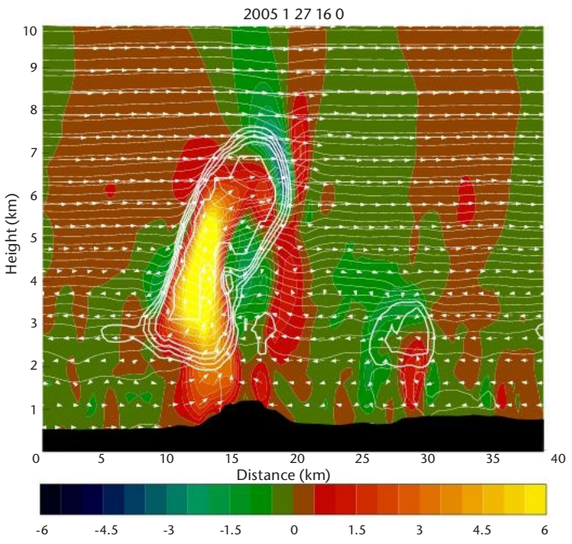
Mining case studies

Mine micro-modelling and transport improvement design using big data in Africa

Background: West Africa has seen several mega-mining projects being developed over the past decade. Challenges include understanding the impact of the mine design on the local weather and associated effects on the local environment and biodiversity, as well as the designing and building of railroads through tropical jungle with annual rainfall amounts varying between 2.5-3m.

What we did: The Met Office worked with over 20 environmental and ecology, hydrology, biodiversity, and specialised animal, plant, fungi and lichen consultancies and three of the largest mining companies. Working together, we modelled the weather over the region, before and at the end of the mine life, to understand the impact on weather, especially rainfall patterns. This required handling of data sets using one of the largest weather supercomputers at a final resolution of 100 m over vast areas of jungle. We also generated historical 10-15 year datasets along the proposed railroads, using several verification methods to provide complex interpretations of storm duration and frequency during dry and wet seasons.

The result: These big datasets, their analysis and interpretations, helped improve understanding of the global impact of these proposed mines on biodiversity and how to mitigate these impacts and justify several multi-million dollar decisions. This not only saved very large investments in these projects but also informed and significantly impacted the understanding of biodiversity at the mine, the rail-road designs and movement logistics.



Modelling mountain top mining to understand changes in rainfall pattern.

Life extension to mine in Central Asia

Background: Investors looking to re-open a mine in Central Asia needed to determine the number of working days likely to be lost to snow storms and deep snow during winter. As the mine has an expected operational lifespan of 30 to 40 years, the investors needed to know if climate change is likely to alter the local weather, specifically if the number of days lost as a result of snow are likely to increase.

What we did: With our knowledge of climate change and climate modelling processes, the Met Office was able to provide guidance and reassurance to the client.

The result: This study, along with other similar work, demonstrated a rigorous and long-term scientific approach as part of the investment opportunity, increasing the resilience of the proposition and making it more attractive to potential investors.

In the future, will there be changes to snow quantities in this open cast mine?

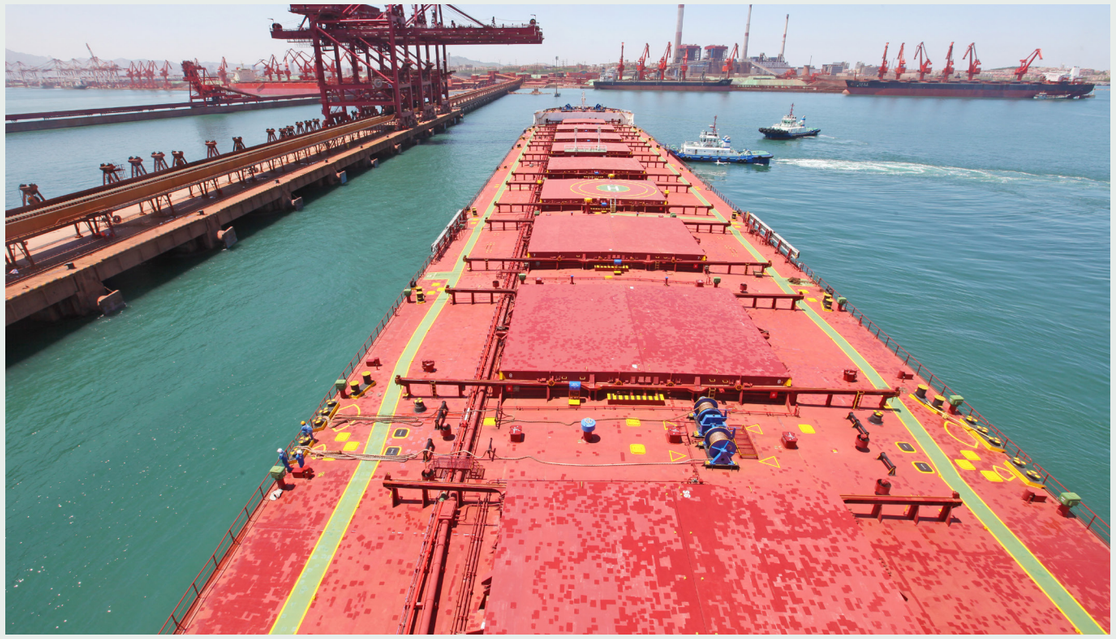
Resource planning in South America

Background: A leading mining company has chosen a 250 km pipeline to carry minerals and so reduce impacts on the environment. Given the projected 40 year lifespan of the mine, the company sought reassurance that sufficient water would be available throughout the duration of the project.

What we did: Using large modelling databases we produced studies of the water catchment areas which determined the longevity of each catchment. A big data approach helped understand the impact on the port water treatment at the base of the pipeline, the impact on the port and long-term changes to sea tide and storm surges.

The result: The catchment study highlighted the expected life of the catchments. It provided hard evidence to the engineers and provided information that could be used to change the priority given to water catchment licensing. For example, a second catchment was brought into operation two years earlier than originally planned which prevented a significant reduction on production. The impact of the data generated in the port area, informed the inundation modelling and enabling engineers to substantially modify sea defences and port structures to prevent unforeseen erosion.

Both results, based on robust and leading edge science and quality data sets, saved millions of dollars by anticipating major changes.



Helping with port and pipeline design criteria and logistics resilience