

It's not just high-flown ideas or high-tech inventions that get things done in the developing world. Ingenuity and common sense are vital, too

I'M STANDING in a festering slum: there are no sewers, no drains, the communal pit latrines are overflowing, and the alleyways are too narrow for conventional latrine-emptying trucks. Three-quarters of a million people are trapped in this area of about 100 hectares—roughly the size of London's Regent's Park. For the inhabitants, clearing the sewage is a pressing priority.

"It's the kind of practical problem aid agencies are not very good at," **Graham Alabaster (PhD, Civil Eng., University of Leeds)** who is based in Nairobi with Habitat, the UN's urban development agency, tells me. "They are hot on sociology, but not so hot on hard technology." So, presented with a crisis of overflowing latrines, stinking alleys and intermittent cholera in Kibera, the Kenyan capital's largest slum, he called in a professional - Irish waste consultant Manus Coffey.

Coffey's solution was a contraption called the **Vacutug**. It looks like a cross between an industrial vacuum cleaner and a high-powered lawnmower—which is roughly what it is. Coffey rigged up the prototype in his workshop in Wicklow. **Its 6-kilowatt Honda motor provides traction (maximum speed 5 kilometres per hour) and the suction to transfer the thickest latrine sludge into its 500-litre tank and later discharge it into a nearby city sewer. Vacutug is narrow and maneuverable enough to navigate most of the alleyways of Kibera, where the latrines can be 10 metres deep and serve more than 100 people each.**

Despite its aid-agency origins, this is no charitable enterprise. **Householders pay for Vacutug's services and that, says Alabaster, is the key to its success. The going rate is 500 shillings (just over £4) to empty a latrine.** At ten loads a day, that's good money for the operator, the Kenya Water for Health Organization (KWAHO). **"Because it is profitable, they always get it repaired when it goes wrong,"** says Alabaster. Kaltuma Tahir of KWAHO agrees. "We are saving up to buy another this autumn," she says.

Alabaster thinks Kibera could sustain a dozen Vacutugs working full-time. And they are urgently needed, to judge by the foul state of the slum's alleyways last month as the rainy season approached.

The Vacutug is a rare example of something development agencies desperately need: an innovative technology that can improve the health and quality of life for poor people around the world. Coffey's machines are already operating in Dhaka, the Bangladesh capital, and Haiphong in Vietnam. Vital aid to expand the programme internationally arrived from the British and Irish governments just a few weeks ago. "We should soon have 20 machines working," says Coffey. Dar es Salaam in Tanzania and Addis Ababa, Ethiopia, where 60 per cent of the population uses pit latrines, want them. So do a host of Indian cities, where the Indian Institute of Technology is taking over operations. Coffey is looking for local engineers to mass-produce Vacutugs in Kenya and India.

In Kibera, Coffey's engineering skills are complemented by those of Wiclif Ambani, the machine's chief operator. He has come up with a series of technical advances to the brakes, chain drive and tyres to help it tackle the bends and potholes of the slums.

Habitat is one of the smaller UN agencies, and its staff know that to make a difference they have to seek out and promote clever and affordable low technologies that allow the world's poorer communities to help themselves. **"Our job is to take engineers and sensitize them to the real conditions inside poor communities so that they can help, with the communities themselves, to come up with new solutions to old universal problems—problems like getting rid of sewage and refuse, finding clean and reliable water, fixing up affordable transport and gainful employment,"** says Alabaster. So he works not only with government research

institutes, churches and international charities, but also with municipal officials, neighbourhood groups and even glorified street gangs.

Many slums are hives of innovation, says David Satterthwaite of the human settlements programme at the London-based International Institute for Environment and Development. By comparison, large companies and aid agencies may be slow, ill equipped and lacking in financial incentives to solve local problems. Local entrepreneurs, often living in the slums themselves, can and do fill the innovation gap, says Tova Solo of the World Bank's water and sanitation division. "They have nothing to lose by trying something new."

One surprise is that it is often services that are usually supplied centrally—such as water, sanitation and electricity—that are most likely to benefit from small-scale innovation. In the giant Orangi settlement of more than a million people in Karachi, Pakistan, locals gave up on official promises to install a sewerage system, and started building their own based on an entirely original technical idea. Between each latrine and the new sewers they put a simple septic tank: this meant that only liquids reached the pipes, which could then be built much narrower without becoming blocked. Not only did the locals get the job done, but they were able to pay for it by using cheap local resources.

In Kenya, where the national electricity grid fails to reach most of the country, at least 150,000 households in rural areas and city slums get electricity from privately purchased solar panels. The panels top up car batteries, which in turn power TVs, radios and lights, says Moses Agumba of the Solar Energy Network in Nairobi, which promotes the technology.

Building materials are another major area of innovation, says Satterthwaite. In Cebu in the Philippines, local groups have developed a way of making basic building blocks out of raw earth. And in Thailand, squatters in Bangkok have designed portable walkways that they can install over boggy ground and take with them when they are evicted.

In Nairobi's second-largest squatter community, Korogocho, around the Dandora waste dump in the east of the city, local priests have launched the Makuru Recycling Centre. The centre helps people who scavenge on the dump to sell what they produce without middlemen eating into their profits. A decade on, they are selling compost made from market waste to garden centres, and recovered glass and metal to city factories.

The centre also helps to add value to the scavenged materials, with a locally designed and manufactured machine that converts waste paper into fuel briquettes for sale to schools and houses. Workers take turns on what looks like a pair of exercise bikes. Their effort turns blades that chop the waste paper, which is then soaked overnight, mixed with sawdust or coffee husks from local mills, and compressed and shaped in a hand-powered extruder, also locally made. The resulting briquettes are left to dry in the sun.

The workshop makes 2000 briquettes a day, which sell under the brand name Makaa Meupe, or "white charcoal", for about a shilling each. "Not only do they make money and recycle waste, they also save the local forests from the charcoal makers," says Alabaster, who helped design the equipment and find a manufacturer for it. "A lot of people here said it wouldn't work. But in engineering terms it's perfect, and the market is huge," he says. As local people take over, the centre's aid workers will be able to move on to other things. "Soon, we should be able to walk away and leave it to them," says Alabaster. "The method is extremely replicable and could be profitable almost anywhere you can get waste paper."

Alabaster's advice to aid workers is to forget handouts, and not get too hung up on development theory. Some basic technology is often what is needed in the world's shanty settlements. That, he says, "is the way ahead for improving the living conditions of the urban poor."

Fred Pearce