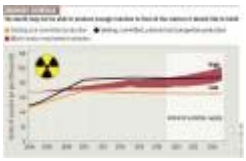
Human health may be the cost of a nuclear future

Click to Print

10 June 2006
NewScientist.com news service
Rob Edwards

IN THE mountain village of Kara Agach in Kyrgyzstan people are unwittingly eating radioactive waste. Radium left behind by more than two decades of uranium mining during the Soviet era has contaminated their chickens, milk, potatoes and pears.



Enlarge image
Uranium shortage

Enlarge image
Where all the uranium is

A new study by Belgian and Kyrgyz scientists has shown that villagers are receiving radiation doses up to 40 times the internationally recommended safety limit, mostly from the food they grow. If the uranium waste dumps were dislodged by earthquakes or landslides, thousands more could be in danger. "There is a potential for a radiological disaster to happen," says Hildegarde Vandenhove from the Belgian Nuclear Research Centre in Mol.

In the debate over the merits and demerits of nuclear energy, the situation in Kara Agach is a warning. Often the people and places that have to deal with the hazards of uranium mining are forgotten in discussions of the environmental costs of nuclear fuel. As the world gears up to build more nuclear reactors to augment energy supply, maybe even combat climate change, mining risks look set to rise.

Uranium mining is a major worldwide industry. In 2004, about 50 mines in 16 countries produced more than 40,000 tonnes of uranium. Business is booming, according to the Organisation for Economic Cooperation and Development's Nuclear Energy Agency (NEA), which has 28 industrialised countries as members. In a report published on 1 June it says that uranium production increased 11 per cent between 2002 and 2004, and has the potential to double by 2010 to feed new nuclear reactors.

Digging uranium out of the ground is an even messier business than mining other ores. After the uranium is extracted from the ore, usually by acid or alkali digestion, the remaining liquid contains radioisotopes that occur naturally alongside uranium, predominantly radium-226. This has a half-life of 1600 years and decays into radon gas, a known cause of lung cancer. The toxic sludge, known as tailings, remains radioactive for thousands of years.

In Kara Agach, there are 23 uranium waste dumps in a region prone to landslides and earthquakes. If one of them were to be dislodged, the Mailuu Suu river could be contaminated and threaten the health of the 25,000 people who live 3 kilometres downstream. Worse, it could carry pollution 20 kilometres over the border into Uzbekistan's Fergana valley, the country's main agricultural region (*Journal of Environmental Radioactivity*, vol 88, p 118).

Kyrgyzstan is not the only country contaminated by radium-226 from the sprawling mines that fuelled the Soviet Union's reactors and bombs. An unpublished survey for the European Union completed in 2002 found over 7000 old mines, dumps, ponds and plants that needed cleaning up in 11 central European countries.

"It is a huge and daunting legacy," says Mike Thorne, a British consultant who helped with the EU survey. "I estimated that some people would be receiving radiation doses 10, 20 or 30 times higher than the recommended safety limits, in the range that requires remedial action to protect their health."

Communities are also at risk elsewhere in Europe and Russia, Thorne says. In the former East Germany there is a $9 billion clean-up programme under way to tackle over 170 million tonnes of tailings dumped at 12 sites between 1946 and 1990. And a new study has confirmed that the country's 400,000 uranium miners suffered at least a 10 per cent increased risk of lung cancer (*Health Physics*, vol 90, p 208).

Western nations, too, have reminders of past bad practice. The US government has to shift more than 10 million tonnes of uranium tailings from the banks of the Colorado river in Utah to a site 48 kilometres away in order to prevent the contamination of water supplies in southern California. Some 200 million tonnes of tailings at Elliot Lake in Canada pose persistent storage problems. In Australia, mining at Jabiluka near Darwin in the Northern Territory has been suspended because of opposition from Aboriginal landowners.

Even as it tries to address past blunders, the nuclear industry says it has cleaned up its act for future mines. The environmental impacts of new mines are "vastly less" than in the past, says Ian Hore-Lacy from the World Nuclear Association in London. "Any mine started up in the west in the past 20 years would be properly managed for rehabilitation. I don't see standards slipping in the future." Measures include keeping tailings underwater during mining and subsequently burying them to prevent the emission of radon gas.

But Hore-Lacy does not have "great confidence" that high standards will be maintained in all countries. "Some countries have great regulations, but if they are not enforced, they are meaningless," he says. Uranium to help meet the demand for new nuclear power programmes in Asia will come partly from increasing production at existing mines in China, India and Australia, and according to last week's report from the NEA, a host of new mines are also being planned. The report lists 20 mines scheduled to open before 2030, including one each in Russia, India, Namibia, Niger and Brazil, two in Canada, two in Iran and 11 in Kazakhstan.

Luis Echávarri, director-general of the NEA, accepts that there might be problems in less developed countries. "Economic conditions have an influence on how you protect the environment," he says. The NEA report says that if global nuclear capacity was to increase by 44 per cent by 2025 - the maximum it envisages - uranium demand could start to outstrip supply by 2018. If safe, established mines can't satisfy the demand, environmental regulations everywhere, including the west, could come under pressure.

At the moment uranium recycled from old nuclear plants makes up 40 per cent of world supplies. According to the NEA report, this is due to decline after 2015, as stocks of uranium from 50 years of civil and military programmes run out. This means that an increasing proportion will have to be dug out of the ground. Couple this with increasing uranium prices because of growing demand, and it is inevitable that there will be prospecting for fresh sources of uranium ore. One consequence could be that lower-grade ores will be exploited, leading to more environmental damage. "Sites will have to be cleaned up by the taxpayer, at a cost that may reach the value of the uranium mined," says Peter Diehl, the author of a report on world uranium resources for Greenpeace.

The nuclear industry could deal with this looming uranium shortage by reverting to a technology that was abandoned after considerable investment in both the US and Europe: the fast breeder reactor (FBR). Even as they burn uranium, these reactors make plutonium that can be used as fuel. Only Russia, China, Japan and India are working on FBRs at present. FBRs will soon have to be back on the agenda in the west, nuclear advocates believe. In 30 years they will be commercially viable and in 60 years they will be necessary, Echávarri says. Because they can increase 30-fold the amount of energy extracted from uranium, they are "most attractive from a sustainable point of view", he argues. Meanwhile, India is investigating reactors that can burn thorium, which is more abundant than uranium.

But these alternatives are aspirations, not plans, and they all come with downsides. Thorium, says Hore-Lacy, has metallurgical problems, and FBRs have yet to be proved economic. Besides, the FBR's dependence on plutonium could speed the proliferation of nuclear weapons,.

Which leaves the nuclear industry mining for uranium, at least for the next couple of decades. And that is something about which we still have lessons to learn, says radiation consultant Mike Thorne. "Maybe we should solve the problems of the past before we create new ones."