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Ten of the most polluted places on the planet

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Human activity can leave a toxic toll on the planet. And some of the worst affected species are humans. Here's ABC Environment's list of some places you don't want to visit any time soon.

MORE THAN 100 million people worldwide are exposed to dangerous levels of toxic chemicals. These pollutants include radionuclides, industrial chemicals, pesticides and heavy metals, which may come from activities such as mining, industry, agriculture and weapons manufacture.

"The scope of [global] health impact is comparable to AIDS/HIV, or malaria, and that should call us into action to deal with this problem," says Richard Fuller, president of the New York City-based NGO, the Blacksmith Institute.

Since 2006, the Institute has released a series of reports every year which have flagged the world's most toxic threats and more than 2,500 sites in the developing world that are heavily polluted. "All of the sites that I have visited are tragic, horrible, shocking places that make your stomach turn," says Fuller. "Often physical deformity is evident. These are not places I will bring my kids."

The former Soviet Union has "by far and away the worst problems," he says, often at ageing industrial or weapons manufacture and storage sites - but surging industry in India and China is also leading to great levels of pollution at poorly regulated spots.

There are many badly polluted sites around the world, making it difficult for experts to select the absolute worst offenders, but the following ten are among the most polluted in the world for each type of toxin:

1. Air pollution: Linfen, China

According to one World Bank report, 16 out of 20 of the world's worst cities for air pollution are found in China and Linfen has the highest levels of pollution. This city, in China's Shanxi Province, is at the centre of the nation's coal industry. Here, emissions from vehicles and industry have created an atmosphere where people literally choke on coal dust. High levels of pollutants such as fly ash, carbon monoxide, sulphur dioxide and arsenic are taking their toll on the greater city's three million residents: clinics here see high levels of bronchitis, pneumonia and lung cancer and lead poisoning in children is alarmingly common.

2. Industrial chemicals: Bhopal, India

In terms of number of deaths, Bhopal remains the worst industrial accident yet. In December 1984, 40 tonnes of isocyanate gas escaped from a pesticide plant in this central Indian city of 1.8 million people. The accident killed nearly 4,000 people outright and the number of fatalities rose to 15,000 in following weeks. "More than 26 years have passed since the disaster, yet thousands in Bhopal continue to suffer and die from chronic illnesses, with as many as 500,000 people suffering ill health as a result," says Dr Mariann Lloyd-

Smith a senior advisor to the National Toxics Network, an Australian NGO based in Bangalow NSW. "In 1989, Union Carbide [the US company responsible] agreed a financial settlement...yet most victims didn't get enough to cover medical expenses. The site was never cleaned up and still contains the evaporation ponds where toxic effluent was dumped. The contaminated groundwater continues to poison residents today. High numbers of infants in the affected communities are born with congenital defects and cerebral palsy and residents drinking the contaminated groundwater have higher rate of skin, respiratory and gastrointestinal diseases."

3. Mercury: Central Kalimantan province, Indonesia

The largest concentration of people at risk from mercury pollution is in Indonesia. Here, in Borneo's Central Kalimantan province, mercury is commonly used to extract gold from ore by small-scale processing operations. According to the WWF, so-called artisanal gold mining (ASGM) here results in the emission of 45 tonnes of mercury into the environment annually. Around the world it accounts for over 900 tonnes of emissions - around 30 per cent of all mercury emissions. Gold miners mix liquid mercury with silt or ore from riverbeds that contains tiny flecks of gold. The gold and mercury form an amalgam, from which the gold can be recovered by heating to drive off the mercury. However, this is often done inside homes and anyone nearby is at risk of inhaling the vapours. "There's also lots of environmental damage, because the mercury finds its way into the environment, where it can be converted to methylmercury, which is even more hazardous to human health when ingested," says Professor Ian Rae, an expert on environmental pollution at the University of Melbourne. The United Nations is currently negotiating a treaty which will hopefully lead to better management of mercury, including its replacement in ASGM with safer alternatives, such as borax.

4. Pesticide: Kasargod, India

Endosulfan, an organic pesticide now banned in many countries, has been responsible for poisonings in Africa, India and Latin America, says Dr Lloyd-Smith from the National Toxics Network. In West Africa, hundreds of cotton farmers have died as a result of exposure, and many others as a result of eating contaminated food, she says. "In Kasargod, in southern India, 20 years of aerial spraying of cashew nut plantations has left a legacy of disease, death and deformity. Numerous congenital, reproductive and long-term neurological and other effects have been experienced, including congenital deformities, cerebral palsy, epilepsy, lowered IQ, delayed development [and] cancer." A survey by the Kasargod District Committee reported a disability rate 73 per cent higher than the Kerala State average, with the rate of locomotor disability and mental retardation 107 per cent higher. "The Kerala State Government is trying to provide treatment for those affected and have registered 2,000 victims. Compensation has been paid to some... including the families of at least 135 victims who have died," says Lloyd-Smith. "Despite the recent ban, endosulfan and its toxic metabolites are found across the globe in human breast milk [and] umbilical cord blood." Following a phase out announced in 2010, endosulfan may be legally used with registration in Australia until 12 October 2012.

5. Chemical weapons manufacture waste: Dzerzhinsk, Russia

Dzerzhinsk has the unenviable status as one of the former Soviet Union's major sites for chemical weapons production - and remains a significant chemical manufacturing site. But little of the chemical weapons industry was properly regulated, and according to the city's own figures, more than 270,000 tonnes of chemical waste were poorly disposed of between 1930 and 1998. According to the Blacksmith Institute: "In places, the chemicals have turned the water into a white sludge containing dioxins and high levels of phenol - an industrial chemical that can lead to acute poisoning and death. These levels are reportedly 17 million times the safe limit." As of 2007, the average life expectancy in the city of 250,000 people was reported to

be 42 for men and 47 for women.

6. Organic chemicals: Sumgayit, Azerbaijan

Sumgayit was another centre for Soviet industry with more than 40 factories producing industrial and agricultural chemicals. In their heyday these factories - which manufactured products ranging from detergents and pesticides to chlorine and aluminium - chugged out 64,000 to 109,000 tonnes of harmful emissions into the air each year, which has left a heavy legacy of pollution. During that time the city had one of the highest morbidity rates in Azerbaijan. Today incidence rates of cancer are 22 to 51 per cent higher than the national average, while mortality rates from cancer are eight per cent higher.

7. Lead: Tianying, China

Around the world, an estimated 19 million people are at risk from lead smelting operations while either using ore or recycling scrap metal. Tianying in China's Anhui province is one of the centres of the nation's lead mining and processing industry, and accounts for approximately half of Chinese production. Small-scale operations there have been notorious for disobeying regulations, which has resulted in lead concentrations in the air and soil to being 8.5 and 10 times higher than the national health standard. The health of 140,000 people is at risk, and many residents are reported to suffer the effects of lead poisoning, which the Blacksmith Institute says includes "lead encephalopathy, lower IQs, short attention spans, learning disabilities, hyperactivity, impaired physical growth, hearing and visual problems, stomach aches, irritation of the colon, kidney malfunction, anaemia and brain damage."

8. Hexavalent chromium: Sukinda, India

Hexavalent chromium (chromium VI), one of two forms of the metal, is a carcinogen which can cause or increase the chance of developing some kinds of cancer. Sukinda, in India's state of Orissa, has 97 per cent of India's reserves of chromite ore, one of the only sources of chromium. It also has one of the world's largest open-cast chromite mines. According to the Blacksmith Institute, as of 2007, 12 mines continued to operate with no environmental management plans, spreading waste rock over the surrounding area and discharging untreated water into the rivers. Mine workers are habitually exposed to chromium VI contaminated dust and water and they have suffered gastrointestinal bleeding, tuberculosis, asthma, infertility and birth defects. In some cases, twenty times the international standard for chromium VI has been detected in drinking water. The Orissa Voluntary Health Association reports that around 85 per cent of deaths in the mining areas and nearby industrial villages have a link to chromite mining operations.

9. Radiation: Chernobyl, Ukraine

In terms of scale of pollution and number of people affected, the 1986 Chernobyl nuclear reactor meltdown is truly staggering. In April that year, testing at the reactor led to a catastrophic accident. Thirty people were killed outright, 135,000 had to be evacuated and some estimates suggest that up to 5.5 million people across northern Europe may have suffered ill health as a result, although few health effects have been definitively proven, says Professor Rae from the University of Melbourne. A 30-kilometre exclusion zone around the city remains dangerously radioactive and uninhabitable today.

10. Persistent organic pollutants (POPs): Arctic Canada

"The contamination of the Arctic with POPs seriously threatens the very existence of indigenous communities," says Lloyd-Smith. "Some of these poisons have been banned...but many go unregulated and

travel the world on water and air currents." POPs are organic chemicals which break down very slowly in the environment, such as hexachlorobenzene or DDT. They are often industrial products, byproducts or pesticides. These accumulate in Arctic environments and in the animals that inhabit them and get concentrated in whale and seal blubber and other traditional foods that Inuit people eat. "The blood and breast milk of Canadian Arctic peoples are contaminated with the full suite of POPs [and other] chemicals... One carcinogenic chemical used in the production of stain treatments and non-stick cookware, perfluorooctanoic acid (PFOA) is doubling in the Arctic environment every five years," she says. "The Arctic people are fighting for their survival against one of the worst contaminated regional hotspots." Birds and other Arctic animals are also under threat.



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