Half-a-million labourers are employed in the natural stone industry of Rajasthan alone, so it's impossible to calculate exactly how many people toil all over India to supply the stone, cement and bricks of the boom-time construction industry. Yet, India still clings to elementary methods of extraction using bonded labourers, many of them female and under 14, with absolutely no safeguards.

The market for construction material is massive. China, the world's biggest producer and consumer of cement, churns out more than 30 billion tonnes of it a year. Sandstone production from the Indian state of Rajasthan doubled between 1995 and 2000 (from 4,106 to 8,369 million tonnes), meeting an estimated 10% of global demand (1). Such demand is accelerating, not just due to rising consumer expectations of "quality" housing and ever more roads; it's also the inevitable consequence of devastation caused by climate change and war. Just one project, the Iraqi government's 'Rebuild Iraq 2007', was worth at least a hundred billion dollars to building contractors, and such high returns are not exceptional. Hanson, one of the world's leading brick manufacturers, had assets of 8 billion pounds when taken over by Heidelberg Cement in mid-2007. French cement producer Lafarge made over 5 billion euros worth of sales in the third quarter of 2008 alone.

Due to their weight and size, big stones usually don't travel far. The main exceptions are certain grades of sandstone, granite, slate, limestone, quartzite and marble.

The extraction of all types of building stone carries implications for the health of workers and nearby communities. Marble is exported all over the globe, primarily from Italy, China and India where workers are lowered in 'cradles' into deep and precarious pits. High-quality cement also crosses borders with ease, as a new cohort of multinational cement suppliers has emerged over
the past 10 years, consolidating control through mergers and acquisitions. Cimenterie Nationale of France, for example, accesses markets in Syria and Iraq, north Africa, the US and Canada, while some Indian manufacturers have been selling to the United Arab Emirates (2).

If you buy Gujarat Ambuja cement in India, in reality you're helping line the pockets of the Schmidheiny family of Switzerland. Their Holcim conglomerate snapped up the company for US$800 million in 2005, marking the costliest foreign takeover of any Indian domestic company until that date (3).

Such world players naturally benefit from the lower cost of raw materials, fuel and labour available in the global South, especially in Asia. They have a clear and well-thought-out strategy of amalgamation with smaller, regionally-based companies.

Yet, on the ground, the two Asia-Pacific countries with the biggest potential for "growth" in construction -- China and India -- still cling to elementary methods of extraction, milling and processing, although mechanisation is gradually increasing. These operations centre on small pits and makeshift kilns in thousands of locations where labourers toil under derisory 'contracts' (often none at all), bound to often quasi-criminal middlemen. Commonly dubbed a 'mafia' in India, these entrepreneurs are not a peculiarly Asian breed. As two British researchers observed in 2004: "It is not Polish bricklayers who drag UK construction down -- rather, the sector's brutish nature makes it rely, for much of its existence, upon the almost feudal practice of day labouring. (4)"

'Broken -- just like the stone we break'

Though Turkey, Iran, Brazil and South Africa are among the rising exporters of natural stone (5), India and China are by far the dominant producers. The world's most populous country has more quarries than its neighbour, but also imports Indian stone before 'dressing' and re-exporting it, so trade statistics can be misleading. Regrettably, there is a dearth of detail on working conditions in Chinese mines in general, and quarries in particular. But, according to government statistics, 75% of all occupational diseases in the country is pneumoconiosis (6), of which the primary causes are dust in coal mines, silica inhalation (most acute during sand-blasting) and noxious emissions from cement kilns (7).

It's impossible to calculate exactly how many people toil by the sweat of their brow to supply the bedrock of our infrastructure and to beautify our shelters. One source puts the global figure of direct employees in the construction industry at 110 million (8). But this is inevitably a guesstimate, probably representing only half the true number. Consider that there are as many as 6,000 types of natural stone being worked on in any given day, and that 9 million tonnes were imported into the European Union alone in 2007 (9). It requires an awful lot of fingers -- many of them tiny -- to deliver such variety and tonnage.

A large proportion of the global workforce is peripatetic, seasonal, or recruited locally for a specific project -- a bypass, a bridge or a block of flats. Hundreds of thousands of labourers are female, and under 14 years of age; unregistered because they have been illegally recruited. Conditions for construction employees, wherever they work around the world, are always potentially hazardous, as recognised by key ILO conventions (10). In theory, these standards
are incorporated into national legislation by virtually all those countries where violations are most common. However, the rules are consistently breached -- and not just in South Asia. A 2005 survey of one site in Zambia found "a number of women with children strapped to their backs, crushing the stones without any protective clothing" (11).

Undoubtedly the most insidious impacts derive from mine owners' use of 'bonded labour', a system synonymous with slavery. It makes "owing one's soul to the company store" -- that immortal jingle coined by country and western singer Merle Travis, to reflect his family's experience in the Kentucky coal mines of the 1930s -- seem a mild irritant in comparison (12).

Bonded labour condemns millions of women and children to work off debts, and the interest accrued on them, by a male head of the family, sometimes for several generations. The system is most prevalent in India, and particularly damaging to women, despite the government's ratification, more than 50 years ago, of ILO Convention No 29 against forced labour, and its promulgating its own Bonded Labour System (Abolition) Act in 1976. The latter purportedly frees all bonded labourers and guarantees total liquidation of their debts. But examples of successful enforcement are few and far between. It would be a grave mistake to dismiss widespread contraventions of the rules as merely capricious, or to blame them solely on site foremen and local bosses. Burma's own forced labour, which is ubiquitous in quarries, gem mines and on road and rail construction projects, is press-ganged by the military regime itself.

In India and Pakistan, abuse of workers is often systemic, rooted in discrimination and casteism, endorsed by powerful political figures at the local and state level. The bigger the potential profits in delivery from mine to manufacture, the more lucrative will be the corrupt rake-offs. A 2005 study judged that half-a-million Indian workers are employed in the natural stone industry in
Rajasthan alone (13). Examining conditions in one village, Budhpura, the authors commented: "Quarry owners are generally not involved in retail selling, processing or exporting of sandstone... (The) buyers are generally traders with collection centres or warehouses in Kota, Jaipur, or in Delhi... sell(ing) crude or roughly trimmed sandstone to domestic and international customers. (14)"

The majority of stone cutters in the district belong to the so-called scheduled castes. However, decision-making lies entirely in the hands of the dominant upper castes who, in the Budhpura village elections of February 2005, won all the seats, with the vital posts going to quarry owners (15). Although discrimination against scheduled castes is expressly forbidden under Article 15 of the Indian Constitution, industrial encroachment has forced many of them to sell land to the government's revenue department. Their farms and plots are then leased out for quarrying and -- in an exiguous inversion of natural justice -- the farmers end up working as quarry labourers themselves, or as petty contractors.

The layers of quarry dust that settle on the leaves stall the growth and flowering of crops. Water levels in wells and ponds in the (Budhpura) area dropped drastically due to the frequent deepening of quarry pits around the village, rendering them ideal breeding grounds for malarial mosquitos (16). Wages have fallen too -- by up to 15% of late, despite the increase in sandstone exports. Hired out to sub-contractors, the labour squads never work directly under the quarry owner. "(They) cannot claim any medical expenses, insurance cover, earned holidays, or any other compensation in the event of accident or death. No records are maintained... making it difficult for them to avail or claim compensation or any other benefits accrued on the quarrying company or from the government. (17)" Basic sanitation and adequate fresh water are non-existent. Instead, most residents use quarry water to wash clothes and bathe, and women walk up to 2 km for drinking water.

As for environmental despoliation: "In the Budhpura quarries... the amount of usable stone has never been more than 25% of all the material upturned... The quarrying waste is dumped in forest areas as well as on land belonging to the revenue department, generally without permission, destroying the natural vegetation and ecology of the area." If a quarry proves no longer profitable, "the owner abandons it... to move on to new areas... There is no specific legislation in India which covers the requirements for environmental protection during the closure of a mine" (18).

Many observers (including this author) can testify that basic safeguards, mandatory for quarry workers in the global North, are almost invariably not applied to stone breakers in South Asia. Occasionally they wear helmets, sometimes boots, but only exceptionally are they provided with breathing masks, gloves and special clothing. Mine owners may claim to offer all these items, blaming their workers for not requesting them; in practice, the equipment rarely exists. In any case, day labourers will rarely ask for protective gear, either because it's cumbersome to wear in the heat, or they fear being sacked as potential troublemakers. Consequently, they always face the dangers of rock falls, blasting, and contracting serious occupational diseases, specifically silicosis, pneumoconiosis, bronchitis and tuberculosis. They take their meals in or around the pits, have to urinate and defecate behind trees (especially humiliating for women) and, if seriously injured, customarily have to travel miles before reaching hospital. Accident compensation, when there is any, is negligible, while pensions, healthcare or the right to
organise a union are consistently denied.

But this type of attrition doesn't stop (or even start) at the mining site. It is also grounded in a fundamental failure -- shared by regulatory regimes and the public perception -- to distinguish the digging up of rocks from other forms of mining such as open-pit coal, iron, bauxite or diamond extraction, where workers face similar risks. By operating a 'quarry', bosses in India can safely ignore the environmental and workplace standards legally imposed on other mining operations. The duty of inspecting stone mines resides with the state, not central, government; trained officers from the Indian Bureau of Mines and Directorate General of Mine Safety (DGMS) have no authority to control what goes on. Pits with a design output below a certain tonnage do not require environmental impact assessments, so most quarries will be exempt. Nonetheless, owners will regularly apply for several leases under different names, effectively ending up with plots that extend to five or more hectares.

Managers of metal mines also wash their hands of responsibility to workers by depending on the pernicious contract labour system. The author visited several such Indian operations between 2000 and 2006. One iron mine in Orissa was officially operated by the state mining company in a joint venture with UK's Rio Tinto. In practice, the companies bought ore from a haulage firm employing 20 or so local men and youths. Under the lea of a crumbling, almost vertical cliff, they smashed rocks by sledgehammer, sorting and pitching them into trucks with their bare hands. The reward was the national minimum wage of roughly one dollar for a 10-hour day, but only provided they collectively filled a 10-tonne truck. A high-ranking Indian team, which inspected iron ore and granite mines in the Bellary district of Karnataka in April 2005, was appalled to discover around 200,000 girls and boys, from the ages of five years up, "working in the most hazardous conditions and leading a 'pits' of an existence between survival and death". It concluded that "(t)he entire chain of mining operators, including central and state governments, all the private, public and illegal mine owners in the district, the traders, buyers, national and multinational companies connected to iron ore mining and processing, contractors and others involved in the mine extraction, processing and marketing, are equally responsible for the existence of child labour. (19)"

Gradually -- but far too sluggishly -- the health predicament of South Asian and Chinese stone breakers is being addressed. Some Indian state governments now have legislation on their books designed to tackle silicosis as an occupational disease; officially, the diagnosis of pneumoconiosis covers silicosis as well as asbestosis and any disease accompanied by pulmonary tuberculosis (TB). Unfortunately, enforcement of the law is weak at best, while patchy implementation has led to further insecurity. After agitation by residents of Delhi's Lal Kuan area in 1992, several silica stone quarries were closed by order of the Indian Supreme Court. This left the mainly tribal workers stranded and bereft of compensation, since they could not prove a link between their silicosis and their previous employment. It was not for another 15 years that the Lal Kuan workers achieved any success, when India's Supreme Court imposed restrictions on dust exposure in 10 of the country's states ('Azad delivers -- but Delhi govt?', Civil Society, New Delhi, March 1, 2007).

All too often, driven by expediency, a doctor will wrongly identify TB as the sole culprit even though it is a direct result of silicosis, displaying similar symptoms. According to Dr T K Joshi of the department of occupational and environmental medicine at the Maulana Azad Medical
College in Delhi, silica is "perhaps the most toxic particulate matter that can destroy human life... Crystalline silica dust causes a fibrogenic reaction in the lungs. The ability to breathe is compromised. Blood vessels get obstructed and you could have heart failure. It also has the unique ability to destroy macrophages in the lungs. Therefore, immunity is compromised... In crowded places like India, it is impossible not to be exposed to tubercule bacilli. Those who have silicosis will also get TB, but the difference is that TB can be cured whereas silicosis is irreversible" (20).

**Bricks in the wall**

The scouring out of clay, fashioning it with water, and subsequent baking into pots or bricks attracts little critical attention. However, clay mining is far from innocent of causing damage to water supplies and spreading silica dust. In early-2005, several thousand villagers near Trivandrum, capital of the Indian state of Kerala, indicted seven local clay mining outfits before the state's Human Rights Commission for ruthlessly depleting their water supplies, causing the drying up of many wells (21).

By far the biggest market for clay is the brick making industry, identified in 2001 by a Pakistan human rights commission as exploiting "the most deprived section of society" (22). The commission found that, of 300 brick kilns in Multan city alone, only 98 were registered with the labour department. Workers were legally entitled to two dollars daily for making 1,000 bricks, but claimed never to receive even this derisory amount. Rape of women, and the imprisonment of dissident male workers in chains by kiln owners, was common practice. Although labourers have a constitutional right to establish their own union, no one had ventured to do so. Bonded labour practices were common:

"The (workers) wake up early in the morning irrespective of the season, and prepare mud to produce bricks with cold water... They (take) loans from their kiln owner for marriages of their daughters or sons, which they are not able to pay back throughout their lives, because the interest rate on the loan is so high that the actual loan remains payable while the instalments paid only cover the interest. (23)"

A group of brick kiln workers in Lahore in 2006 did dare to organise. Shortly afterwards, one of its leaders was attacked by an armed group of men and beaten to death in his own courtyard. Shoukat Masih and his family had spent many years opposing the use of bonded labour ('haris' or 'debt slaves') in Punjab's brick kilns. Finally, he helped form a union to file complaints with the government, which were usually ignored. In late-2005, Masih was sold by one brick kiln owner to another for $3,300, without his knowledge or consent. Thereupon he told his story to a local reporter, triggering the attack that felled him. Masih's father is convinced his son was targeted by a secretive protection racket called 'the SP group', allegedly set up by local kiln owners (24).

**Cement: The burning question**

Cement is anything but a pure product, conjured up through some benevolent alchemy. Depending on the quality desired, its basic ingredient of mined limestone requires the addition
of gypsum, quarried shale, clay, marble, iron ore, calcium silicate, dolomite, and chlorine. For some brands, high alumina clays -- a by-product of bauxite mining -- are much sought after. Sulphate-rich rocks go into the manufacture of 'super sulphate' cement. Most worrying of all, in several countries, chrysotile asbestos -- of which Russia and Canada are the key miners and exporters -- is added to increase fire resistance. Despite being banned in 40 countries, including throughout the European Union and the US, India's demand for these carcinogenic fibres has been growing by around 9% a year, both for cement and housing (including schools) (25).

Cement mixes are fired together at very high temperatures in kilns fuelled by almost anything that will ignite. The output of this 'miraculous mortar' therefore carries a triple jeopardy. Mining of limestone (which itself is also burned in kilns) gives rise to vast clouds of silica-laden dust and spoil heaps. The raw material contains toxics (sulphates, sulphides, iron pyrites, nitrogen) which, if not captured in the burning process, will deliver sulphur dioxide to the atmosphere, thus triggering acid rain. Conventional fuels (coal, coke, gas, timber, oil) fed to the kilns are often high in sulphur, nitrogen and heavy metals; they are also a major factor in global climate change (26).

The world's big cement manufacturers have taken some steps to limit these egregious impacts. Modern plants install flue gas de-sulphurisation, reduce nitrous oxide output, limit input of high alkaline materials, and capture some of the particulates to avert the potential choking of entire local populations. However, these measures in themselves do not guarantee a significant lowering of greenhouse gas emissions, nor do they cope with other types of pollution; nor may they be applied in different countries even by the same company. Faith in 'tough' enforcement regimes can also be sorely misplaced. Up to now, no limits on mercury emissions have been applied to US cement plants because the federal Environmental Protection Agency (EPA) has "concluded no reasonably priced controls are available (sic)" (27). This malfeasance was dramatically exposed in August 2006, when Oregon's department of environmental quality revealed that state-based cement kilns were coughing out more airborne mercury than any other single industrial sector.

Fighting back: Some examples

April 2003-2005: Three Punjabi youths from India, tricked by human traffickers into believing they would get lucrative jobs in western countries, are instead sold by agents to Lebanese brick kilns in 2003. After further payment for a flight to Istanbul, they are arrested by the Turkish authorities and sent to Iran where they suffer three months in jail. Finally they are deported to Pakistan, allowed to spend a year as refugees in a Hindu temple, and returned to India in early-2005 (28).

2006: 'Courage Village' is established in Pakistan's Punjab province as a safe haven for freed brick kiln and agricultural labourers, thanks to the efforts of peace activist Aslam Khwaja and businessman Kaleem Sheikh (29).

January 2006: Forty-four bonded labourers, including 28 children, from a brick kiln
in Ranchi, capital of the Indian state of Jharkhand, are rescued by the police. They were receiving nothing but food for their toil. The police took action after one bonded labourer managed to escape and inform the police about the plight of the others (30).

Endnotes

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10 ILO conventions governing health and safety in the construction sector include the Safety and Health in Construction Convention of 1988, and the Safety and Health in Mines Convention of 1995, updated in 2006

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12 This iconic song has sold millions of copies, in various versions, worldwide. Its chorus runs:

   You load sixteen tonnes, and what do you get?

   Another day older and deeper in debt.

   Saint Peter, don't you call me, 'cause I can't go;

   I owe my soul to the company store.
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