ECOLOGY

Peru plans oil clean-up

Proposal would address decades of pollution in the country's largest Amazon oil field.

BY BARBARA FRASER

Nearly half a century after poorly regulated oil producers began dumping billions of litres of wastewater and other toxic substances into the rivers and tropical forests of northern Peru, the government is taking its first steps towards cleaning up the damage in the country's oldest and largest Amazonian oil field.

Government contractors are drawing up plans for the remediation of 32 polluted sites — out of up to 2,000 identified so far — in an oil-producing area known as Block 192. The sites have been listed as priorities by environmental authorities and local indigenous organizations. Meanwhile, a government-funded study conducted by the United Nations Development Programme (UNDP), and released publicly in August, recommends a more comprehensive remediation strategy based on health risks, along with changes to environmental regulations.

Block 192 covers about 4,970 square kilometres overlapping the Pastaza, Corrientes and Tigre rivers, which flow into the Marañón, one of the main tributaries of the Amazon. It is located in a remote region near Peru's northern border with Ecuador that is inhabited mainly by Quechua, Achuar and Kichwa people. The US-based company Occidental Petroleum began operating there in the mid-1970s, two decades before Peru passed environmental regulations for the oil and gas industry. Oil production in Block 192 peaked in 1982, at 120,000 barrels a day.

For four decades, the environmental effects of this activity were largely uncontrolled and unremediated. The hot, salty, metal-laden water pumped out of wells with oil was dumped into streams and rivers until 2009, nine years after the Argentinian firm Pluspetrol took over Occidental's lease. In 2015, Occidental announced that it had settled — for an undisclosed sum — with five Achuar communities who sued in a US court over pollution in the Corrientes River. The company denies that its operations contaminated Block 192.

BARBARA FRASER

Segundo Cariajano Hualinga, president of a Kichwa community in Peru, stands on an oil pipeline.

The discharge of polluted water, combined with ongoing spills from the pipelines criss-crossing the block, resulted in chronic exposure of fish, frogs and other aquatic life to salts, heavy metals and hydrocarbons, according to the UNDP-sponsored study. Residents of villages in Block 192 have also been exposed to these pollutants. Until 2015, when the government began installing temporary water-treatment plants, rivers and streams were the only source of water for drinking, cooking and washing. Villagers recall bathing in salty water and pushing oily scum aside to draw water for drinking or cooking.

Many continue to question whether fish are safe to eat. Near the Kichwa community of Doce de Octubre on the Tigre River, oil seeps to the surface of a former lake in the midday heat and a small stream of salty water trickles past decades-old pipes, says Segundo Cariajano Hualinga, the community's president.

Indigenous federations have fought for more than a decade to get Peru's government to commit to remediating sites polluted with oil, and to agree to the UNDP study. Plans are under way to clean up the 32 priority sites, but a US$15-million contingency fund is nearly exhausted. The UNDP study estimated that remediating 92 sites could cost $300 million. Although full funding is not yet assured, Peru's minister of energy and mines said on 6 September that he would request an extra $51.5 million in 2019 to clean up Block 192.

ECOSYSTEM OBSTACLES

But the Amazon itself presents major challenges to any clean-up effort. Environmental remediation is daunting in rainforest ecosystems, with their seasonal flooding, varying water chemistry and poorly understood groundwater flows, says Margarita Núñez, a biologist in Costa Rica who headed the UNDP study team. The saturated, nutrient-poor clay soil in Block 192 contains little oxygen. She

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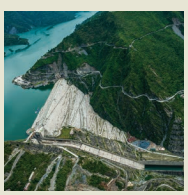

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says that this makes it difficult to use one of the cheapest, least invasive clean-up methods — introducing microorganisms that can break down oil and gas pollution.

Because of those conditions, along with the accumulation of metals from decades of polluted-water discharge, the UNDP study recommends a combination of measures. These include bioremediation with plants and microbes, removal and incineration of contaminants, stabilization or solidification of polluted areas, and thermal desorption, in which heat is used to separate individual contaminants from a mixture.

Many clean-up options put forth by the study would be difficult to use in Block 192, says Raúl Yusta García, a chemical engineer at the Monterrey Institute of Technology in Mexico. His research suggests that pollution levels in water discharged from oil operations have been underestimated.

Because Peruvian law lacks a clear definition of environmental remediation, government officials, company executives and local communities have different expectations about what a clean-up effort should entail. Although the "occidental, technified world" sees the goal of remediation as reducing health risks, Indigenous people think of it "more as restoration", returning a site to its former state, says Fernando Morales, an environmental chemist at Simón Bolívar University in Caracas, who worked on the UNDP study.

Peru's environmental standards are inadequate for gauging risks to human health and the environment, especially the aquatic ecosystems on which people depend for food, says Diana Papoulias, an aquatic toxicologist retired from the US Geological Survey, who was also on the UNDP team.

The country has quality standards for water and soil, but not for sediments — where hydrocarbon residue and metals have probably settled, and which might be redistributed throughout the forest by floodwaters during the annual rainy season, she says. The standards that do exist were taken from nations such as the United States, Canada and the Netherlands, whose largely temperate ecosystems are very different from the Peruvian Amazon.

That very ecosystem might put local residents at further risk from pollution. Health exams have found cadmium and lead in Indigenous villagers' blood and urine. Núñez and her colleagues suspect that people might be more likely to absorb those elements in nutrient-poor environments that lack sufficient calcium and magnesium.

The UNDP team has recommended further study of the ecosystem, but that should not delay the clean-up, Núñez says. "Of course you'd do a better job of remediation if you had more knowledge, but I believe the remediation, as such, has to begin now." ■

EQUALITY

Nobel committees to tackle gender skew

Nominators will be asked to consider diversity in gender.

BY ELIZABETH GIBNEY

When Donna Strickland won a Nobel Prize in Physics this week (see page 20), she was the first female winner in more than 50 years. Over that period, just one woman has won in chemistry (*Nature* went to press before this year's prize was announced).

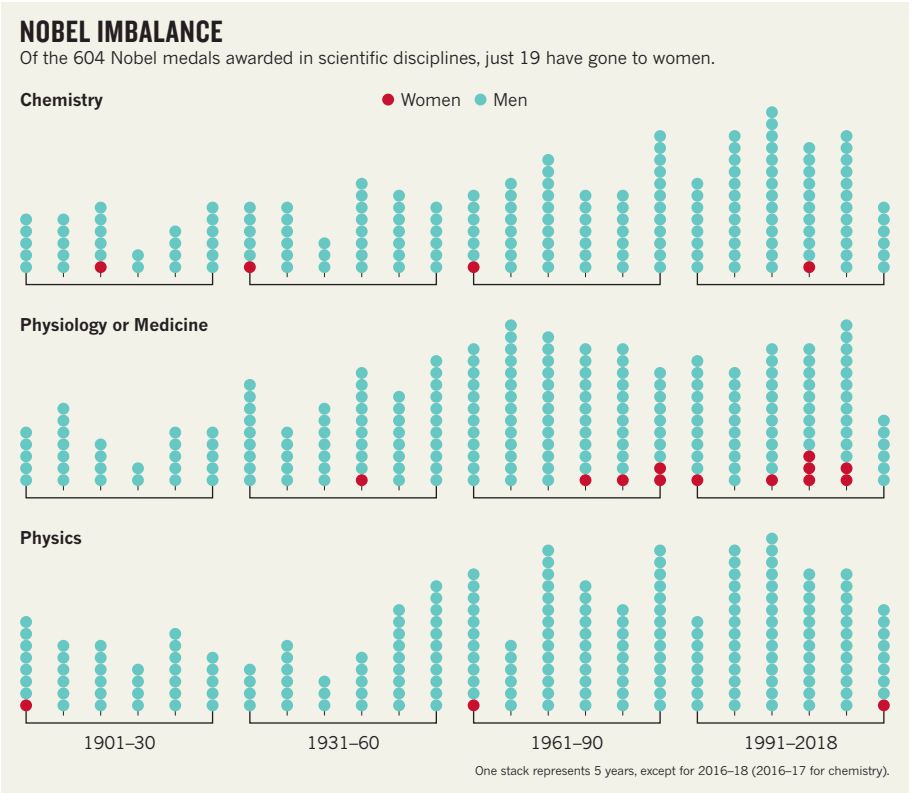
This gender imbalance is the subject of increasing criticism, much of which is aimed at the Nobel committees that award the honours. In the awards' history, women have won only 3% of the science prizes (see 'Nobel imbalance'), and the overwhelming majority of prizes have gone to scientists in Western nations. Some argue simply that the prizes tend to recognize work from an era when the representation of women and non-Western researchers in science was even lower than it is today. But studies repeatedly show that systemic biases remain in the sciences — and the slow pace of progress was especially evident in 2017, when there were no female laureates for the second year in a row.

Göran Hansson, secretary-general of the Royal Swedish Academy of Sciences, says that even now, too few women might be nominated.

For the first time, the committees will explicitly call on nominators to consider diversity in gender, geography and topic for the 2019 prizes. The request will be included in invitation letters scheduled to go out this month to the thousands of scientists asked to nominate candidates for each prize. "We need the scientific community to see the women scientists, and to nominate those who have made outstanding contributions," he says.

"The smallest possible nudge can make a difference, so I praise them for that," says Curt Rice, president of Oslo Metropolitan University and head of Norway's Committee for Gender Balance and Diversity in Research. Other measures and suggestions are in the works to improve gender balance, including changes to nomination committees and nomination rules.

Hansson says that the diversity measures are not about improving the statistics, but about helping the best scientists to win by ensuring that outstanding women are not overlooked. "We are admittedly slow, but we are aware of the situation and we work on it," he says. ■



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CORRECTION

The News story ‘Peru plans oil clean-up’ (*Nature* **562**, 18–19; 2018) erroneously stated that the United Nations Development Programme (UNDP) funded a study on remediation strategies. In fact, the Peruvian government funded the study and the UNDP conducted it.