

# POLLUTION: “Made in China”

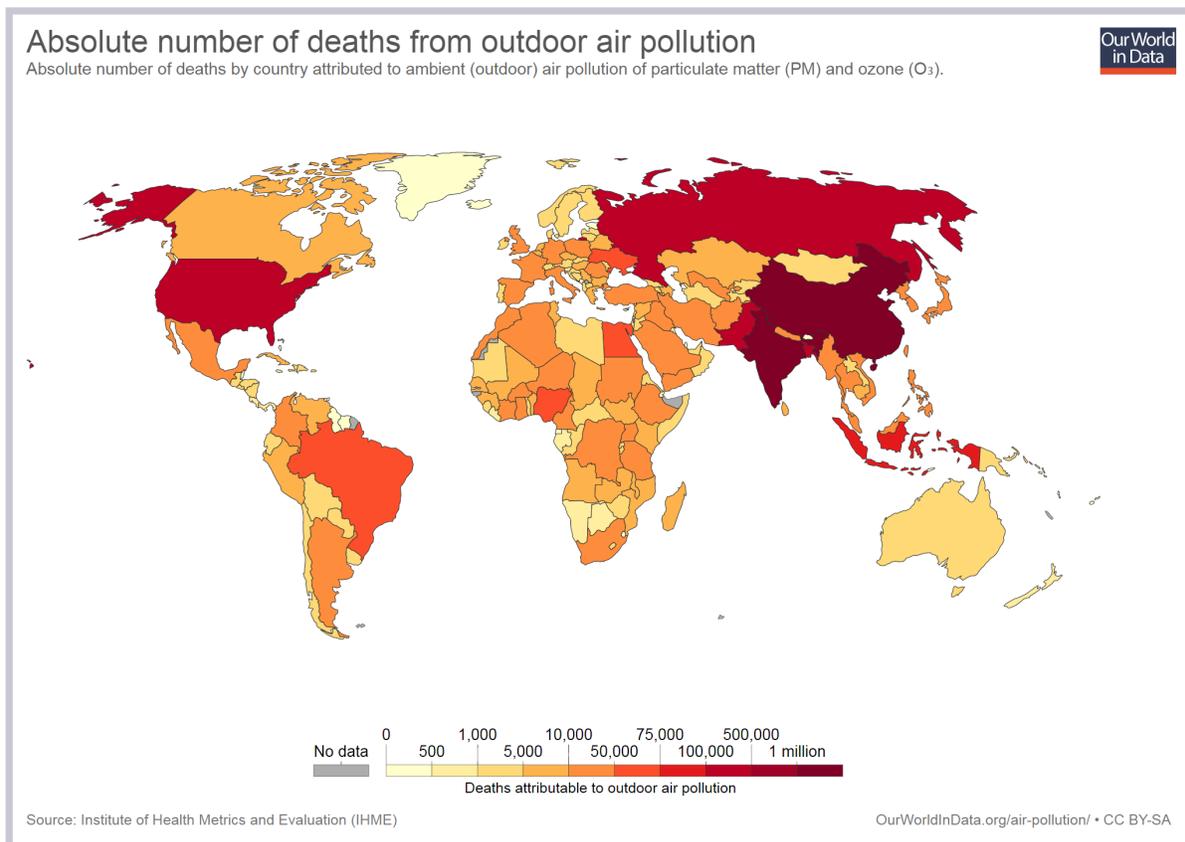
case study | air pollution unit

Look on the tags of many of the products you purchase – clothes, toys, housewares, electronics. Chances are you’ll find a familiar phrase: “Made in China.” China has indeed become the world’s manufacturing giant, but not without consequence. Such large scale industry requires massive amounts of power and has caused China to become a major producer of industry’s unwelcome byproduct: pollution.

## A giant production

China is one of the world’s fastest growing economies. Over the past 40 years, the country’s GDP has grown ten-fold. In 2010, China became the world’s largest exporter.<sup>1</sup> While rapid economic growth has brought increased incomes, reduced poverty levels, and improved healthcare to this country of 1.4 billion people, growth has not been benign.

With a fast-growing economy has come rising air and water pollution levels that are impacting public health, especially in the most industrialized regions of China. It is estimated that around 500,000 people in China die prematurely from pollution-related illnesses every year.<sup>2</sup> Environmental health costs, wasted resources, reduced work efficiency due to illnesses, and disaster cleanup have had a tremendous economic impact that China and the world are increasingly unable to ignore. China’s growth has put immense pressure on the environment, which is now cracking under the strain of rapid industrialization.



At the heart of China's pollution problems is energy consumption. Population growth, economic development, changes in the industrial structure, outdated technology, and a lack of diversified energy sources play key roles in environmental pollution. With progressive economic development, continued population growth, and higher living standards come higher demands for energy and increased **carbon emissions** as more people gain access to motorized vehicles.

China's physical size, its burgeoning industries, and its enormous population require massive amounts of energy use. For its energy supply, China depends on **coal combustion**, which has a harmful effect on human health and the environment. China uses coal as its primary source of energy (66 percent in 2012) because it is abundant and cheap, whereas oil and gas are not.<sup>3</sup>

## Noxious environment

Of the ten most polluted cities in China, six of them are located in Hebei province near the “**coal belt**” region.<sup>4</sup> China's coal burning power plants and the sulfur dioxide that they produce are the biggest source of air pollution. Hebei is also home to China's steel industry, another sizable source of pollutants. Making matters worse, Hebei is surrounded by mountains, causing **heat inversions** which trap the smog, mostly in Beijing. Some areas of China record pollution levels at 1000 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) –the **World Health Organization (WHO)** recommends exposure to be limited to 25 ( $\mu\text{g}/\text{m}^3$ ) for PM2.5 (fine **particulate matter**) and 50 for PM10 (course particulate matter) over a 24-hour period.<sup>5</sup> The impact of China's pollution on public health is already at intolerable levels. Air pollution levels have been linked to worsening cases of infectious diseases such as **severe acute respiratory syndrome (SARS)** and causing others like cancer and **chronic obstructive pulmonary disease (COPD)**.



Smog hangs over the city of Beijing.

Large areas of North-Central China have been devastated by the stunning growth of the local coal and steel industries. Intense underground mining makes thousands of acres in the region prone to sinking, and hundreds of villages are routinely blackened with coal waste. Roads are covered in coal tar, houses are covered with soot, and the smell of burning coal lingers in the air. Despite the already high level of environmental pollution, coal-fired plants are upping production. Chinese corporations are building or planning to build more than 700 new coal plants at home and around the world over the next decade.<sup>6</sup>

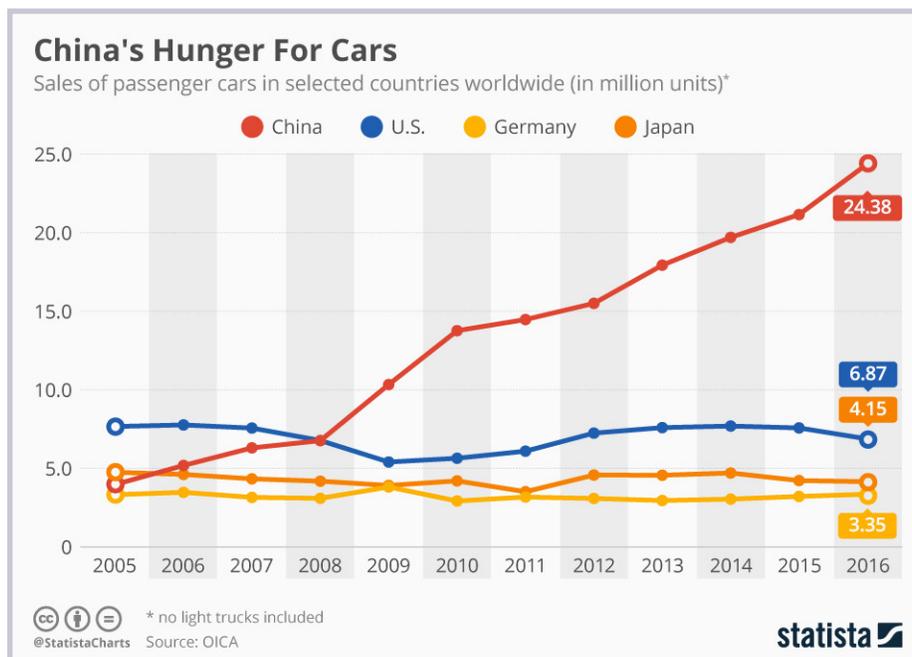
The coal boom has led to a rapid rise in the number of people suffering from lung cancer and respiratory diseases. The increase has dramatically risen over the past 25 years, causing growing concern about the impact of the coal industry on public health. Although the Asian Development Bank is said to be financing pollution control programs in the province and other government-related clean-up efforts were recently launched, the region's coal factories still spew poisonous black smoke into the air, just at a lesser rate.

**Sulfur dioxide**, released into the atmosphere from coal burning, is China's primary pollution problem. The toxic gas causes the most serious **acid rain** problem in the world; acid rain and pollutants have made nearly 60 percent of the country's groundwater unusable.<sup>7</sup> Studies have found that the worst effects of acid rain and pollution occur within several hundred miles of a power plant, where the extra acidity in rainfall can poison crops, trees, and lakes alike. In 2015, China released about 21 million tons of sulfur into the air, over three times the amount released that year in the United States.<sup>8</sup>

Another byproduct of coal combustion is **mercury**, a dangerous pollutant linked to fetal and child development problems. China is the largest emitter of mercury in the world. Mercury can contaminate local soil near power plants and can travel long distances in the atmosphere. It can find its way into lake, rivers and oceans where it is ingested by fish, and eventually contaminating human diets.

## Driving pollution

As the Chinese economy continues to grow and incomes rise, automobile ownership also increases, making it the largest car market in the world. In 2016, total vehicle sales in China reached 28 million, up 13.7 percent from the previous year.<sup>9</sup> With nearly 300 million motor vehicles on Chinese roads by the end of 2016, there is now one car for every five people.<sup>10</sup> Should Chinese consumption patterns begin to mimic those of Americans as Chinese income levels rise, China would have four cars for every five people, or 1.1 billion vehicles. (The total world fleet in 2015 was 1.3 billion vehicles!)<sup>11</sup>



Considering China's already large population and its responsibility for an ever-increasing amount of global carbon dioxide emissions, a rise in the number of China's drivers means a substantially lower global air quality. China overtook the United States as the biggest emitter of **carbon dioxide** (CO<sub>2</sub>) in 2007, years ahead of predictions.

## An export product

China is producing such mammoth quantities of pollution that the effects are being felt far and wide. Breath-constricting agents like sulfur and ash are carried by wind far beyond China's borders. Not only have world trade and services gone global, so too has air pollution.

Polluted air can travel great distances and cause harmful effects in far-off places. China's pollution regularly dirties the air of its neighbors, South Korea and Japan, and has even effected the air in the western United States. Scientists from the National Oceanic and Atmospheric Administration (NOAA) measured **ground-level ozone (smog)** in western national parks (including Yellowstone, Yosemite and the Grand Canyon) over a 25-year period and found increasing levels of smog, despite a 50 percent reduction in U.S. emissions of smog-forming pollutants during that time period. Asian air pollution was, by far, the biggest contributor to smog in the West, the researchers found (about 65 percent), considerably more than from home-grown sources like wildfires.<sup>12</sup>



A biker wears a mask during a heavy hazy weather morning in Shenyang City, China.

## Finding pollution solutions

To limit pollution internally and externally, the Chinese government must take some large steps to solve the problem. Indeed, the Chinese have already set some of the world's most ambitious targets for energy conservation; within the last decade, the national government has undertaken several environmental initiatives, including the 1998 establishment of the State Environmental Protection Agency (SEPA) to curb pollution and environmental damage. The government now requires many power plants approved after 1995 to install equipment that reduces sulfur and carbon dioxide and filters mercury emissions.

In preparation for the 2008 Olympics, China initiated projects to reduce sulfur dioxide emissions. Several strategies were used, including the widespread installation of **flue gas desulfurization devices** on power plants; switching to coal with a lower sulfur content; and closing coal-fired power plants in favor of less-polluting energy sources (natural gas, wind, and solar). While sulfur dioxide levels over China remain the highest in the world, the new strategies and a slowing of the Chinese economy led to a 50 percent reduction in emissions of the gas between 2012 and 2014.<sup>13</sup>

China's legislature has also introduced tougher penalties for polluters in recent years, in an effort to combat smog in the cities and the contamination of groundwater and soil.<sup>14</sup> The Chinese government is also experimenting with a system of **emissions trading** for sulfur dioxide similar to that used in the U.S.<sup>15</sup>

Along with penalizing the coal and steel industries, China is turning to renewable energy to fuel its growth. In fact, China is the world's largest investor in clean energy — it has the largest wind and solar capacities of any country. The Chinese government is investing heavily in renewable energy development in an effort to achieve their goal of being on 20 percent renewable energy by 2030.<sup>16</sup> The state government also offers subsidies of over \$13,000 to citizens for the purchase of electric vehicles, to steer the country away from fossil fuels.<sup>17</sup>

In 2014, President Xi Jinping announced that China's emission of carbon dioxide would peak around 2030, a pledge that became the centerpiece of its commitments under the Paris climate agreement. While pollution reduction may be the main driver of a switch to renewable energy, Chinese leaders also see the potential for job creation and becoming the dominant economy for global energy's future.

- 
- <sup>1</sup> Central Intelligence Agency. The World Factbook: China. Retrieved 31 October 2017 from <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html>.
- <sup>2</sup> Wainwright, O. (2014). Inside Beijing's airpocalypse- a city made 'almost uninhabitable' by pollution. The Guardian, Retrieved from <https://www.theguardian.com/cities/2014/dec/16/beijing-airpocalypse-city-almost-uninhabitable-pollution-china>.
- <sup>3</sup> U.S. Energy Information Administration. <http://www.eia.gov>.
- <sup>4</sup> China Daily. (2017). Hebei has 6 of 10 most polluted Chinese cities in 2016. China Daily, Retrieved from [http://www.chinadaily.com.cn/china/2017-01/22/content\\_28023186.htm](http://www.chinadaily.com.cn/china/2017-01/22/content_28023186.htm).
- <sup>5</sup> Leng, S. and Li, J. (2016). Air pollution in Hebei climbs past lung-busting mark. South China Morning Post. Retrieved from <http://www.scmp.com/news/china/society/article/2055810/air-pollution-hebei-climbs-past-1000-mark>.
- <sup>6</sup> Tabuchi, H. (2017). As Beijing joins Climate Fight, Chinese Companies Build Coal Plants. The New York Times. Retrieved from <https://www.nytimes.com/2017/07/01/climate/china-energy-companies-coal-plants-climate-change.html>.
- <sup>7,14</sup> Duggan, J. (2014). China's polluters to face large fines under law change. The Guardian. Retrieved from <https://www.theguardian.com/environment/chinas-choice/2014/apr/25/china-environment-law-fines-for-pollution>.
- <sup>8</sup> National Bureau of Statistics of China and the Ministry of Environmental Protection. (2016). Emission target of Sulphur dioxide according to the 12<sup>th</sup> five-year plan in China in 2010 and 2015.
- <sup>9</sup> Mitchell, R. and Meyers, J. (2017). China is banning traditional auto engines. Its aim: electric car domination. Los Angeles Times. Retrieved from <http://www.latimes.com/business/autos/la-fi-hy-china-vehicles-20170911-story.html>.
- <sup>10</sup> China Ministry of Environmental Protection. (2017). China Motor Vehicle Environmental Management Report (2017).
- <sup>11</sup> International Organization of Motor Vehicle Manufacturers. Retrieved 1 November 2017 from <http://www.oica.net/category/vehicles-in-use/>.
- <sup>12</sup> Rice, D. (2017). Air pollution in Asia is wafting into the USA, increasing smog in West. USA Today. Retrieved from <https://www.usatoday.com/story/weather/2017/03/02/air-pollution-asia-wafting-into-usa-increasing-smog-west/98647354/>.
- <sup>13</sup> NASA Earth Observatory. (2015). Sulfur Dioxide Down over China; Up over India. NASA. Retrieved from <https://www.earthobservatory.nasa.gov/IOTD/view.php?id=87154>.
- <sup>15</sup> The Climate Group. (2017) Spotlight on China as New Emissions Trading System Is Set to Revamp the Global Market. The Climate Group. Retrieved from <http://www.theclimategroup.org.cn/>.
- <sup>16</sup> Gardiner, B. (2017). Three Reasons to Believe in China's Renewable Energy Boom. National Geographic. Retrieved from <https://news.nationalgeographic.com/2017/05/china-renewables-energy-climate-change-pollution-environment/>.
- <sup>17</sup> De Feijter, T. (2016). 5 Stunning Facts about the Chinese Car Market You Need to Know. Forbes. Retrieved from <https://www.forbes.com/sites/tychodefeijter/2016/05/16/five-things-you-need-to-know-about-the-chinese-car-market/#39fee75e3025>.