure the social value it is generating through its wide range of activities to meet shareholder expectations. In order to do this the company requested help from ERM to develop a model which can be applied throughout its business to identify and measure the social value the company generates. Clémence worked on the solution design to develop a fit for purpose model that meets stakeholder expectations and Transnet's capability and requirements.

Safety Management Maturity Model, Confidential Mining Client, 2014- 2015.

Project Manager

The client needed to understand performance on safety management across different business units and define the next steps on the journey. Clémence oversaw the development of a safety performance dashboard drawing from the existing KPIs and integrating new leading indicators to inform performance and support continuous improvements.

Mine closure due diligence, Multiple clients Mining South Africa, 2014-2015.

Closure/ financial evaluation lead

During transactions, clients require due diligence of their closure plans and estimates. Clémence has contributed to a few due diligence projects where she has participated in site visits and completed a range of interviews to clarify closure plans and assumptions. She then completes a full review of the closure cost estimate and compiles a cash flow analysis of the closure costs for the assets, including both material issues and any identified opportunities, for integration into the asset valuation models.

Sustainability roadmap, MTN, 2014.

Project Manager

The client needed to define a roadmap for MTN's sustainability journey to 2018 to present to the Board of Executives. Clémence led the team which completed an

analysis of the changing mobile sector context and the expectations/ opportunities that have arisen in the past five years in relation to sustainability. From the renewed understanding of internal as well as external context, recommendations for a broader set of sustainability objectives and an updated operating model were defined.

Country entry - non technical risk assessment, Confidential mining, 2014.

Risk assessment lead

The client required support to understand the sustainability implications of restarting exploration activities in a country which they had previously exited because of stakeholder pressures. Clémence facilitated a workshop with key internal stakeholders to identify and evaluate the risks and opportunities tied to a re-entry decision, based on the social/ stakeholder/ environmental context framing the decision. She compiled the risks and opportunities identified into a set of Board level recommendations proposing three decision pathways with specific programmes of actions to support any re-entry decision.

ESG Communications Strategy, Anglo American, 2014.

Strategy lead

The client required support to define and implement an approach to communicating on Environmental/ Social/ Governance aspects of their business to a wide range of stakeholders. Clémence led engagements with internal and external stakeholders to clarify the expectations in terms of ESG communications. She worked with the client to develop a strategy to address expectations and to support value creation through a maintained license to operate, efficient communication approach and enhanced reputation tied to ESG best practice.

Mine closure plan and provision update, Confidential Mining Mozambique, 2014.

Project Manager

The client needed to update their closure plan and estimate to meet the Mozambican regulator's requirements around closure. Clémence coordinated the analysis including the review of the knowledge base, closure risk register and clarifying the preferred closure strategy in conjunction with the site. The closure estimate was updated to reflect the reviewed closure plan and included an analysis of both scheduled and non-scheduled closure costs to meet regulatory requirements.

Mine closure plan development and financial provisioning, South Africa and Mozambique, Confidential Mining Client, 2013 and 2014.

Project Manager

The client required closure plans and associated financial provisions to be updated for two of their sites. Clémence project managed the analysis which required a range of site visits to define the closure concept and approach, identify key closure risks and opportunities and include into a closure risk register, and evaluate the costs to close the sites. The evaluation considered both deterministic and probabilistic cashflows (using a Monte Carlo simulation model run with Crystal Ball) which the client then used for financial provisioning.

Cost/ benefit analysis of mine rehabilitation practices, South Africa, Confidential Mining Client, 2013.

Project Manager

The client wanted to understand how adopting different rehabilitation practices for its open cast mines could lead to the mitigation of long term liabilities, especially in relation to water, land management and community expectations around livelihoods. ERM worked with a range of stakeholders from the client to identify the technical and non technical risks and opportunities tied to different rehabilitation practices and compiled a cost benefit cash flow model to assess the financial outcomes of different rehabilitation practices and inform the Corporate guidance around rehabilitation.

Mine closure risks assessment and valuation, South Africa, Confidential Mining Client, 2012.

Financial analyst

The client sought to understand the potential risks and related financial impacts tied to mine closure. Clémence project managed the analysis coordinating inputs from subject matter experts from both ERM and the client and compiled the financial analysis to feed into a reviewed provisioning framework.

Sustainability framework definition, South Africa, Confidential Mining Client, 2012.

Corporate and Projects Sustainability Lead

ERM supported the client to define an integrated sustainability framework to ensure alignment of their social and environmental activities to enable their corporate strategy. Clémence coordinated the landscape analysis and interviewed key stakeholders across the value chain to define their sustainability requirements. Based on the clients' commitments, their corporate strategy and sustainability aspirations, Clémence has worked to compile a sustainability framework to integrate sustainability action across each step of the value chain.

Sustainability risks assessment and valuation, South Africa, Confidential Mining Client, 2011/ 2012/ 2013.

Sustainability facilitator and business case specialist

The client sought to ensure that sustainability risks are integrated into their capital planning process to enable sustainable project design and optimal economic, environmental and social value outcomes. Clémence worked in conjunction with the client's project teams at various stages of concept and feasibility to identify and financially value sustainability risks and opportunities to guide decision making and project planning. Clémence facilitated workshops with multi-disciplinary teams and acted as the business case specialist to integrate and value sustainability risks from lack of social license to operate to negative impacts on biodiversity within the existing financial models.

Corporate Affairs Strategy Development, South Africa, International oil major, 2011/ 2012.

Project Manager

The client required a strategy to guide activities across its Corporate Affairs portfolio, which spans transformation and corporate social investment, sustainability, stakeholder engagement and communications. Clémence coordinated analysis across the various areas of the portfolio to identify requirements to deliver on the corporate strategy and ensure competitiveness within the Southern African liquid fuels sector. Based on the assessed needs, the team defined a corporate affairs strategy and supporting prioritised implementation plan as well as a governance structure. The strategy was endorsed by the Chief Financial Officer and is currently being deployed.

Sustainability performance and environmental risk management programme update, South Africa, Construction, 2011/ 2012.

Sustainability consultant

The client needed assistance to re-energise their agenda and activities related to sustainability performance and environmental risk management. As part of this ongoing exercise, Clémence led an analysis of best practice sustainability/ environmental risk management frameworks and benchmarked competitor performance in the area. Further work will assess materiality of various sustainability issues and define appropriate governance frameworks to support performance management.

Sustainability Strategy Development, South Africa, Pioneer Foods, 2011.

Sustainability strategy consultant

Pioneer Foods defined a sustainability strategy to align to the Group's corporate vision and manage sustainability risks (including climate change). Clémence led the stakeholder engagement workstream to define the sustainability context for the company. She

compiled the sustainability strategy and worked with the client team to prioritise activities and develop an action plan for delivery.

New Energy Group Strategy & Operating Model, South Africa, Sasol, 2011.

Project manager

Sasol set up a New Energy business unit in 2008. Faced with a wide range of demands and multiple opportunities, the unit needed to clarify its strategy and define an operating model to transition into an operating group. Clémence completed a review of client's New Energy strategy to develop low carbon and water solutions. She facilitated senior executive workshops to clarify mandate and strategic intent – compiling a refined strategy for the group. She defined a flexible operating model to support delivery of the group's high growth ambitions.

Utility Revenue Management Review, United Kingdom, EDF Energy, 2008.

EDF Energy faced challenges in its revenue management functions, from Unbilled to Revenue collections, and sought both tactical initiatives as well as strategic operating model solutions to close the gap to best practice. Clémence identified and reviewed EDF's accounting/financial metrics and operational indicators of unbilled position to define a set of initiatives to mitigate unbilled write offs. She also conducted a strategic review of pre-payment and dual fuel customer segments, including processes, metrics and financials, to understand impact on unbilled and improve collection. Finally, she reviewed the Revenue Collections function operating model and designed high level organisation to deliver required performance improvements.

Build Environment Opportunity Assessment, United Kingdom, BP, 2007.

Modelling lead

BP sought to understand opportunities and threats of demand side responses to carbon emissions mitigation within the residential and commercial built environment. Clémence led the research on the building related energy market to define current and future energy consumption patterns within buildings and demand side technologies for carbon reduction, from insulation to smart metering. She defined a financial model to test different scenarios for technology adoption to 2030 based on regulatory, technical, consumer and business dimensions in US, EU and China and assessed the quantitative impact on energy consumption, CO2 emissions and company's financial position.

Nigeria Gas Master Plan, Nigeria, Nigeria National Petroleum Company (NNPC), 2006.

NNPC, which holds responsibility for orchestrating upstream and downstream hydrocarbon developments on behalf of the Nigerian government, needed help to compile an integrated Nigerian Gas Master Plan to guide gas industry development. The Plan defined both infrastructure requirements to 2030 and commercial and governance frameworks to support investment and operation. Clémence worked on the commercial and governance stream of the plan to define commercial and governance frameworks to support investment and operation for a domestic gas industry to 2030. She conducted a series of stakeholder interviews and workshops to:

- Understand opportunities/challenges
- Record existing and planned gas infrastructure
- Identify implementation issues or barriers

She completed analysis of five international gas markets (Algeria, Egypt, Norway, UK and US) which served to define market structure options.

Vertical Integration Business Model Testing, United Kingdom, E.On, 2006.

Financial Model Lead

In period of highly volatile and increasing commodity prices, E.On UK wanted to test the robustness of their vertically integrated business model to deliver medium term plans for both electricity/gas segments. Clémence conducted client interviews and interfaced with industry experts to develop range of possible market scenarios for the medium term, such as M&A activity, migration of value outside value chain or regulatory intervention. She built a financial model of the UK gas and electricity markets to test the client's business model in terms of profitability.

High Performance Utility, Germany, RWE, 2005.

RWE Corporate wanted to ensure their corporate strategy integrated drivers of high performance in European utilities. Clémence conducted shareholder value and future value analysis for selected European utilities to identify drivers of high performance as demonstrated by best Total Return to Shareholders over extended and successive periods.

Charles Allison

Lead ERM Partner, Climate Change Services, Europe Middle East and Africa Region



Synopsis

Charles Allison has nearly 20 years' experience of supporting and advising clients in both business and government in relation to management of environmental and sustainability issues. He is lead partner for ERM's energy & climate change practice in the Europe, Middle East and Africa region.

Charles' focus is on helping clients to assess and manage the risks and opportunities to their business arising from environmental and sustainability factors. Much of his recent experience has been related to climate change and greenhouse gas emissions. In this area, he has led projects to develop and review GHG inventories for clients across all major industry sectors, applying the major international and national GHG accounting protocols, guidelines and standards. He has led ERM teams advising clients on GHG reduction and energy efficiency, compliance with GHG regulation, and response to climate and extreme weather risk.

Charles has worked with numerous multinational companies to build effective responses to emerging environmental regulation, stakeholder and market concerns. This work often involves gathering of data, appraisal of business case, development of strategy and management responses, engagement with stakeholders, and communication to customers and regulators.

Alongside his corporate experience, Charles also has broad experience of assisting clients in government, both in the UK and within the European Commission, to develop and implement environmental and sustainable development policy. This has included analysis of the environmental, technical and economic impact of policy options; design and management of multi-stakeholder consultations; and evaluation of government programs in the areas of greenhouse gas emissions; waste; chemicals; water; the environmental impact of products; and public procurement. Through understanding the government policy agenda, Charles is able to provide additional insights to his corporate clients.

Clients

Charles' corporate clients have included: Anglo American, BP, GE, G4S, Honeywell, Hyundai, KKR, Kraft, Kuwait Petroleum, Mitsubishi Electric, Schlumberger, Shell, Standard Chartered Bank, Toyota, Vale and Xstrata.

For government clients, Charles has conducted assignments for the European Commission, numerous UK government departments and agencies, and the Environment Ministries of the Netherlands and Portugal.

Charles has also provided support to international NGOs and industry associations including World Business Council for Sustainable Development, International Council for Mining and Metals (ICMM), the International Petroleum Industry Environmental Conservation Association (IPIECA), the European Steel Industry (Eurofer), and the European Metals Industry (Eurometaux).

Fields of Competence

- corporate strategy development, management and communications
- business risk assessment, with a specific focus on environmental risks
- regulatory advice, regulatory impact assessment and compliance planning
- GHG emissions inventory, carbon footprint and associated disclosures and reporting
- GHG reduction and energy efficiency programmes
- environmental and sustainable development policy analysis for government authorities

Education

BSc (Hons) Engineering Science, 1989

MSc Environmental Technology, Imperial College London, 1993

Selected Projects

Assessment of GHG emissions and options for GHG emissions reduction and energy efficiency, for a major capital project in the Oil & Gas sector, Kazakhstan, 2014.

Charles is currently leading this assessment as part of the Environmental, Social and Health Impact Assessment for a project to expand operations at a major oil and gas field.

Assessing the public carbon disclosures of leading oil and gas companies, for IPIECA, 2014. Charles is leading an ERM study to review submissions to the Carbon Disclosure Project by IPIECA's members.

Developing a GHG strategy, management standard, GHG emissions inventory protocol and associated capacity building, for Kuwait Petroleum International, 2012-14.

Charles has led and been centrally involved in a significant ERM program of work for the international operations of Kuwait Petroleum Corporation.

Developing the IPIECA Compendium of GHG Reduction and Energy Efficiency Technologies and Practices, International Petroleum Industry Environmental Conservation Association, 2012-13. Charles is partner responsible for an international ERM team working with the IPIECA secretariat and representatives from member companies including BP, Chevron, ExxonMobil, Petrobras, Repsol, Statoil, and Total to develop reference guides on Energy Efficiency and GHG Emission Reduction Technologies and Practices which are intended for use by IPIECA's 31 member companies. They will provide accessible and informative guidance to project managers and engineers working on both existing and new facilities across upstream, midstream and downstream operations.

Overseeing ERM's work for the CO2 Capture Project, a consortium of oil & gas majors researching the potential of CO2 Capture & Storage, 2005 - 13. Charles has played a Partner-in Charge role for ERM's work for the CO2 Capture Project (funded by Shell, BP, Chevron, Petrobras and Suncor) over the past 8 years. This has included technical, economic and regulatory studies into the feasibility and application of CCS, worldwide.

GHG inventory, carbon footprinting and reporting support (Scope 1, 2, 3 and product life cycle) for a range of FTSE100 and Global 500 companies in the oil & gas, mining, industrial, consumer goods and support services sectors, 2006-12. Charles has directed ERM project teams that have

developed corporate and site-level GHG inventories for numerous large corporations in UK and Europe. This has included development and implementation of associated GHG emissions inventories, carbon calculators and data collection tools. Alignment with international standards such as GHG protocol and ISO14064. Advice on disclosure and submissions to Carbon Disclosure Project etc.

Developing a Briefing Paper on Monitoring, Reporting and Verification of GHGs, for the International Council on Mining and Metals (ICMM), 2011. Development of a briefing paper on the topic of "Measurement, Reporting and Verification of Net Greenhouse Gas Emissions" on behalf of the ICMM. The briefing paper was distributed at the UNFCCC conference in Durban and served as a document to raise the profile of ICMM's work in this area and to establish them as a legitimate stakeholder in the negotiations.

Development of a climate change adaptation report for a major UK energy utility, under the UK Climate Adaptation Reporting Power, 2011. The UK Climate Change Act requires providers of 'nationally important' infrastructure to demonstrate that they understand the potential risks and opportunities posed to their operations, people and assets from the physical impacts of climate change and how they intend to adapt to these impacts. Charles led the ERM that assisted the client in meeting their obligations by assessing the vulnerability of their electricity generation business and gas distribution business to the physical impacts of climate change over the coming half century. ERM's assistance involved undertaking climate modelling, holding stakeholder workshops and working with the businesses to identify adaptation options collectively across the range of their generation and distribution assets.

Assessment of global GHG emissions from the mining and metals sector, for the ICMM, 2010. Charles led the ERM team which conducted an assessment of the GHG emissions from ICMM's members and used this to estimate total GHG emissions from the mining and metals sector worldwide, in specific countries, and for specific metal and mineral commodities.

A Review of Methods and Initiatives for Company-level GHG Reporting, for the European Commission DG Environment, 2010. This study reviewed and assessed the major GHG accounting methods in use internationally for company-level GHG accounting and also the major voluntary and mandatory company GHG reporting initiatives internationally.

Study on the uptake of GHG assessment and reporting by companies, and assessing the impact of this on company-level GHG emissions, for UK Department of the Environment, 2009. Charles led this policy study for UK government which provided evidence supporting a new law for mandatory GHG reporting by large companies in the UK. It influenced the EU to undertake a similar review.

Development recommendations for guidance on GHG reporting and assessment of various carbon intensity measures within the mining and metals sectors, for the ICMM, 2008. Charles directed this research study for ICMM, working with a group of member companies.

Review of corporate GHG inventory, gap analysis against best practice including the GHG Protocol and the API Guidelines, for Schlumberger, 2008. This led to provision of recommendations for upgrading and improvement of the GHG inventory of Schlumberger, a major oilfield services company.

Quantitative assessment of the business opportunities and risks related to climate-change for the 40+ portfolio companies of a leading private equity investor, 2008. This major assessment modelled the business opportunities and risks related to climate change regulation, changes in market and customer preferences driven by climate change, and also at a high level the physical risks created by climate change, to the companies within one of the world's largest private equity portfolios. Risks and opportunities were monetised to enable their significance to be considered alongside other financially-driven risks.

Assessment of physical risks from climate change, applying a quantitative risk assessment approach to identify the likely financial risks from business interruption resulting from climate change over the period to 2040, for a leading global mining company, 2007-8. This major study applied risk assessment techniques and a review of data from IPCC 4AR to make a quantitative assessment of the potential business impact from climate change across this mining company's 100+ major assets around the world. These include mines, smelters, rail routes and port handling facilities. The assessment, which also drew upon the company's historical data of weather-related insurance claims, identified the assets most likely to be at risk and the potential loss in financial terms. This study has informed adaptation measures by the company.

Modelling of a global sectoral approach to GHG emissions reduction in the cement sector, for the Cement Sustainability Initiative of the World Business Council for Sustainable Development, 2008. Charles was ERM partner responsible for this study. He also developed and facilitated an earlier multi-stakeholder workshop on sectoral approaches to GHG reduction, for WBCSD Cement Sustainability Initiative, in 2006-7.

Awareness-raising management workshops on climate change, for a FTSE100 bank, 2007-8. These workshops, run for investment managers of a leading UK financial institution, focused on the risks and opportunities arising from climate change, and generated an action plan to be taken forward by the client. This successful project led to a second project to train senior managers across the bank within their 'Corporate University'.

Assessment of the potential for including offshore gas flaring in the EU Emissions Trading Scheme, for the UK Department of the Environment, 2005. Charles was director of this ERM study which informed the UK government position on including flaring from the upstream offshore oil and gas sector in the EU GHG emissions trading scheme from 2008 onwards.

Advice on management of technical advocacy, stakeholder management and regulatory issues management practices in Europe, and recommendations for improvements, for an oil & gas major, 2004-5. This project assisted the client to improve its systems for identifying, assessing, prioritizing, and influencing emerging environmental policy and legislation in Europe.

Recent publications and conference presentations include:

Measurement, Reporting and Verification of Net Greenhouse Gas Emissions. Briefing Paper, on behalf of on behalf of the International Council on Mining and Metals (ICMM), 2011 at <http://www.icmm.com/inbrief-measurement-reporting-and-verification-and-the-mining-and-metals-industry>

Presentation to the IPIECA workshop on greenhouse gas reporting, 2011.
<http://www.ipieca.org/event/20110120/greenhouse-gas-reporting-workshop>

A Review of Methods and Initiatives for Company-level GHG Reporting, Final Report of ERM Study for the European Commission DG Environment, 2010

Study on the uptake of GHG assessment and reporting by companies, and assessing the impact of this on company-level GHG emissions, Final Report of ERM Study for UK Department of the Environment, 2009.

Sarah Bonham

Senior Consultant
Sustainability and Climate Change



Sarah Bonham joined ERM in 2010 and is a Senior Consultant in the Sustainability and Climate Change practice, based in Johannesburg, South Africa. She transferred into the practice from the ERM London office in July 2014.

Sarah's main area of experience is Climate Change risk and adaptation. Her work involves assisting clients with assessing Climate Change risk on business assets and operations, and managing that risk through adaptation measures. She has worked on site-specific climate risk and adaptation assessments as well as assessments that cover global portfolios of assets and operations.

In the Climate Change mitigation field, Sarah has conducted Greenhouse Gas (GHG) assessments for proposed developments as part of the ESHIA process, and has significant experience in conducting carbon footprint studies for corporate clients in order to calculate Scope 1, 2 and 3 GHG emissions arising from their global operations. She also supports clients with the annual disclosure on their Climate Change performance to the Carbon Disclosure Project (CDP). Sarah also has experience in corporate GHG, biodiversity and water strategies, and has worked with industry associations on the development of papers relating to policies and incentives around Carbon Capture and Storage (CCS).

Fields of Competence

- Climate Change Risk & Adaptation
- Corporate Carbon Footprinting & Disclosure
- GHG Assessments for EIAs
- Corporate Sustainability Strategy: Energy/Carbon, Water and Biodiversity

Education

- MSc (Environmental Technology) specialising in Business and Sustainability, Imperial College London, 2010
- MA Oxon (Biological Sciences), University of Oxford, 2009

Languages

- English

Key Industry Sectors

- Power
- Oil & Gas
- Mining
- Food & Beverage
- Agrichemicals

Publications

- Sarah Bonham et al, CO2 Capture Project: *Regulatory Challenges and Key Lessons Learned from Real World Development of CCS Projects*. 2012
- Sarah Bonham et al, CO2 Capture Project: *Local Community Benefit Sharing Mechanisms for CCS Projects*. 2013

Selected Project Experience

GHG Specialist Study: Rail & Port EIA Project, Mozambique, 2014 - 2016

Consultant

Sarah conducted the greenhouse gas assessment as part of the ESHIA for a proposed rail and port project in Mozambique. ESHIA and related project documentation was reviewed to identify key GHG emission sources. Annual GHG emissions were estimated according to IPCC / GHG Protocol Guidelines, after which an assessment of the impact of the GHG emissions associated with the project was conducted, based on a review of Mozambique's GHG emissions and reduction commitments under UNFCCC, and international lender standards relating to GHG emissions. Potential mitigation measures (opportunities to reduce emissions and use resources more efficiently) and GHG management plans were recommended. In addition, an assessment of climate risk was conducted. Climate projections for the project area were analysed (using IPCC AR5 climate model outputs) and an analysis of how the climate projections could affect the Specialist Study impact assessments was undertaken in order to ensure climate change was factored into the remainder of the Impact Assessment.

Carbon Footprint and Regulatory Analysis, South Africa Mining & Ferro-Alloys Producer, 2015-2016.

Project Manager

Sarah is managing the carbon footprint and regulatory assessment for this global company's South African ferro-alloy mining and smelting operations. GHG emissions from the mines and ferro-alloy smelter were assessed using IPCC and GHG Protocol (WBCSD/WRI) methodologies, and a subsequent assessment of how the operations may be captured by South Africa's upcoming energy and carbon regulations was undertaken.

Carbon footprinting and reporting, South Africa, Multinational Telecommunications Company, 2014 - 2015

Consultant

Sarah supported this multinational telecommunications company (based in Africa) with the calculation of its carbon footprint in 2014-15. Direct (Scope 1) and indirect (Scopes 2 and 3) emissions were calculated for each country of operation using bespoke carbon calculator tools developed by ERM. The emissions data was aggregated at the company level and reported externally. ERM also supported the client with the identification, analysis and quantification of energy efficiency and emission reduction opportunities across its operations.

Strategic Energy Management, South Africa, Confidential Mining and Chemicals Company, 2015 *Project Manager*

ERM was commissioned to develop a strategic energy management approach and plan for an energy-intensive chemicals company. The work was partly funded by the Private Sector Energy Efficiency (PSEE) programme and involved the development of an Energy Management Plan and Policy (including a 5-year plan to track and implement energy reduction opportunities), an energy awareness campaign for all staff, energy management training for senior staff, and embedding energy in procurement.

Carbon and Water Strategy, South Africa, Investment Holding Company, 2015 & 2016.

Project Manager

Sarah is the project manager on numerous work streams for this investment holding company. The program of work is focused on calculating its subsidiaries' carbon and water footprints, identifying of climate change and water risks and opportunities across the group, and reporting this as part of its public disclosure to the Investor and Water CDP Programmes. In addition, in 2016, Sarah is supporting the company with the setting of GHG intensity metrics and reduction targets and an emissions reduction strategy in order to drive environmental performance improvement across the Group. Carbon and water strategies are being developed for diverse companies spanning the mining, production, beverage, hospitality, and gaming sectors.

Climate Change Strategy, South Africa, Platinum Producer, 2015

Project Manager

This study involved developing a climate change framework for the client. Existing climate change and sustainability policies and procedures were reviewed, and interviews conducted with key internal stakeholders to understand the current approach to managing climate change risks and opportunities. A detailed review was undertaken of the previously conducted climate change vulnerability assessment, which assessed both direct climate change risks to operations, as well as indirect risks resulting from the impact of climate change on communities, and recommendations made. The resulting climate change framework included a climate change policy statement, the framework, and associated implementation plan.

Climate Risk and Adaptation Assessment Guidelines, Multinational Mining Company, Global, 2013

Consultant

ERM was commissioned to develop guidance for the client's global operations on how to assess climate change risks and adaptation options at mining sites in operation and under development across the world. Sarah led on the development case studies of climate risk and adaptation assessments undertaken by existing operations to be used as a basis for the guidance documents. The guidelines and case studies focused on integrating climate change into standard operational risk management procedures in order to ensure risks were logged, tracked, and actively managed over the mines' lifecycles.

Climate change screening tool, Multinational Power Sector Client, Asia, 2015

Lead Consultant

Sarah was the lead consultant and climate change expert working on the development of a GIS-based climate risk screening tool for CLP Group. The tool incorporates historical data on climate and weather events, as well as IPCC AR5 climate change projections according to two scenarios. Sarah led on the development of the Guidelines accompanying the tool, designed to give CLP to have ownership of the tool such that they can run climate risk screenings for existing and new assets.

Climate Change Adaptation Study for Renewable Energy Assets, India and China, CLP Group, 2013 - 2014

Lead Consultant

Sarah was the lead consultant in this study which assessed climate change risk and identified and prioritised climate change adaptation options for selected renewable energy assets, including a hydropower plant in China and a wind farm in India. Sarah was responsible for running the site visits and climate risk workshops for each asset, and undertook the risk and adaptation assessments for each site. ERM, working closely with a team of engineers and with the operations, maintenance, procurement, HSE and finance functions on site, identified a number of adaptation options to address the key risks, and by performing a cost-benefit analysis for each of the proposed adaptation measures was able to prioritise the most cost-effective actions for the site.

Climate Change Risk Assessment, UK, Confidential Global Agrocommodities Client, 2011 & 2015

Consultant

ERM was commissioned by a multinational agribusiness to carry out an assessment of the physical risks of climate change on global operations for the year 2025 including increased costs of asset damage and business interruption

arising from extreme weather events; and cost impacts resulting from certain crops losing viability in growing regions (for example due to drought or water scarcity). ERM conducted a quantitative assessment of risks associated with historic impacts from extreme weather and of the impact of climate change on the value at stake. A subsequent assignment in 2015 aims update the 2010/11 study as well as to enhance the robustness of the assessment of future climate change through incorporation of more recent climate change projections and engagement with staff to test assumptions made in overlaying climate change projections on existing vulnerabilities.

Climate Change Risk and Adaptation Assessment, UK, Oil & Gas Producer, 2012 - 2013

Consultant

Sarah was part of a team working to identify climate-related risks for a new oil and gas development and to identify potential risk mitigation measures. The project required a climate baseline to be developed for the area, and local climate change projections to be analysed. The interaction of climate variables with project assets and operations were then analysed in order to identify and prioritise climate risks and to identify risk mitigation and adaptation measures.

Strategic Water Risk Assessment, UK, Global Agribusiness, 2013

Lead consultant

Sarah was the lead coordinator for this global project with the overarching aim of defining water-related strategic sustainability risks and opportunities with the potential to impact the client's growth strategy over the next 15 years. The work involved risk modelling, workshop engagement and development of future water risk scenarios considering growth plans, likely competition for water resources from other users in existing and future regions of operation, regulatory changes with regards to water abstraction licences, future demographics, and the predicted effects of climate change on water availability.

Resumé: Dr Barry Dean Millstead

Qualifications

B.Sc Geology (Hons), University of Wollongong, Australia, 1982 -1985

Ph.D Geology, University of Queensland, Australia, 1986 - 1997

Professional Institutes

South African Council for Natural Scientific Professions (Reg No 400332/07)

Geological Society of South Africa

Paleontological Society of South Africa

Relevant Career Experience

Various: 2006 –2013

Position: Consulting Geologist

- **2012 Manganese, Zimbabwe**
Appraisal of geological setting and mineralisation style of vein-hosted manganese deposits.
- **2012 Palaeontological Impact Assessment Report, Gauteng**
Preparation of a Palaeontological Impact Assessment Report on the site of proposed civil construction project in southern Gauteng Province.
- **2012 Palaeontological Impact Assessment Report, Mpumalanga**
Preparation of a Palaeontological Impact Assessment Report on the site of proposed civil construction project near Waterval Boven, Mpumalanga Province.
- **2012 Gold, Sudan**
Field verification program of remote sensing characterisation of structurally deformed Precambrian age igneous and sedimentary strata. A significant component of the study involved the collection of geological data and lithological samples for assay. Compilation of exploration program.
- **2012 Gold, Eastern Democratic Republic of Congo**
Planning and implementation of a detailed soil and stream sediment sampling programs as well as structural and lithological mapping program covering approximately 300km² in the structurally deformed, gold-bearing strata of the Kibaran Orogeny. Lithological and structural mapping formed a significant component of the study. The project resulted in a detailed assessment of the economic potential of a number of prospecting concession areas.
- **2012 Building Sand and Brick Clay, Western Cape**
Planning and implementation of a detailed pitting and sampling program within Cainozoic age sediments to determine the economic potential of sand and clay deposits.
- **2011 Mine Works Program, Mpumalanga**
Preparation of a Mine Works Program for a proposed gravel quarry in the Mpumalanga
- **2011 Copper, Democratic Republic of Congo**
Lithological and structural mapping of an area of approximately 320 km² in the structurally deformed Katangan Copper Belt sequence resulting in the production of geological maps and a structural synthesis. Interpretation of mineralization style and genesis as well as generation of exploration targets were significant outputs of the fieldwork program.
- **2011 Palaeontological Impact Assessment Report, Northern Cape**
Preparation of a Palaeontological Impact Assessment Report on the site of proposed manganese mine, Northern Cape.
- **2009 Alluvial Diamonds, Mozambique**
Desktop appraisal of the geological potential for alluvial diamonds in a selected area of eastern Mozambique.
- **2009 Mine Works Program**
Preparation of a Mine Works Program for a proposed brick clay quarry, eastern Western Cape Province.
- **2007 Lead/Zinc, Nigeria**
Desktop low level due diligence report on a predominantly lead/zinc hosting vein deposit Located in Nigeria.
- **2007 Building Sand/ Ceramic Clay, Western Cape**
Planning and implementation of a detailed pitting and sampling program within Cainozoic age sediments to determine the economic potential of sand and clay deposits.
- **2007 Brick Clay, Western Cape**
Planning and implementation of a due diligence study of an operating clay quarry to ascertain the quantity and quality remaining clay resources as well as identification of possible negative environmental issues that may constitute a barrier to utilisation of remaining resources. The study resulted in a calculation of potential life of mine and a valuation for the deposit.

- **2007 Gold, Northern Free State**

Desktop study to identify the location of historical exploration boreholes and field-based follow-up and location validation survey. These activities formed part of a larger due diligence study.

- **2007-2011 Uranium, Karoo**

The majority of this time has been involved in the management of an extensive exploration programme for sediment hosted uranium in the Karoo of South Africa. This project was taken through all exploration phases from the point of initiation through satellite and air photo interpretation, managing of air-borne geophysical surveys and interpretation of the results, extensive field mapping, target generation through to (and including) the drilling and initial resource calculations.

Universities of KZN and Durban-Westville : 2003 - 2006

Position: Lecturer, Geology

Role: During the tenure of this position a number of courses were produced and presented including stratigraphic principles, sedimentary basin analysis, Precambrian geology of South Africa, palaeontology, a half-year first year level course on Earth's surface processes which contained a one semester set of practical exercises based on understanding and interpretation of geological maps.

Council for Geoscience: 1990 - 2000

Position: Research Scientist

Role: Conducting research programs, including responsibility for identification of research needs, planning and conduct of research. Production of research reports and papers. Research was predominantly centred the stratigraphy of southern African Karoo-age sedimentary basins. Research programs were a combination of biostratigraphic, and purely stratigraphic research, combining sedimentological, biostratigraphic, and climatological data. The scale of investigation varied between local and broad scale international correlations. As a result a broad knowledge of world wide, late Palaeozoic and Mesozoic continental sedimentary systems was developed.