

Uncovering impacts of gold mining in Papua New Guinea

February 8 2016, by Joshua Fisher, Earth Institute, Columbia University



EPS Faculty/Earth Institute Research Scientist Joshua Fisher and Professor Sarah Knuckey from the Columbia Law School work with a translator to explain the results of an independent environmental assessment during a community consultation in Papua New Guinea in December 2015.

The Pacific island of Papua New Guinea is one of the world's most resource rich countries, hosting nearly 7 percent of global biodiversity and important reserves of gold, copper and hydrocarbons. However, despite a burgeoning resource economy, the country [struggles to translate resource rents into development](#). One of the principal challenges that the country has faced has been in effectively governing the extractive industry sector, which historically has been a source of grievance and conflict for communities living near mine sites and is the focus of a [2015 United Nations Development Programme report](#).

This legacy continues, and from late December 2015 through January, a [team](#) of Earth Institute scientists and [human rights](#) lawyers from Columbia University worked in the highlands of Papua New Guinea [to deliver the results of an independent study](#) of water quality and human rights to the indigenous communities living near an industrial gold mine. The team was led by myself and Professor Sarah Knuckey from the Human Rights Law Clinic at Columbia Law School. Together with co-investigator Professor Tess Russo of Pennsylvania State University, our team has been working for two years to assess environmental quality and the human rights impacts of mining on local communities.

Many of the communities in Porgera, Papua New Guinea, experience episodic water insecurity, poor sanitary conditions and chronic poverty. These challenges are magnified by continual in-migration of people from surrounding areas seeking economic opportunities from small-scale gold mining, and from a scarcity of arable land for farming and other traditional livelihoods. In addition, there has been a legacy of [human rights abuse and sexual violence](#) at the mine site, and this has built a legacy of mistrust between communities and mine owners.



An erodible waste dump from the Porgera Joint venture gold mine. The red color is produced by liquid tailings that are released by the mine.

The Porgera Joint Venture (PJV) gold mine, majority-owned by Canadian mining company Barrick Gold and Chinese company Zijin, has brought benefits to [local communities](#) in the form of improved infrastructure and royalties. But residents have frequently raised concerns about abuses by security forces, as well as the mine's impacts on their water, flora and fauna, air, and general livelihoods.

The mine has replaced once arable farmland with hard rock dumps and liquid tailings, which release contaminants directly into local rivers and

creeks. Many of the traditional residents, as well as newer immigrants, frequently pan for gold in the rivers near the mine, including in the liquid tailings waste. However, these communities often report not having adequate information about the health risks associated with industrial waste.

In response to community requests for independent environmental assessment, the team designed a hybrid human rights/environmental assessment method, with funding from The Earth Institute and the Human Rights Clinic. In 2015, the Columbia team conducted interviews in each community near the mine to understand community concerns about the environment and identify how residents interact with potentially contaminated materials.



Penn State Assistant Professor Tess Russo measuring alkalinity in a river near the mine in January.

Penn State Assistant Professor Tess Russo and PhD student Beth Hoagland led the project's hydrology and geochemistry investigation. Russo, Hoagland and I collected water and soil from across the valley and made measurements using mass spectrometry and acid digestion methods back at Penn State. Additional soil measurements were made by Professor Benjamin Bostick at the Lamont-Doherty Earth Observatory using X-Ray fluorescence analysis. After analyzing the samples for heavy metals, the team consulted public health researchers at the Columbia Mailman School of Public Health and at the Penn State Hershey College of Medicine to determine the potential implications of environmental contaminants for peoples' health.

When we analyzed the samples, we found that major rivers near the mine have heavy metal concentrations above World Health Organization recommendations for safe drinking. In contrast, we did not find evidence that the rainwater people collect for drinking contains heavy metal contaminants, although it could be unsafe due to the generally poor sanitary conditions in villages.

The interdisciplinary team is now working to assess the implications of these and other findings for [water security](#) and human rights in the area.



Penn State PhD student Beth Hoagland explains the process of measuring turbidity to children from a community near the mine in January.

In December 2015-January 2016, the team returned to each village to report the results of the environmental testing, using satellite imagery color-coded for water drinking quality, created with project partners Brad Samuels and McKenna Cole of [SITU Research](#)—an organization focused on spatial analysis and visualization for fact finding and reporting. In addition to these community consultations, the team collected additional water and soil samples in order to explore how metal contamination changes across the watershed.

The team met with a wide range of stakeholders on the issue of water in the valley to explore ideas and opportunities for improving water security. While in Papua New Guinea, the team also met with senior management from the mine and government officials to discuss the project.

By combining the environmental measurements with a legal analysis of the human right to water, the interdisciplinary team is working to assess whether that right is being fulfilled. Additionally, through stakeholder engagement with communities, government and company representatives, the team is exploring potential policy and governance changes that might be able to improve water security for the communities living near the mine.

The team will issue reports on the environmental assessment and right to [water](#) later this year, including recommendations to improve conditions around the mine. The team is also working with SITU Research to create an interactive online platform to share the results.



Joshua Fisher with several local community members who assisted in collecting samples.

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