

# Sand mining: the global environmental crisis you've probably never heard of

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Vince Beiser

February 27, 2017



A boat is stranded on the Poyang Lake in east China, site of one of the world's biggest sand mines. Photograph: Xinhua/Barcroft Images

From Cambodia to California, industrial-scale sand mining is causing wildlife to die, local trade to wither and bridges to collapse. And booming urbanisation means the demand for this increasingly valuable resource is unlikely to let up

Times are good for Fey Wei Dong. A genial, middle-aged businessman based near Shanghai, [China](#), Fey says he is raking in the equivalent of £180,000 a year from trading in the humblest of commodities: sand.

Fey often works in a fishing village on Poyang Lake, China's biggest freshwater lake and a haven for millions of migratory birds and several endangered species. The village is little more than a tiny collection of ramshackle houses and battered wooden docks. It is dwarfed by a flotilla anchored just offshore, of colossal dredges and barges, hulking metal flatboats with cranes jutting from their

decks. Fey comes here regularly to buy boatloads of raw sand dredged from Poyang's bottom. He ships it 300 miles down the Yangtze River and resells it to builders in booming Shanghai who need it to make concrete.

The demand is voracious. The [global urbanisation boom](#) is devouring colossal amounts of sand – the key ingredient of concrete and asphalt. Shanghai, China's financial centre, has exploded in the last 20 years. The city has added 7 million new residents since 2000, raising its population to more than 23 million. In the last decade, Shanghai has built more high-rises than there are in all of New York City, as well as countless miles of roads and other infrastructure. "My sand helped build Shanghai Pudong airport," Fey brags.

In the past few years, China has used more cement than the US used in the entire 20th century

Hundreds of dredgers may be on the lake on any given day, some the size of tipped-over apartment buildings. The biggest can haul in as much as 10,000 tonnes of sand an hour. A [recent study](#) estimates that 236m cubic metres of sand are taken out of the lake annually. That makes Poyang the biggest sand mine on the planet, far bigger than the three largest sand mines in the US combined. "I couldn't believe it when we did the calculations," says David Shankman, a University of Alabama geographer and one of the study's authors.

All that dredging, researchers believe, is a key reason why the lake's water level has dropped dramatically in recent years. So much sand has been scooped out, says Shankman – 30 times more than the amount that flows in from tributary rivers – that the lake's outflow channel has been drastically deepened and widened, nearly doubling the amount of water that flows into the Yangtze. The lower water levels are translating into declines in water quality and supply to surrounding wetlands. It could be ruinous for the area's inhabitants, both animal and human.



The intersection of Poyang Lake and the Yangtze River. Photograph: Xinhua/Rex/Shutterstock

## A building problem

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Poyang Lake, which sits in a verdant rural area best known for a waterfall in the nearby hills, is Asia's largest winter destination for migratory birds. It hosts millions of cranes, geese and storks during the cold months – as well as several endangered and rare species. It is also one of the few remaining habitats for the endangered freshwater porpoise. Studies have found that the sediment stirred up and the noise generated by sand boats interfere with the porpoise's vision and sonar so drastically they cannot find fish and shrimp to feed on. And there are fewer fish to be found in the first place, say locals.

"The boats are destroying our fishing areas," says one wrinkled fisherwoman selling plastic bags of crayfish. The dredging destroys fish breeding grounds, muddies the water and tears up her nets. These days, she says, she's lucky to make £1,200 a year.

"I've been fishing here for 30 years, and there are fewer and fewer fish," says Tan Jung Hwa, another local fisherman. He's taken to working part-time on the sand boats because he can't earn enough otherwise.

Lake Poyang may be a unique place, but the damage being done there is not. All around the world, riverbeds and beaches are being stripped bare, and farmlands and forests torn up to get at the precious sand grains. It's a worldwide crisis that nobody has heard about.

The main driver of this crisis is our era's unprecedented urban growth. [Cities are expanding](#) at a pace and on a scale far greater than at any time in human history. The number of people living in urban areas has more than quadrupled since 1950, to about 4 billion today. More than half of the world's people now live in cities – with another 2.5 billion to come in the next three decades, [according to the UN](#).



Sand dredgers in Poyang Lake by Hamashu village. Sand mined here is sold to builders in Shanghai.

All these new cities require mind-boggling amounts of sand. Just about every apartment block, skyscraper, office tower and shopping mall that gets built anywhere from Beijing to Lagos is made with concrete, which is essentially just sand and gravel glued together with cement. Every yard of asphalt road that connects those buildings is also made with sand. So is every window in every one of those buildings.

In India, the amount of construction sand used annually has more than tripled since 2000, and is still rising fast. There is so much demand for certain types of construction sand that Dubai, which sits on the edge of an enormous desert, imports sand from Australia.

China in particular is on a city-building spree that beggars anything the world has ever seen. Over half a billion Chinese now live in urban areas, triple the total of 60 years ago. That's roughly equal to the populations of the US, Canada and Mexico combined. China is also home to [the world's biggest urban agglomeration: the Pearl River Delta](#), across from Hong Kong, bursting with somewhere between 42 and 60 million [inhabitants](#). Even Nanchang, the unglamorous provincial city that is the nearest major urban area to Lake Poyang, is fringed with fast-growing forests of high-rise apartment blocks.

In the past few years, China has used more cement than the US used in the entire 20th century. Last year alone, the nation used enough construction sand to cover the entire state of New York an inch deep.

All that sand has to come from somewhere. In the region around Shanghai, it came until recently from the bed of the Yangtze River. That turned out to be a bad idea. By the late 1990s miners had pulled out so much that bridges were undermined, shipping was snarled, and 1,000ft swaths of riverbank collapsed.

Unnerved by the damage to a waterway that provides water to 400 million people, Chinese authorities banned sand mining on the Yangtze in 2000. That sent the miners swarming to Poyang Lake.



Fishers on Lake Poyang look out at industrial sand dredging boats.

The boats used to dig up the sand are essentially gigantic floating platforms, fitted with two huge conveyor belts studded with buckets that haul up sand from the bottom of the lake. The sand is then transferred to transport ships. In one narrow part of the lake, dozens of dredgers extend from the shore in a line, leaving only a narrow passageway for a tugboat hauling a barge piled up with yellow sand.

“We used to make more money, but now there is too much competition,” complains a crew member aboard one of the dredgers. “There are too many people doing this job.”

## Catastrophic damage

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Sand mining is causing environmental damage worldwide. In some places locals dig out riverbanks with shovels and haul it away with pickup trucks or donkeys; in others multinational companies dredge it up with machinery. Everywhere, the process impacts its surroundings in ways that range from cosmetic to catastrophic.

We're losing eight acres a year of pristine Californian shore, some of the most beautiful in the world

In mid-January, just north of Monterey, [California](#), several dozen cheering activists made an odd political statement: they dumped 200 pounds of bagged, store-bought sand onto a beach. They were returning the grains to where they had come from. The sand had originally been mined from that beach – a beach which, according to researchers, is gradually disappearing as a result.

"This is the fastest eroding shoreline in California," says professor Ed Thornton, a retired coastal engineer with the Naval Postgraduate School in Monterey who has been studying the impact of the mine for years and who spoke at the demonstration. "We're losing eight acres a year of pristine shore, some of the most beautiful in the world. It's because of sand mining." (A spokesperson for Cemex, the company that operates the mine, says via email that Thornton's conclusions "are based on what we believe to be erroneous, speculative data and unsound theory".)

The beach is the only one in the US that is still being mined for construction sand. Cemex, a global construction firm based in Mexico, operates a dredger that sucks up an estimated 270,000 cubic metres of sand every year. For most of the 20th century there were many such sand mines along the California coast, but in the late 1980s the federal government shut them down due to the erosion being suffered by the Golden State's famous beaches. The Cemex plant is still operating thanks to a legal loophole – it appears to sit above the mean high-tide line, putting it out of federal jurisdiction. But protesters want state authorities to step in.



Demonstrators protest against sand mining operations in Marina, California, in January 2017.

Photograph: Adara Shilling

Environmentalists in many places are similarly calling on their governments to rein in sand mining. In Northern Ireland, activists are trying to stop dredging in Lough Neagh, an important bird sanctuary. In southern England, developers want to dredge sand to expand the port of Dover from a stretch of offshore sandbars and shoals, prompting an [outcry](#) from conservationists who fear that would endanger the seals, birds and other marine life for whom the sandbars provide habitat and food.

Different types of sand mining inflict different types of damage. Dredging from river beds destroys the habitat of bottom-dwelling creatures and organisms. The churned-up sediment clouds the water, suffocating fish and blocking the sunlight that sustains underwater vegetation. Kenyan officials shut down all river sand mines in one part of the country a few years ago because of the environmental damage it was causing. India's supreme court recently warned that "the alarming rate of unrestricted sand mining" is disrupting riparian ecosystems all over the country, with fatal consequences for fish and other aquatic organisms and "disaster" for many bird species.

Sand extraction from rivers has also caused millions of dollars in damage to infrastructure. When stirred, sediment clogs up water supply equipment, and all the earth removed from river banks leaves the foundations of bridges exposed and unsupported. A 1998 study found that each tonne of aggregate mined from a California river caused \$3 in infrastructure damage – costs that are borne by taxpayers. In Ghana, sand miners have dug up so much ground that they have exposed the foundations of hillside buildings, putting them at risk of collapse.

It's not just a theoretical risk. Sand mining caused a [bridge to collapse in Taiwan in 2000](#), and another the following year [in Portugal](#), as a bus was passing over it; 70 people were killed. [Another bridge collapse](#) in India in 2016 that killed 26 may have been caused by sand mining, though the local government denies it.



Cattle graze on the dried up bed of Poyang Lake. Photograph: Xinhua/Barcroft Images

Mining sand from the floodplains near rivers is less damaging but it can alter the water's course, creating dead-end diversions and pits that have proven fatal to salmon in Washington state. In Australia, flood plains that are home to the world's biggest collection of rare carnivorous plants are being wiped out by sand mining. In Wisconsin and Minnesota, farmers fear that a recent boom in sand mining is polluting their water and air. In Vietnam, miners have torn up hundreds of acres of forest and farmers' fields to get at underground sand deposits.

As land quarries and riverbeds become exhausted, sand miners are turning to the seas. The UK, for instance, gets about one fifth of the nation's sand from the ocean floor. Worldwide, thousands of ships vacuum up millions of tonnes from the seabed each year, tearing up habitats and muddying waters with sand plumes that can affect aquatic life far from the original site.

Closer to shore, in places such as coastal Cambodia, dredging threatens important mangrove forests, seagrass beds and endangered species like Irrawaddy and spinner dolphins, and the royal turtle. On land, sand miners have devoured whole swaths of beach, from Jamaica to Russia.

The most dramatic impact of ocean sand mining is surely felt in Indonesia, where sand miners have completely erased at least two dozen islands since 2005. The stuff of those islands mostly ended up in Singapore, which needs titanic amounts to continue its programme of artificially adding territory by reclaiming land from the sea. The city-state has created an extra 20 square miles in the past 40 years and is still adding more, making it by far the world's largest sand importer. The demand has denuded beaches and river beds in neighbouring countries to such an extent that Indonesia, Malaysia and Vietnam have all restricted or banned the export of sand to Singapore.

"It's the same story as over-fishing and over-foresting," says Pascal Peduzzi, a researcher with the United Nations environment programme who authored a [study on sand mining](#). "It's another way to look at unsustainable development." The problem is that the supply of sand that can be mined sustainably is finite – but as the great urbanisation boom is proving, the demand for it is anything but.