The World's Worst Polluted Places

The Top Ten of The Dirty Thirty

A Project of the Blacksmith Institute

September 2007

THE WORLD'S WORST POLLUTED PLACES

The Top Ten
(of The Dirty Thirty)

Blacksmith Institute
New York
September 2007

This document was prepared by the staff of Blacksmith Institute with input and review from a number of experts and volunteers, to whom we are most grateful. Special thanks to:

The full cast of the Technical Advisory Board (see Annex for details)
Meredith Block
David Hanrahan
Aadika Singh
Jennifer Spiegler, and
Richard Fuller

For questions, comments and feedback, please contact Blacksmith Institute in New York City at the following address:

Blacksmith Institute
2014 Fifth Avenue
New York, NY 10035
(646) 742 0200
info@blacksmithinstitute.org

Media enquires should be directed to Meredith Block block@blacksmithinstitute.org in New York or David Hanrahan dhanrahan@blacksmithinstitute.org in London.

This report is available online at www.blacksmithinstitute.org

Appendices

The Pollution Challenge Remains Unfinished

In 2006, Blacksmith Institute launched the first assessment of the extent of toxic pollution in the developing world. This was published as *The World's Worst Polluted Places: The Top Ten*. Blacksmith Institute now presents its second annual review of the most polluted places in the world – sites where human health is severely affected.

The initial report pointed out that decades of effort and attention have reduced industrial pollution to no more than an occasional worry for most of the developed world. However, this is certainly not the case in the poorest countries where pollution continues to be a major cause of death, illness, and long-term environmental damage. In these parts of the world, pollution shortens lives, damages children's development and growth, causes chronic illnesses, and kills thousands of people indiscriminately. All this makes strong, sustainable economic development very difficult.

Pollution in developing countries is often hidden away from the casual visitor. In most countries the major polluting industries are concentrated in special estates or industrial cities, usually well away from the capitals. Mining and metals processing are frequently located where the ore deposits are found, often in remote and mountainous areas. In these places people are faced with ongoing soil, air and water contamination from antiquated enterprises and the legacy of decades of uncontrolled emissions. These are locations where soils and groundwater have been poisoned, where rivers are saturated with toxins, and radioactive lakes cannot be approached safely, let alone be used for irrigation or drinking. In some towns, life expectancy approaches medieval rates and birth defects are the norm, not the exception. In others, children's asthma rates are measured above 90 percent and mental retardation is endemic. In such places, life expectancy may be half that of the richest nations and these shortened, debilitated lives are miserable.

The developed world may find it scarcely credible that such medieval conditions continue to exist, although it is perhaps only fifty years since parts of Europe and North America were black and infernal. The levels of regulatory and management controls that protect people in modern industrial societies are not yet reflected in developing countries. Even if sub-standard or antiquated factories were brought to modern expectations, the legacy of old contamination from the past would continue to poison the local population. Inadequacies in formal controls are often compounded by weaknesses in civil institutions and the inability to hold governments accountable when they fail to take action.

The 2006 Top Ten Report summarised the present situation bluntly: "Living in a town with serious pollution is like living under a death sentence. If the damage does not come from immediate poisoning, then cancers, lung infections and mental retardation are likely outcomes. Often insidious and unseen, and usually in places

with deficient and exhausted health systems, pollution is an unacknowledged burden on the poor and marginalized in the developing world. It is a major factor impairing economic growth, and a significant strain on the lives of already impoverished people." Efforts are being made and some successes have been seen but far too many people still live under these debilitating circumstances.

The problems are major, but this does not mean that they are hopeless. There are decades of experience in industrial nations in cleaning up the most toxic sites and as well as a handful of successful projects that are being implemented in the developing world. Blacksmith's website lists a number of such "Success Stories".

Solving these problems can also be extremely cost effective in terms of health impact. A recent review of the cost effectiveness of a sampling of Blacksmith interventions made estimates of the resulting health impacts and the cost-benefits, using established epidemiological data and methodologies. The estimated benefits compare favourably to World Bank estimates of costs of lives saved on interventions related to water supply, improved cooking stoves, and malaria controls. This confirms that dealing with highly polluted sites is one of the most cost effective methods to improving life expectancy in the developing world. (See full report at http://www.blacksmithinstitute.org/docs/costEff1.pdf).

What Has Changed in a Year?

The worldwide publicity that followed the publication of the 2006 *Top Ten* succeeded in reaching politicians, industrialists and concerned citizens around the world. As a result of the exposure and newly invigorated public pressure, governments and polluters in several of the sites listed in the 2006 report have responded. Positive actions have been taken to clean-up many of these pollution problems and protect impacted communities. However, given the scale of the problems at the worst sites, it is going to take time for measurable improvements in the health conditions of the local populations to emerge.

A significant number of new sites were nominated from across the globe as potential candidates for the 2007 Top Ten list. Every nomination received was added to Blacksmith's database and considered for the 2007 review. The methodology for assessing the severity of polluted sites has also been refined to place more weight on the scale and toxicity of the pollution and on the numbers of people at risk.

There have been some changes in the Top Ten as a consequence of these adjustments but no major reshuffle. The details and implications of the changes are discussed below, after the presentation of the selected sites.

Despite ongoing efforts to make the survey of the world's most toxic places more comprehensive, the list of nominated sites is still incomplete.

Blacksmith will continue to review sites as they are nominated, continually improving and updating our yearly list until health in developing countries is no longer threatened by toxic industrial pollution.

Updating the Top Ten and Introducing the Dirty Thirty

The Top Ten list was compiled again this year with heavy reliance on Blacksmith's Technical Advisory Board (TAB) of experts, with over 250 years of combined experience in this field. The TAB includes specialists from Johns Hopkins University, Hunter College, Harvard University, IIT Delhi, University of Idaho, Mt. Sinai Hospital, and leading international environmental engineering companies.

Blacksmith began the Top Ten review process by surveying the existing database of polluted sites. Over the past seven years, Blacksmith has amassed a list of over 400 severely polluted locations from all regions of the world. The initial survey narrowed these down to about seventy sites - all with severe human health risks, all deserving the attention of the global community. In discussing feedback from last year's Top Ten, it became clear that the list needed to be more representative of the different types and locations of polluted sites.

To achieve this while maintaining an objective process of selecting the Top Ten, the initial seventy sites were presented as a matrix showing location and type. These seventy were then reduced to thirty while maintaining, as far as possible, a full range of diversity in the sites. These then became the "Dirty Thirty" which formed the basis of the Top Ten selection. The full Dirty Thirty are presented on page 7, in the matrix format.

The TAB used the revised methodical approach that places increased emphasis on the toxicity and scale of the pollution sources and also on the numbers of people at risk. This approach is presented in more detail in the Annexes. TAB members individually prepared their evaluations of the thirty sites and then discussed them in a conference. Based on the individual rankings and the consensus from the conference, the worst of the larger group made the final Top Ten list.

It is not realistic or feasible to put these sites into a final rank order from one to ten, given the wide range of location sizes, populations and pollution dynamics. This report refrains from pointing a finger at any one place as being the worst on earth and therefore this report lists polluted sites *alphabetically*, by country name.

One important caveat to be made is the relative weakness of the information on which the selection process is based. More and better data would greatly improve the assessment process but the reality is that good data is (at best) missing and (at worst) hidden or distorted. Efforts continue to improve the knowledge and understanding of the main sites. However, we must rely significantly on the qualitative judgements and experience of the TAB in ranking the worst sites.

The Top Ten – Summary Table
(NOT RANKED - listed alphabetically by country)

Site Name and Location	Major Pollutants and Sources	Scope of the Problem and Human Health Impact	Cleanup Status
Sumgayit, Azerbaijan	Organic chemicals and mercury, from petrochemical and industrial complexes	Dated technologies, a lack of pollution controls and improper disposal of industrial waste have left the city contaminated.	Various multilateral development agencies, international banks and governments have invested moneys to do the clean-up.
Linfen, China	Particulates and gases from industry and traffic	Expanding and unregulated industry based on local coal and other resources has resulted in the worst air quality in China. There are high incidences of respiratory and skin diseases and lung cancer.	The local government plans to shut down more than 200 factories by the end of 2007 and replace them with clean and better regulated facilities.
Tianying, China	Heavy metals and particulates; industry	Average lead content in the air and soil are up to10 times higher than national standards. Children suffer from birth defects and developmental challenges.	The State Environmental Protection Administration has ordered all lead processing firms to be shut down until they address environmental impacts.
Sukinda, India	Hexavalent chromium; chromite mines	Waste rock and untreated water from the mines impacts local water supplies. The air and soils are also heavily affected. Residents suffer from gastrointestinal bleeding, tuberculosis, and asthma. Infertility and birth defects are common.	Some piecemeal actions have been taken by mining companies but the scale of the problems is "beyond the means of the State to solve".
Vapi, India	Wide variety of industry effluents; industrial estates	More than 50 industrial estates discharge heavy metals, pesticides, and chemical waste.	A number of waste facilities have been constructed but serious problems persist, despite pressure from environmental agencies and NGOs. No comprehensive plan for the area has been proposed.
La Oroya, Peru	Lead and other heavy metals; mining and metal processing	Metal mining and smelting over 80 years has caused significant lead contamination. Blood lead levels for children average 33.6 µg/dl, triple WHO limits.	The current owner, Doe Run, has made some investments in the operating plant but the legacy issues have not been addressed.
Dzerzhinsk, Russia	Chemicals and toxic byproducts, lead; chemical weapons and industrial manufacturing	A major site for Cold War era manufacturing where industrial chemicals have been discharged into the local water supplies. Life expectancy is short and the death rate is significantly higher than Russia's average.	A number of isolated efforts have been undertaken in individual villages but no major clean-up activity has been undertaken.
Norilsk, Russia	Heavy metals, particulates; mining and smelting	Mining and smelting operations have devastated the area with particulates and heavy metal pollution. Norilsk Nickel is the biggest air polluting industrial enterprise in Russia.	Norilsk Nickel has begun to implement plans for some emissions controls. There is as yet little visible improvement.
Chernobyl, Ukraine	Radioactive materials; nuclear reactor explosion	The legacy of this most infamous of nuclear disasters lingers and has resulted in thousands of cancer deaths. Respiratory, ear, nose, and throat diseases are common ailments.	Most residents have moved and some remediation projects have been implemented. Future health impacts are possible.
Kabwe, Zambia	Lead; mining and smelting	Unregulated lead mining and smelting operations resulted in lead dust covering large areas. Children's' blood lead levels average between 50 and 100 µg/dl – up to ten times the recommended maximum.	The World Bank has begun a $40 million remediation program with the Government of Gambia, initiated with Blacksmith involvement.

The Dirty Thirty (including the Top Ten)

(listed by region and type)

2007 World's Worst Polluted Places – The Dirty Thirty Summary Matrix										
World Region	**Type of Pollutant/Source**									
	Mining	Metals	Petro-Chems	Nuclear	Weapons	Industrial Complex	SME Cluster	Urban Waste	Air Pollution	Other
Africa	**Kabwe, Zambia**							**Dandora Dumpsite, Kenya**		
China	**Wanshan China**	**Tianying, China**				**Huaxi, China**			**Lanzhou, China** **Linfen, China** **Urumqi, China**	
Eastern Europe and Central Asia	**Chita, Russia**	**Norilsk, Russia** **Rudnaya Pristan/ Dalneg'sk, Russia**	**Bratsk, Russia**	**Chernobyl, Ukraine** **Mailuu-Suu, Kyrgyzstan**	**Dzerzhinsk Russia**	**Sumgayit, Azerbaijan** **Ust-Kameno-gorsk, Kazakh-stan**			**Magnitogor sk, Russia**	
Latin America and the Caribbean	**Huancav' lca Peru** **La Oroya, Peru**	**Haina, Domincan Republic**	**Oriente, Ecuador**						**Mexico City, Mexico**	**Matanza-Riachuelo, River Basin, Argentina**
South Asia	**Sukinda, India**		**Hazarib'g Bangl'sh** **Ranipet, India**			**Mahad Industrial Estate, India** **Vapi, Gujarat, India**				
South-east Asia							**Meycaua-yan City and Marilao, Philippines**			

What Has Changed From the 2006 Listing?

Six of the ten sites that were on last year's list remain in this year's Top Ten:

Linfen (China),
La Oroya (Peru),
Dzerzhinsk (Russia),
Norilsk (Russia),
Chernobyl (Ukraine), and
Kabwe (Zambia).

Two sites that were on the longer list in 2006 have now moved into the Top Ten, as a result mainly of the revisions to the scoring methodology. These are

Sumgayit (Azerbaijan) and
Vapi (India).

The two following sites that were not on the nomination list in 2006 have now been included in the Top Ten. Their identification during the past year and their inclusion as top sites highlights the need for ongoing expansion and refinement of the overall database of polluted sites, in order to find other neglected candidates.

Tianying (China) and
Sukinda (Orissa).

As a consequence of the inclusion of four new sites at the top of the overall list, the following have dropped down lower into the Dirty Thirty listing.

Haina (Dominican Republic),
Ranipet (India),
Mailuu-Suu (Kyrgyzstan), and
Rudnaya Pristan (Russia).

The reasons for these lower rankings are fundamentally due to increased competition from new sites and changes in the methodology that reduced the ranking for smaller sites or for those where the risks are less clear. Remediation works have commenced at some of these sites but the clean-ups have not progressed to the point where they have reduced the impacts to a significant extent.

What Next?

As noted at the beginning of this report, there are cost effective interventions that can be undertaken to deal with highest priority "hot spots" within the Dirty Thirty. However, the level of investments required to deal with the top sites is beyond that

which can be assembled locally and therefore national government or even international support is needed. Blacksmith and other groups work with key local champions to identify realistic and practical solutions and then continue to be intermediaries in trying to identify major support. The kind of issues that are most amenable to this approach are large scale point-source problems such as mines and metal smelters.

More difficult to address are the declining industrial cities or complexes, where a focus on unfettered production in the past has left a legacy of human and environmental problems. Unfortunately, there are too many of these “industry towns” still carrying on where there is no economic alternative for the local population. The interventions in these places begin with supporting a core group of concerned people and officials to create a consensus and build momentum, starting with some simple but visible improvements to show that progress is possible. Blacksmith continues to support all of these approaches.

Details of the 2007 Top Ten World's Worst Polluted Places

(Sites Listed Alphabetically by Country)

Sumgayit, Azerbaijan

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
275,000	Organic chemicals, oil, heavy metals including mercury.	Petrochemical and Industrial Complexes

The Problem:

Sumgayit was a major Soviet industrial center housing more than 40 factories manufacturing industrial and agricultural chemicals. These included synthetic rubber, chlorine, aluminium, detergents, and pesticides. While the factories remained fully operational, 70-120,000 tons of harmful emissions were released into the air annually. With the emphasis placed on maximum, low-cost production at the expense of environmental and occupational health and safety, industry has left the city heavily contaminated. Factory workers and residents of the city have been exposed to a combination of high-level occupational and environmental pollution problems for several decades.

Untreated sewage and mercury-contaminated sludge (from chlor-alkali industries) continue to be dumped haphazardly. A continuing lack of pollution controls, dated technologies and the improper disposal and treatment of accumulated industrial waste are just some of the issues that plague the city.

Health Impacts:

Sumgayit had one of the highest morbidity rates during the Soviet Era and the legacy of illness and death persist. A study jointly conducted by the UNDP, WHO, Azerbaijan Republic Ministry of Health and the University of Alberta demonstrated that residents of Sumgayit experience intensely high levels of both cancer morbidity and mortality. Cancer rates in Sumgayit are 22-51% higher than average incidence rates in the rest of Azerbaijan. Mortality rates from cancer are 8% higher. Evidence suggests that lower reported cancer rates are flawed as a result of underreporting.

A high percentage of babies are born premature, stillborn, and with genetic defects like downs syndrome, anencephaly, spina bifida, hydrocephalus, bone disease, and mutations such as club feet, cleft palate, and additional digits.

Status of Clean-Up Activity:

The government of Azerbaijan has obtained international support for the economic and environmental rehabilitation of the city from several United Nations organizations, including the United Nations Development Programme (UNDP) and the World Health Organization (WHO). The UNDP helped to create the Sumgayit Centre for Environmental Rehabilitation (SCER) to research and prioritize the environmental problems and propose programs to address them. A number of environmental epidemiology courses were held in Baku to strengthen the capacity of local experts.

In 2003, the World Bank launched a US $2.7 million project for the cleanup of a chlorine producing plant where 1,566 tons of mercury were spilled, including the construction of a secure landfill. Other international projects funded by UK and Japan have also been implemented.

Reports indicate that only 20% of Soviet Era polluting factories are still operating and there are ongoing debates about closure of the remaining number. However, even if all the polluting industries are dealt with, there remains a significant legacy clean-up challenge.

Resources:

J.E. Andruchow, C.L. Soskolne, F. Racioppi, et al. "Cancer Incidence and Mortality in the Industrial City of Sumgayit, Azerbaijan". Int J. Occupational Environmental Health. (2006). 12 (3). 234-241. http://www.ijoeh.com/pfds/IJOEH_1203_Andruchow.pdf.

J. W. Bickham, C. W. Matson, A. Islamzadeh, et al. "Editorial: The unknown environmental tragedy in Sumgayit, Azerbaijan" Ecotoxicology, (2003).
12, 505-508.

"The State of Environment. Azerbaijan." Ministry of Ecology and Natural Resources of the Republic of Azerbaijan. http://www.eco.gov.az/v2.1/az/Azerbaijan/Eco_En.htm

Azerbaijan Country Environmental Analysis. ADB. (2006) Jan.

http://www.asiandevbank.org/Documents/Studies/Ctry-Environmental-Analysis/2005/AZE/chap3.pdf#search=%22SUMGAYIT%20AZERBAIJAN%20remediation%202006%22

Andruchow, James Edward. Epidemiology Program, Department of Public Health Sciences, University of Alberta, January, 2003.
http://www.phs.ualberta.ca/staff/soskolne/PDF%20Files/Thesis-FINAL-UofA-Lodged-Jan6- 2003.pdf

Islamzade, Arif. Sumgayit: Soviet's Pride, Azerbaijan's Hell. Autumn 1994.

Linfen, China

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
3,000,000	Fly-ash, carbon monoxide, nitrogen oxides, PM-2.5, PM-10, sulfur dioxide, volatile organic compounds, arsenic, lead.	Automobile and industrial emissions

The Problem:

Shanxi Province is at the heart of China's enormous and expanding coal industry, providing about two thirds of the nation's energy. Within this highly polluted region, Linfen has been identified as one of its most polluted cities with residents claiming that they literally choke on coal dust in the evenings. In terms of air quality, the World Bank has stated that 16 out of 20 of the world's worst polluted cities are in China while the State Environmental Protection Administration (SEPA) has branded Linfen as having the worst air quality in the country. Levels of SO_2 and other particulates are many times higher than limits set by the World Health Organization.

Rapid development and unequivocal faith in industry has led to the development of hundreds of unregulated coal mines, steel factories and refineries which have not only polluted indiscriminately but have also diverted agricultural water sources. Water is so tightly rationed that even the provincial capital receives water for only a few hours each day.

Health Impacts:

The high levels of pollution are taking a serious toll on the health of Linfen's inhabitants. Local clinics are seeing growing cases of bronchitis, pneumonia, and lung cancer. The children of Shanxi Province also have high rates of lead poisoning. A growing number of local deaths in recent years have been linked to these overwhelming pollution levels.

Arsenicosis, a disease caused by drinking elevated concentrations of arsenic found in water is at epidemic levels in the area. Chronic exposure to this toxic chemical results in skin lesions, peripheral vascular disease, hypertension, blackfoot disease, and high cancer incidence rates. A study of Shanxi's well water published in *Toxicology and Applied Pharmacology* found the rate of unsafe well water in the province to be at an alarming 52%.

Status of Clean-Up Activity:

By the end of this year, the city of Linfen plans to shut down 160 of 196 of its iron foundries and 57 of 153 of its coal producing plants. Small, highly polluting plants will be replaced with larger, cleaner, more regulated facilities. Emissions will be cut further by shifting from coal to gas for central heating. Last year, Linfen's residents gained 15 more days of clean, breathable air as a result of newly implemented initiatives. In addition to air quality improvement, the local government also hopes to prevent serious coal mine accidents, which at this point are the cause of more than 10 deaths annually.

Resources:

China Internet Information Center. "Rivers Run Black in Shanxi Province." China Daily *(2006) July 17, 2006. http://service.china.org.cn/link/wcm/Show_Text?info_id=174874&p_qry=Linfen*

Qin Jize. "Most polluted cities in China blacklisted." China Daily. (2004) July 15. http://www.chinadaily.com.cn/english/doc/2004-07/15/content_348397.htm

"The Most Polluted City in the World: Sixteen of the 20 most polluted cities in the world are in China." The Epoch times. (2006) June 10, 2006. (refers to air pollution and particulates) http://www.theepochtimes.com/news/6-6-10/42510.html

"Environmental quality stable in general: report." *People's Daily Online* (2004) July 14, 2004. http://english.people.com.cn/200407/14/eng20040714_149521.html

Y. F. Li, Y. J. Zhang, G. L. Cao. "Distribution of seasonal SO2 emissions from fuel combustion and industrial activities in the Shanxi province." *Atmospheric Environment (Oxford, England)* (Jan. '99) 33 no2 p. 257

G. Sun. "Arsenic contamination and arsenicosis in China." Toxicology and Applied Pharmacology. (2004) 198 268-271.

S-g Wang, J-l Zhang. "Blood lead levels of children in China". Environmental Sciences and Pollution Mgmt. (2004) 21(6) 355-360.

Mary Kay Magistad "Land of Pollution." The World. (2006) July 17, 2006. http://www.theworld.org/?q=node/4059

Kristin Aunan, Jinghua Fang, Haakon Vennemo, Kenneth Oye, Hans M. Seip. "Co-benefits of climate policy-lessons learned from a study in Shanxi, China." Energy Policy. (2004) 32(4) 567-581

http://environment.guardian.co.uk/waste/story/0,,2042999,00.html#article_continue

http://www.chinadaily.com.cn/china/2007-05/24/content_879724.htm

http://www.gadling.com/2007/04/01/lifen-china-boosts-tourism-with-mask-give-a-way/

Tianying, China

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
140,000	Lead and other heavy metals	Mining and processing

The Problem:

Tianying in Anhui province is one of the largest lead production bases in China, with an output accounting for half of the country's total production. Low-level technologies, illegal operation and the lack of any serious pollution control measures in the firms have caused several severe lead poisoning cases in the region. It is also believed that there are numerous small scale recycling plants in the area, which are notorious for polluting. As a result of these indiscriminate practices, lead processing firms in Tianying have been pressured by local residents and officials to shut down their operations.

The average lead concentrations in air and soils were (respectively) 8.5 times and 10 times national health standards. Eighty-five per cent of air samples collected had lead concentrations higher than the national standards. Local crops and wheat at farmers' homes were also contaminated by lead dust, with some levels 24 times higher than national standards.

Health Impacts:

Residents, particularly children, are reported to suffer from lead poisoning and its related effects: 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. Pregnant women have reported numerous cases of premature births and smaller/underdeveloped infants.

Status of Clean-Up Activity:

In June of 2000 SEPA (State Administration of Environmental Protection) designated this area as one of the eight worst polluted sites in China. The local administration ordered that all lead processing firms be shut down until they addressed their environmental impacts. The government has demanded that all lead processing firms move their operations to a specified industrial zone and improve their treatment facilities. New lead smelters in China will have to be large scale, modern and with adequate pollution controls. It is not known how effectively these orders are being implemented.

However, regardless of improvements made to ongoing plants, the legacy pollution from the tons of lead lost from badly run plants in the past will continue to negatively impact the local population for decades unless specific measures are implemented to remove or encapsulate the worst polluted dust and soils.

Resources:

http://bobwhitson.typepad.com/howlings/2004/10/river_without_f.html

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12411081&dopt=Abstract

http://news.xinhuanet.com/english/2003-09/10/content_1074451.htm_1-sep03

http://english.people.com.cn/200309/10/eng20030910_124085.shtml

Sukinda, India

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
2,600,000	Hexavalent chromium and other metals	Chromite mines and processing

The Problem:

Sukinda Valley, in the State of Orissa, contains 97% of India's chromite ore deposits and one of the largest open cast chromite ore mines in the world. Twelve mines continue to operate without any environmental management plans and over 30 million tons of waste rock are spread over the surrounding areas and the Brahmani riverbanks. Untreated water is discharged by the mines into the river. This area is also flood-prone, resulting in further contamination of the waterways. Approximately 70% of the surface water and 60% of the drinking water contains hexavalent chromium at more than double national and international standards and levels of over 20 times the standard have been recorded. The Brahmani River is the only water source for the residents and treatment facilities are extremely limited. The State Pollution Control Board has conceded that the water quality at various locations suffers from very high levels of contamination. The air and soils are also heavily impacted.

Health Impacts:

Chromite mine workers are constantly exposed to contaminated dust and water. Gastrointestinal bleeding, tuberculosis and asthma are common ailments. Infertility, birth defects, and stillbirths and have also resulted. The Orissa Voluntary Health Association (OVHA), funded by the Norwegian government, reports acute health problems in the area. OVHA reported that 84.75% of deaths in the mining areas and 86.42% of deaths in the nearby industrial villages occurred due to chromite-mine related diseases. The survey report determined that villages less than one kilometre from the sites were the worst affected, with 24.47% of the inhabitants found to be suffering from pollution-induced diseases.

Status of Clean-Up Activity:

Sukinda is a classic example of pollution where the wastes are spread over a large area and residents are affected by the chromium through multiple pathways. The pollution problem from the chromite mines is well known and the mining industry has taken some steps to reduce the levels of contamination by installing treatment plants. However, according to state audits from Orissa, these fail to meet agency regulations. The Orissa government has said, "It is unique, it is gigantic and it is beyond the means and purview of the [Orissa Pollution Control] Board to solve the problem."

Various organizations have carried out studies proving the debilitating health impacts of the toxic pollution. However, remediation actions remain piecemeal with no decisive plans to provide for effective health monitoring and abatement programs.

Resources:

http://www.geocities.com/envis_ism/news36_28.html http://mines.nic.in/anrep04-05/chapter7.pdf
http://cag.nic.in/reports/orissa/rep_2001/civil_overview.pdf

http://www.mmpindia.org/madhavan/pages/14.htm

http://www.atsdr.cdc.gov/tfacts7.html

http://www.rrlbhu.res.in/envis/Marine_pollution.html

http://www.mmpindia.org/madhavan/pages/14.htm

http://www.downtoearth.org.in/fullprint.asp

http://www.cesorissa.org/PDF/newsletter_vol_5.pd

http://rajyasabha.nic.in/book2/reports/petition/127threport.htm

Vapi, India

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
71,000	Chemicals and heavy metals	Industrial estates

The Problem:

The town of Vapi marks the southern end of India's "Golden Corridor", a 400 km belt of industrial estates in the state of Gujarat which includes Nandesari, Ankleshwar, and Vapi. There are over 50 industrial estates in the region including more than 1,000 individual industries that extend over more than a thousand acres. Many of these are chemical manufacturing estates producing petrochemicals, pesticides, pharmaceuticals, textiles, dyes, fertilizers, leather products, paint, and chlor-alkali.

The waste products discharged contain heavy metals, cyanides, pesticides, complex aromatic compounds (such as polychlorinated biphenyls or PCBs), and other toxics. Vapi and the Ankleshwar area were declared ‘‘critically polluted’’ by the Central Pollution Control Board of India (CPCB) in 1994. This followed a survey that revealed that there was no system in place to dispose of industrial waste at these estates. Effluents drain directly into the Damanganga and Kolak Rivers; water downstream of the Kolak is now unable to support much biological life. Active dumping is also reported in at least one industrial site. Air pollution results from emissions due to the improper handling of chemicals by industries.

Local produce has been found to contain up to 60 times more heavy metals (copper, chromium, cadmium, zinc, nickel, lead, iron) than non-contaminated produce in control groups. Heavy metal analyses have revealed that both the effluents and sediments collected were contaminated with cadmium, chromium, copper, lead, mercury, nickel and zinc.

Health Impacts:

Many residents have no choice but to drink contaminated well water as other clean water sources are more than a mile away. The Indian Medical Association reported that most of the drinking water supplies are contaminated, because of the absence of a proper system for disposing industrial effluents.

Status of Clean-Up Activity:

In the late 1990s, Vapi Industries Association incorporated the Vapi Waste and Management Company to set up and operate a common effluent treatment plant to collect and purify effluents from the major plants. However, the operation of the plant has been determined to be unsatisfactory by the Supreme Court Monitoring Committee. Recent efforts by the Vapi Waste and Management Company in the late 1990s may have improved performance. The efforts to improve the local river and water quality are hampered by the haphazard dumping of sludge from the treatment plant and the widespread dumping of various industrial and hazardous wastes in the general area. There has been considerable NGO activity and efforts by environmental authorities effective cleanup at the various sites remains limited.

Several treatment, storage and disposal facilities (TSDFs) are now coming into operation in the area and can deal with some of the ongoing wastes but in the absence of a comprehensive and commited clean-up effort, the problems in Vapi will remain.

Resources:

D. C. Sharma. "By order of the court: Environmental Cleanup in India". Environmental Health Perspect. (2005) June; 113(6): A394-A397.
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1257623

A. Agarwal. "When will India be able to control pollution?" CSE Washington. (2000) Jan.
http://www.cseindia.org/hindu.htm

http://www.gujaratplus.com/environment/vapi.html

http://www.toxicslink.org/docs/06038_CETP_Report.pdf

La Oroya, Peru

Potentially Affected People:	Type of Pollutant:	Source of Pollution:
35,000	Lead, copper, zinc, and sulfur dioxide.	Heavy metal mining and processing

The Problem:

Since 1922, adults and children in La Oroya, Peru - a mining town in the Peruvian Andes and the site of a poly-metallic smelter - have been exposed to the toxic emissions and wastes from the plant. Peru's Clean Air Act cites La Oroya in a list of Peruvian towns suffering from critical levels of air pollution, but action to clean up and curtail this pollution has been delayed for area's 35,000 inhabitants. Currently owned by the Missouri-based Doe Run Corporation, the plant has been largely responsible for the dangerously high lead levels found in children's blood.

Health Impacts:

Ninety-nine percent of children living in and around La Oroya have blood lead levels that exceed acceptable limits, according to studies carried out by the Director General of Environmental Health in Peru in 1999. Lead poisoning is known to be particularly harmful to the mental development of children. A survey conducted by the Peruvian Ministry of Health in 1999 revealed blood lead levels among local children to be dangerously high, averaging 33.6 µg/dL for children between the ages of 6 months to ten years, triple the WHO limit of 10 µg/dL. Neurologists at local hospitals state that even newborn children have high blood lead levels, inherited while still in the womb. Absurdly large rates of premature deaths are linked to noxious gasses from the smelter. Lung-related ailments are commonplace.

Sulfur dioxide concentrations also exceed the World Health Organization guidelines by a factor of ten. The vegetation in the surrounding area has been destroyed by acid rain due to high sulfur dioxide emissions. To date, the extent of soil contamination has not been studied and no plan for clean up has been prepared.

Numerous studies have been carried out to assess the levels and sources of lead and other metals still being deposited in La Oroya. Limited testing has revealed lead, arsenic and cadmium soil contamination throughout the town.