

# OUR COMPUTERS ARE POISONING THE PLANET

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Have you ever wondered where our old computers, full of lead, cadmium and PCBs, end up? In Indian sweatshops! There they are dismantled and 'recycled' – a scandalous trade that poisons thousands of children, women and men.

## India – Planet IT's digital dump

Men, women and children are being poisoned, by dismantling old computers with their bare hands, burning them in the open air and plunging them into acid baths. A descent into the world's digital dump.

The air is unbreathable. An adolescent has just set fire to a pile of red, yellow and blue wires, right in the middle of the village cemetery.

Whilst his face disappears in the thick smoke, he stirs the sticky mass with a metal stick, as if he were tending a campfire, immune to the acrid smell of burning plastic. As for me, I am short of breath, my eyes are stinging and my head feels like it is about to explode. He is used to it: it's how people earn a living in Behta, a dusty village on the outskirts of Delhi, in India. Each day people burn multicoloured wires here in order to extract the fine copper filaments – resembling strands of angel hair pasta – before they are sold by the kilo to scrap metal dealers.

The suspicious looking smoke does not attract much attention from the authorities here. We are in an area known as 'Loni Border', halfway between Delhi and Uttar Pradesh, the neighbouring State. This is a desolate border zone, curiously free from cars and overpopulation problems. It's the end of the world. Nevertheless, Loni is the final link in a thriving underground industry, which originates on the other side of the world. This is where many obsolete computers from industrialised countries come to be 'recycled'.

The planet is groaning under the weight of electronic waste. Each year, we generate 20-50 million tonnes of the stuff worldwide, according to figures from the United Nations Environment Programme. In Canada alone, it is estimated that 1.8 million computers will end up in a landfill site or an incinerator this year, as will 552,000 laptop computers, 2.4 million screens, 2.4 million mobile phones, and 3 million printers, scanners and fax machines. And these mountains of rubbish are going to continue to get bigger as the lifespan of these devices shortens. The lifespan of a PC has dropped from six to two years in one decade!

Increasingly often banned from rubbish dumps in developed countries, a growing percentage of this waste is recycled. However, this seemingly 'ecological'

solution has a very dark side. According to Jim Puckett, director of Basel Action Network, a Seattle-based NGO that fights the toxic waste trade, in North America, 50 to 80% of all electronic waste collected for recycling is in fact exported to developing countries. Some 'recyclers' are in reality high-tech scrap metal dealers who quickly sell the goods on the international markets, in Asia mainly. Jim Puckett explains how they charge consumers for collecting their old machines, and then also receive money from the Asian importer they send them to. "They are paid at both ends. It is a very profitable business." A lot more lucrative than conventional recycling, which is a costly and complicated operation, since each computer is made up of a staggering cocktail of dangerous materials.

Alongside China and Pakistan, India is now one of the planet's main digital dumps. Here workers strip old machines in order to extract everything of any value, using methods that are as rudimentary as they are dangerous for human health and the environment. "A lot of people become ill because of this", says a stocky man with henna-dyed hair in Hindi coming up to speak to my interpreter and me as we approach the burning wires. "We are quite aware that it's toxic and that it causes tuberculosis. But we take whatever the market sends us." What he calls 'tuberculosis' is in fact a series of respiratory problems caused by the toxic fumes. In Behta this has become an epidemic. The man goes on to explain how there are no hospitals in the area, only private clinics that are too expensive for these poor people to go to.

India simply does not have the means to dispose of this rubbish properly: there are only three State-approved computer recycling plants in the entire country (see "The Bangalore Laboratory" on page 27). That is simply not enough to deal with the large amounts of junk shipped over by the more prosperous countries.

In Shastri Park, a small village on the outskirts of Delhi, there is e-waste everywhere. It sits piled high in squalid buildings that are used as both warehouses and workshops simultaneously, getting in the way of mopeds that speed through the narrow streets. Everywhere there are sweating workers, often young adolescents, stripping out the insides of computers with amazing dexterity. Rizwan and Vicky, two shy boys aged 13 or 14, squat amongst the precarious towers of screens, CD-ROM readers and printers that clutter up their concrete cubby hole. Using pliers and a screwdriver, they dismantle dozens of computer keyboards, one by one, throwing the plastic casings onto a pile that stretches as far as the pavement. There, three youths are sitting on the ground, barefoot, hammering the circular pieces found inside hard disk drives. They remove the copper coils, which pile up around them like locks of red hair. Farther away, an emaciated man with a white beard lets us enter his chaotically messy room. Amongst the jute sacks and cardboard boxes, all ripped open, we trample on a carpet of tiny multicoloured fragments, mixed up with screws and cigarette ends: these are the components he is in the middle of extracting from printed circuit

boards using pliers. It is a painstaking job, but each of these boards contains a small treasure trove: some of the reusable pieces such as the chips can be resold to repairers, and the copper coils in the transformers also can be extracted. Sometimes the board has to be heated on a stove in order to get rid of the lead soldering that holds the elements in place.

In Delhi alone, computer recycling provides work for 25,000 people, perhaps more as it is hard to get an accurate estimate. On the outskirts of the city, to the east of the putrid waters of the River Yamuna, entire villages live off these deliveries. These are wretched, fly-infested places, where the smell of overheated rubbish sticks to the skin. In the streets, drains designed to collect rainwater have been turned into open sewers filled with black sludge. On the wasteland surrounding these neighbourhoods, boys play cricket amongst the cows and the rubbish, despite the suffocating heat.

“When e-waste came onto the market, around ten years ago, poor people who already lived off sifting through garbage turned to this new means of eking out a living. Recyclers are the new faces of urban poverty”, explains Satish Sinha, associate director of Toxics Link, a Delhi-based environmental NGO. Many of the workers come from neighbouring States. Like shadows among the multicoloured saris, women in black burkas betray the presence in this sector of a large concentration of Muslims – one of the country’s most marginalised communities.

For these workers, earning a living is equivalent to poisoning yourself slowly. They do not wear gloves or masks to protect themselves from the dust that accumulates on the ground and on their hands. Each computer contains a terrifying amount of toxic substances. There are metals such as beryllium, which can cause skin lesions, as well as berylliosis, a serious lung disease; cadmium, which, if breathed in, can damage the kidneys and the bones; mercury, which attacks the brain and the kidneys; and antimony, similar to arsenic in its composition and toxicity. There are also chromium derivatives, which, like beryllium and cadmium, are associated with lung cancer. And then there is lead, lots of lead, whose effects on the nervous system, particularly serious in children, are irreversible.

When a chemist from Greenpeace’s laboratories in the UK collected samples of dust from the dismantling workshops in Delhi in 2005, the levels of several heavy metals he analysed were up to 20 times higher than normal! He also found a large number of dangerous chemical compounds, such as brominated flame retardants, which are added to all sorts of parts to stop fire spreading. He even detected PCBs (polychlorinated biphenyls), which are now forbidden in industrialised countries but were once commonly used in electronic goods.

As for cathode-ray tube screens, they are veritable time bombs, to such an extent that they are banned from several landfill sites worldwide. The glass

contains up to 25% lead, and the luminescent coating on the inside of the screen can contain cadmium. Here they can be seen all over the place, freed from their plastic framework, dumped haphazardly in the narrow streets or piled up in small warehouses. Some are recycled and used as television screens, others are smashed into tiny pieces and the broken glass is often used to make the bangles that married women wear on their arms. Nothing is wasted: not even the remains of ink from old printer cartridges, which are emptied using a paintbrush. The main ingredient of the toner, carbon black, is carcinogenic.

“Very few of these workers are aware that these products are dangerous”, says Arup Mullick, a specialist in environmental science at Development Alternatives, a Delhi-based NGO. And the village doctors are not much help. “I treat people for fever or coughs”, one of them told me in his shabby clinic, scarcely bigger than a broom cupboard. These symptoms may be caused by prolonged exposure to toxic substances. “But doctors are not qualified to distinguish the symptoms from those of a simple cold”, adds Arup Mullick.

A computer passes through many hands before releasing all its precious materials, leaving a trail of poison that spreads from village to village. As the Delhi authorities attempt to crack down on pollution, components that cannot be extracted manually at Shastri Park, for example, are recovered using fire or acid, in locations increasingly far away from inhabited areas.

In places such as Mandoli, an industrial area that looks like a concentration camp, to the northeast of the town, the most clandestine operations are carried out. There are no houses, and no children playing on the dirt roads; just high red brick walls. Access to these yards strewn with waste is restricted; heavy metal gates close behind us. Nevertheless, we dare to steal a glance: the scene that meets our eyes is from another century. Men and women with soot-blackened faces work silently in the unspeakable filth. Columns of black smoke rise from fires – I become unsteady on my legs due to the heat. “Everyone incinerates in Mandoli”, says Billu Singh, a small thin man, who has been working in this sector for eight years. “There are around 500 workshops. Wires are burnt in around 50 of them”. I walk slowly through the narrow, deep enclosure: the earth is sticky from being covered with viscous wires. Five rusty metal drums, heated by gas, are lined up along the wall. A metal grating covered in a smoking whitish mass acts as a lid. These are the wires being heated. The plastic drips down through the bars of the grating and lands, forming a brownish mud, in the containers at the bottom of the drums. The remains of the wires are then rinsed with water.

“300 Rupees a kilo”, says the man in his best English, pointing to the results of the operation: a bunch of blackened copper wires. Printed circuit boards also end up in Mandoli, once stripped of their numerous components. They are burned to extract the fine copper sheets that cover the boards. Or else they are submerged in nitric, hydrochloric or sulphuric acid baths that are then boiled, stirred, decanted and filtered, giving off toxic fumes. The same happens with faulty

computer chips and connectors, which are reduced to small amounts of gold thanks to processes that alchemists from days gone by would have been proud of. The liquid residue and the ashes are simply thrown onto neighbouring land, thus filtering into the soil and the water table. "The groundwater is not suitable for drinking in Mandoli", explains Subhankar Basu, who has analysed samples for the TERI research institute in New Delhi.

The open-air burning of wires and printed circuit boards in particular releases enormous amounts of heavy metals into the atmosphere. The concentration of lead in the ash is 250 times higher than the permitted limit for waste incinerators in the USA! This is what the American Environmental Protection Agency measured when they simulated the process in a laboratory. According to researchers in the *Journal of Material Cycles and Waste Management*, high emissions of dioxins and furans are also produced. Even in very small quantities, these types of carcinogenic compounds can be very harmful to the human nervous, immune and reproductive systems.

Proof of this can be seen in the bronchial problems, irritated eyes and skin and even the miscarriages that are common among the inhabitants of Mandoli. In the long term, the consequences are even more tragic. "It's an entire community whose life expectancy is being shortened", exclaims Satish Sinha of Toxics Link angrily. "Yes, people earn a living here. No, they won't starve to death. However, they don't live longer than 45 or 46 years. Afterwards, their children take over and, later, they too send their children to work in the e-waste business as soon as they are 10 or 12 years' old."

This trade, although informal, is in fact a well-oiled machine. Each material has its own price, each person his or her place in the organised chain of recyclers and dealers. The workers at the lower end of the scale earn no more than 70 Rupees a day – less than two dollars. But for the bosses – those who negotiate the sale of batches and the resale of parts – the trade is attractive. Enough, in any case, to attract newcomers such as Arif Manwsri, who moved to the e-waste business after nearly two years with his sister and brother-in-law. "I was a tailor before, but the business was not doing well. Things are going a bit better for me now: I earn 5,000 Rupees a month (\$US 130)", he explains, balancing on a huge pile of printed circuit boards he has just received at his junk room in Shastri Park. He also earns a little money by selling magnets removed from hard disks. As for Ousman, his good mood gives away his enviable position: he is already one of the richest people in the district. Each complete computer he buys earns him 700 to 1,200 Rupees gross (\$US 20-30) when he sells it on in separate parts. "I do business with around twenty different buyers, one for each material", he says proudly watching the comings and goings of his employees, who are loading steel structures from CPUs onto a van. Destination: a large market in Delhi where factory owners buy metals and other raw materials.

Men like Ousman do business with dealers who are even better off, who buy scrap in bulk from importers or at auctions held at local companies, government offices, embassies, and high-tech equipment manufacturers. (In Delhi there is even a magazine solely devoted to waste auctions.) These dealers often have their own shop in Delhi's large electronic goods markets, where usable or repairable machines are sold individually. The rest is sold off to the poverty-stricken recycling community.

E-waste arrives each month at the ports of Mumbai (Bombay), Chennai (Madras) or Ahmedabad in containers. "Most of it comes from the USA, the UK, Canada or South Korea", explains Subhankar Basu, from TERI. No one knows the exact amount, but, according to Satish Sinha of Toxics Link, India imports at least as much waste as it produces. This country, which is rapidly entering the e-economy, already has its hands full with the 150,000 tonnes of e-waste it generates itself each year.

If this subcontinent has become the rich countries' dumping ground, this is notably because Indian legislation is rather vague on this subject. The Indian Supreme Court may well have banned the importing of hazardous waste in 1997, but the government still authorises the entry of used computers (if they are under 10 years' old) and encourages people to give them to NGOs, schools and hospitals. Scrap metal dealers take advantage of this to import computers that no longer work, which are then immediately sent off to be recycled. Alternatively, the shipments are identified as being simple plastic or metal waste. In any case, the containers change hands (and labels) several times during their tortuous journey from their country of origin, via staging posts such as Dubai. In this context, it is difficult to retrace the guilty exporters.

If the shipments are seized at the customs, or if the importers forget to reclaim them, they are sold at auction... to end up in the very same digital cemeteries! This is how A.K. Verma gets his slice of the cake. This clearly prosperous man employs around 15 workers in a large garage hidden at the end of a street, in the village of Old Seelampur. On his visits to the huge container terminal of Tughlaqabad, in the south of Delhi, he sometimes finds treasures. "I don't have the money to buy things directly from abroad. However, when there are auctions at Tughlaqabad, I can take part", he explains affably in rather good English. "I have already bought containers from Australia and Singapore. And I have seen several from Canada."

Illegal, this traffic is also carried out on an international scale. The Basel Convention, which came into force in 1992, forbids industrialised nations from exporting their hazardous waste to developing countries without obtaining permission in writing from the importing country, and the guarantee that the toxic substances will be treated in an ecofriendly manner. Canada, India and 168 other countries have ratified this treaty.

The problem is that virtually no one is in charge of enforcing this law. At Canada's most important port, in Vancouver, there are only three employees who inspect goods to be exported abroad – over a million containers last year alone! Ken Yick, superintendent in the export control team of the border services agency has his hands full. "Checking goods to be exported is not a priority for customs officers", he says regretfully. "And our main role is to look out for strategic goods such as drugs, arms and anything that affects national security. Not materials that may harm the environment."

Therefore, it was the inspectors' own decision to begin to check waste cargoes at random. Since 2005, out of around 200 containers searched, they have seized 50 (one quarter!), which contained forbidden material that was to be sent to Asia, including thousands of computer screens and other e-waste. Twenty-seven companies, including recycling firms, have been fined. And this is certainly just the tip of the iceberg.

The cargoes seized were mainly intended for China and Hong Kong. But things could change soon. "We see growing numbers of waste cargoes being sent to India", observes Ken Yick. "Due to pressure from China and Hong Kong to stop these imports, people are exploring new markets". And that is without counting exporters who surreptitiously send their goods from the USA, the only industrialised country not to have ratified the Basel Convention.

Legit or not, old electronic goods that are being moved around India will, sooner or later end up in the rubbish collection. In order to curb their uncontrolled recycling in Indian streets, a quick solution is on everyone's lips: a specific law to cover the treatment of e-waste, promised by the government months ago. However, for environmentalists, there is no doubt that the major IT equipment manufacturers – there are over 150 in India – must also do their bit. Satish Sinha of Toxics Link demands a consortium piloted by the industry, following the Polluter Pays Principle. This umbrella organisation would collect the waste and resell it to authorised recyclers, who would then be guaranteed regular deliveries. These factories would be controlled in order to ensure they complied with health and environmental regulations established for hazardous procedures such as metal extraction. By using more sophisticated technologies, it would be possible to extract more precious metals from the waste, and this would then pay for the cost of the installations, the ventilation, the protective equipment etc.

On paper this plan seems perfect. And full of good intentions. It even makes provision for the employment of 'informal' recyclers in regulated establishments. But we have a long way to go before reaching this point... In the winding alleys of New Seelampur, in the 'K-block' district, there is no sign of men in pastel-coloured shirts discussing politics and dreaming of computers being happily sent off to ecofriendly factories. The entire district is devoted to wire recycling. In the dark corners that are used for workshops in the ground floor of houses and grubby lanes, there are mountains, walls of wires of all sizes and colours,

bundled up in half- ripped bags or strewn on the ground. No burning here: they are dissected by hand. One end of the wire is held between two fingers and then the wire is peeled lengthwise with a sharp knife. The plastic sheath is then removed to reveal the copper or aluminium interior. Three or four rapid movements and it's done. To earn 60 Rupees, you need to peel 30 kilos of wire in a day.

The whole village moves to the rhythm of these movements, as if they had all been taken over by some strange choreography: men, boys, women and girls in their shimmering tunics. Even this little girl aged four or five, crouched down next to her father, is already learning to use the knife. Shipments of goods continue to arrive in vans whilst a group of kids play on an improvised swing made of PVC strips, the remains of old wires. All the treaties in the world appear meaningless when you see these piles of wires that are so enormous they seem to rise out of the ground. Like giant earthworms that are cut in half and instantly regenerate. Like the water from a spring that you try to block but which then gushes out somewhere else. E-waste does not obey laws made in offices. It follows the laws of poverty.

**Do you want to get rid of an old computer?  
How can you ensure it is recycled properly?  
Read next month's *Québec Science*.**

A loophole in the law

There is a loophole in the Canadian legislation regarding the exportation of e-waste – a gaping hole in fact. Canada did indeed ratify the Basel Convention, which restricts the international trade in hazardous waste. However, Ottawa considers that complete machines (before they are dismantled) do not fit into this category and judges that it is the responsibility of the recipient country to ban them. “A computer and a cathode-ray tube are not toxic whilst they are in your office. They are not toxic when they are exported either,” explains Joe Wittwer, operations manager in the waste reduction and management division of Environment Canada. “These materials are only controlled if the recipient country has officially informed us that they consider them dangerous under their own legislation, and that their importation is banned.” This is precisely what China and Hong Kong have done over the last few years. According to Jim Puckett of Basel Action Network, an American NGO that fights against the toxic waste trade, the Canadian position is untenable. “This is an extremely perverse interpretation of the Basel Convention, which mentions nothing about complete computers,” exclaims Puckett indignantly. “Moreover, it is completely absurd. If you take the trouble to dismantle computers, you risk being controlled. But if you send off the machines off as they are, without doing any work on them – and that is just what the exporters are trying to do – you are not covered by the law.”

*Photo caption*

*Attracted by ridiculously low wages – under two dollars a day – most of the workers are unaware of the risks they run by coming into contact with these old computers. Moreover, they do not know how to protect themselves against possible intoxication.*

*Photo caption*

*Cathode-ray tubes in the sun in Old Seelampur. Banned from landfill sites (the glass in the tubes contains up to 25% lead), some of them are reborn as TV screens; others are smashed into tiny pieces and used to decorate the bangles worn by young women.*

*Photo caption*

*By burning the plastic coating surrounding computer leads, high-tech scrap dealers manage to extract the precious copper wires. But at what price? The toxic fumes pollute the air in the outskirts of Delhi.*

*Photo caption*

*No school for Ritzwan, 13 years' old. He may never study IT. But he has learnt to take computer keyboards apart with remarkable dexterity.*

*Photo caption*

*Whilst there is beauty in these young girls' gestures – they look like they are spinning wool – their work hides a scandalous exploitation. They are only paid a few Rupees for each kilo of 'peeled' wires.*

*Photo caption*

*Portrait of everyday life in New Seelampur. The pace of life of the whole village is dictated by the recycling of computers. Even children have learnt to play with this rubbish.*

## **The Bangalore Laboratory – clean recycling? This is what they are attempting to do in the Indian Silicon Valley.**

Goripalya has a bad reputation. In this poor district of Bangalore in the south of India, computers are taken apart using hammers or in acid baths. Asif Pasha has been doing this job for eight years with five members of his family. “Before, we had no plan. Now I am hopeful and enthusiastic about expanding our business”, explains this smiling young man with a mobile phone in his hand. He is the administrator of the EWaRDD (Electronics and Electrical Waste Recycling, Dismantling, Disposal) Trust, an association created a year ago by a dozen informal recyclers from Goripalya.

In order to obtain official authorisation from the pollution control council of the State of Karnataka, they will have to move to larger, ventilated premises, store the waste safely and provide their workers with protective equipment. A tall order. But the challenge is attractive. “For the moment we are supplied by small offices and other resellers. With a State permit, we shall be able to get material directly from large high-tech companies”, explains Asif Pasha.

The EWaRDD association is supported by the Bangalore e-Waste Agency, an organisation formed by the Indian, Swiss and German governments in order to clean up the computer recycling chain. The agency is gambling that by targeting the recycler portfolio, they will convince them to clean up their act. Because there is a lot at stake. Bangalore – the Indian “Silicon Valley” – has at least 1,500 IT companies. These businesses alone throw out 30,000 computers each year.

Moreover, this industry entrenched in Electronics City, a technology park that hides glass buildings and perfectly manicured lawns behind its ramparts, has earned a sharp reprimand. Faced with pressure from Greenpeace, in particular, Wipro, an icon of made-in-India IT, now offers to collect its clients’ obsolete computers for a fee. “We ensure that the computers are sent to a clean recycler and we check this ourselves in situ”, explains Ashutosh Vaidya, vice-president of Wipro’s personal computing division.

There are only three authorised recyclers in India: one is in Chennai (Madras), the other two – Ash Recyclers and E-Parisaraa, began operations in autumn 2005 in Bangalore. In Ash Recyclers’ faded premises there is a veritable library of computer components: keyboard keys, hard disk drives, screws, small plastic wheels and metal terminals, sorted in bags piled on shelves. They are used to restore obsolete computers that are then sold as units or for replacement parts to repairers. “That is where the profit lies. And that is how we solve the e-waste problem”, states R. Kumar, one of the company’s managers. There is no need to invest in sophisticated machinery in order to smash everything into tiny pieces and extract the precious metals.”

The company mainly employs local Muslim women who are often poor and illiterate but who are trained on site. Dressed in black from head to toe, they dismantle the machines, sitting at large tables in the rooms on the third floor. Ash Recyclers also offers training to informal recyclers in the district. It is one way of raising awareness about the dangers of e-waste, but also of creating a qualified workforce, available for sub-contracting.

Located 45 km from Bangalore, in Dobbespit industrial area, E-Parisaraa has around 50 employees in its white factory surrounded by gardens. In order to enter the 'machine room', a large room with high ceilings furnished with presses and mills, you have to wear a surgeon's mask. In a large crusher, printed circuit boards are reduced to a grey powder, which is then mixed with water and filtered to extract the small fragments of copper. Beside this, workers plunge their glove-covered hands into a special aquarium-like tank that cleans the dust off cathode-ray tubes with a vacuum cleaner and smashes the glass with a hammer. In the next room, women wearing gloves and masks work under neon lights breaking up computer parts. The aim of the boss, the chemical engineer P. Parthasarathy, is to send only a maximum of 1% of the material to the landfill site for hazardous materials. This is being build nearby, with the support of the State of Karnataka and the German Government.

E-Parisaraa mainly buys its raw materials from high-tech companies such as Hewlett-Packard, IBM, Motorola and Sony. Despite this, in this town that used to generate 8,000 tonnes of e-waste each year, P. Parthasarathy's factory is not working at full capacity. "We receive one tonne of material each day. We could take twice as much", he explains, surrounded by his team of engineers and technicians. "In total, we have treated 460 tonnes of waste to date." A drop of water in an ocean of waste.

Even in India, there is 'fair' recycling of obsolete computer equipment, as seen in the E-Parisaraa factory near Bangalore. Here IBM, Hewlett-Packard and Motorola computers are dismantled 'cleanly'.