Megacity, mega mess...

The creaking infrastructure of Indonesia's capital is overwhelmed by people, vehicles and pollution. As urbanization gathers pace across the developing world, **Jessica Marshall** visits Jakarta to witness its stomach-churning consequences.

On the streets of this city, you can pick your poison. Clouds of black and blue-white smoke billow from the exhaust pipes of buses and motorcycles. Thirteen rivers flow northwards to Jakarta Bay, each a slurry of human waste and garbage. Scavengers pick through the city's rubbish looking for recyclable plastic and cardboard. What they can't sell, they burn — batteries, rubber shoes and all. Rising smoke from burning garbage wafts between the city's skyscrapers.

Pollution in Indonesia's capital, Jakarta, is easy to see, and the causes are not hard to pinpoint. But the effects on its inhabitants' well-being are harder to quantify. Official data are scant, studies of environmental health are few, and those worst affected — the urban poor — are the least likely to be included in city records. Environmental scientists say that much could be done to improve living conditions for those most at risk from pollution. But without a stronger emphasis on research into urban public health, and the political will to act on its findings, experts are pessimistic about making rapid progress. "In the near future, there will be more environmental problems," says James Woodcock, a wastewater consultant to the World Bank who has

lived in Jakarta for more than two decades.

With a population of about 12 million — rising to 21 million if you include the wider conurbation of surrounding towns — Jakarta is already one of the world's largest urban areas. The population of this 'megacity' is predicted to grow by a third in the next decade, part of a global trend towards urbanization. By 2007, the balance of the world's population will tip to give a majority residing in towns and cities¹. Most of the fastest-growing cities are in developing countries (see Chart, opposite). So Jakarta may provide a pointer to a future in which urban pollution becomes a main player in the disease burden of the developing world. "The urban physical environment is going to represent a major health threat," says David Vlahov, an epidemiologist at Columbia University in New York, and president of the International Society for Urban Health.

Gridlock

In Jakarta, air quality is already at crisis point. To get an overview, I meet Budi Haryanto in his wife's office building on a Friday evening in late July. Haryanto, a professor of public health at the University of Indonesia, is waiting for the worst of the traffic to subside before driving home to a Jakarta suburb, a journey of

23 kilometres that can take almost two hours. Some two million people commute into the city each day. From a ninth floor window, Haryanto and I look down on a highway on which stalled head- and tail-lights extend as far as we can see in either direction.

"Jakarta is getting worse," says Haryanto. Traffic is responsible for more than 70% of the nitrogen oxides and particulate matter emitted into the city's air². Haryanto is frustrated that the government is not doing more to monitor and reduce the thick, nostril-burning smog, or to characterize its effects on health. "The Ministry of Health doesn't care," he laments, noting that it is dissolving its subdirectorate dealing with air pollution.

The limited available data paint an ugly picture. Respiratory inflammation accounts for 12.6% of deaths in Jakarta, twice the proportion in the rest of the country³. And estimates based on reported pollution levels attribute more than a million asthma attacks and several thousand premature deaths per year in the city to airborne soot and other particles².

Aside from the sheer volume of traffic, the main problems are poor fuel quality, and a failure to equip vehicles with emissions-control technologies such as catalytic converters. There have been some small steps forward:

SOURCE: REF. 1

before 2001, many vehicles in Jakarta used leaded fuel. At that time, about 35% of Jakartan elementary school students had levels of lead in their blood above the World Health Organization (WHO) safety guideline of 10 micrograms per decilitre⁴. This has now dropped to less than 3%, according to Haryanto's preliminary measurements. But he is concerned that the compound that replaced lead creates emissions of benzene, a known carcinogen. "I suggested to the government that they monitor benzene in the air," says Haryanto. "But they said: 'No funding'."

Although Jakarta's horrendous air quality is evident from a high-rise window, experiencing the city's problems with water pollution and solid waste requires an excursion to street level. Kampung Kandang, a north Jakartan slum, faces a river and backs on to a swamp. I stand on the riverbank, watching the eerily still water slip by. A film of grease coats the surface, broken by plastic bags and other detritus. To avoid paying for garbage collection — which is intermittent, anyway — people drop their rubbish in the river. Downstream, a barrage of trash has collected on an obstacle. The sulphurous smell is overpowering. Next to me, a man flings a wokful of oil into the water.

Dirty old town

Kampung Kandang is typical of the illegal squatter settlements that line rivers and railway tracks throughout Jakarta, or sit tucked beneath the city's flyovers. It is a microcosm of the city's problems with water, sewage and solid waste. To the rear of the settlement, I watch a chicken in the swamp, scratching on an undulating surface of garbage, oblivious that it isn't on solid ground. The communal water tap opens into a bucket that hangs right above the swamp water that residents use as a latrine. Nearby, an elderly woman wades in the water, collecting swamp plants to sell for wicker.

The public toilet in Kampung Kandang costs up to US\$0.10 to use — no small sum for a family living on about US\$2.50 a day. "So people just do it everywhere," says community leader Miftahul Falah. Water pressure from the tap is low, Falah adds, so the villagers rely on water vendors, who sell 60 litres of water for about US\$0.20 — several times what wealthy Jakartans pay for water from a utility company.

Even for legal residents, supplies are limited. Piped water reaches less than 60% of Jakartans, and is safe for drinking only after being boiled. About half of the supply is lost because of illegal connections and leaks. Water shortages

MEGACITIES WITH MORE THAN 10 MILLION PEOPLE (population in millions)

have led many residents to tap into ground-water beneath the city. As a result, salt water is seeping into the aquifer, and subsidence has caused parts of the city to sink by a metre or so over the past decade.

Garbage-clogged waterways and the fact that about 40% of Jakarta now lies below sea level conspire to cause annual floods. These hit the poor, low-lying north of the city particularly hard, bringing a litany of health problems. "If the flood lasts a long time, maybe three days," says Falah, "people start to get sick with diarrhoea and rashes."

Less than 3% of the 1.3 million cubic metres of sewage generated each day in greater Jakarta reaches a treatment plant. More than a million septic tanks are buried beneath the city, and these have contaminated most of the city's wells

Scavengers scale the massive landfill at Bantar Gebang seeking things they can recycle and sell.

with faecal coliform bacteria. What's more, truck drivers hired to pump the tanks often dump their loads, untreated, into waterways.

Solid-waste management is similarly chaotic. The city's Bantar Gebang landfill is a case in point — soil is applied only every few weeks and leachate is inadequately treated, says Widhi Handoko, an instructor in solid-waste management at the Ministry of Public Works. An army of 6,000 scavengers works the mountains of garbage. Like post-apocalyptic sherpas, clad in rubber boots and with wicker baskets strapped to their backs, they travel in the wake of bulldozers, plucking recyclables from the stinking heap.

Heaps of trouble

Although Bantar Gebang is nearing the end of its 20-year design lifetime, its representatives say that there is no option but to keep it open while the city seeks alternatives. A private company has developed land for a new waste-disposal site, but local residents have protested loudly. The municipal government recently announced it will build four incinerators. But this is an expensive option, and may cause other environmental and health hazards.

Many people in Jakarta's poor neighbourhoods say their health is fine, despite the filth that surrounds them. But experts believe that poor sanitation is a serious health issue. Ministry of Health records show gastroenteritis is by far the most frequent disease diagnosis at local clinics and hospitals. The incidence of dengue fever has also exploded in recent years. "It is not normally an urban health issue," says Jan Speets, an adviser with the WHO in Jakarta. But flooding and the piles of rubbish throughout the city have created breeding opportunities for the mosquitoes that spread the disease.

Experts in public health urge more and better research to quantify the health problems

TIM MARSHALL

caused by poor sanitation and waste management. "There are no real studies available to reveal what's going on in the city," complains Jaap van Dissel, an infectious-disease specialist at the Leiden University Medical Center in the Netherlands. His recent investigation of the food- and water-borne diseases typhoid and paratyphoid in east Jakarta found that doctors over-diagnose the former by up to ten-fold because blood cultures that confirm the infection are not normally done⁵. This illustrates the need to improve clinical diagnoses before attempting potentially expensive campaigns to address problems with public health, says van Dissel: "It's important to know your enemies before you start shooting."

Many of Jakarta's problems are shared by other megacities in the developing world. Most have large illegal shanty towns, and face similar issues with pollution and waste management. For instance, recent flooding in and around Mumbai in India, attributed in part to clogged drainage throughout the city, killed more than a thousand people, and brought water-borne diseases in its wake.

Scrubbing up

Some developing-world megacities have taken steps to clean themselves up. Mexico City's appalling smog is now beginning to clear thanks to the introduction of catalytic converters and improvements in fuel quality⁶. And the Indian capital of New Delhi is experiencing similar gains after converting its public transport to run on compressed natural gas.

So what are the chances of Jakarta following suit? Experts say that solving the city's problems with environmental health will require genuine political commitment to pay for research and monitoring to characterize the problems, and spending on the infrastructure needed to solve them. Given a legacy of official corruption, and the continuing hangover from the Asian economic crisis of 1997, the obstacles are formidable — public spending on infrastructure is running at 80% less than during the heady days of the mid-1990s, when Asia's economy was booming⁷.

So far, politicians seem more interested in sweeping pollution under the carpet, rather than tackling the problems it causes head-on. After the WHO labelled Jakarta the world's third most polluted metropolis in the early 1990s, air-quality monitoring equipment was moved to residential areas with lower levels of pollution.

Ritola Tasmaya, secretary to the governor of

"A film of grease coats the river's surface, broken by plastic bags and other detritus. To avoid paying for garbage collection people drop their rubbish in the river. The sulphurous smell is overpowering."

Kampung Kandang's communal tap opens into a bucket by the trash-choked swamp that doubles as a toilet.

Jakarta, defends the municipal government's record, pointing to developments such as a recently built busway, which will later incorporate new buses running on compressed natural gas. Tasmaya blames continuing problems with environmental health on insufficient budgets and limits to the city government's authority — rivers, he notes, remain the responsibility of the national government. "Jakarta as a capital city needs special support from the central government," Tasmaya concludes. "The infrastructure must be good enough so that people who come here for business, tourism and investment can be served."

Foreign specialists say that significant progress could be made if existing environmental regulations were properly enforced. "It's very difficult for a government that's known to be corrupt to enforce laws," says Woodcock. But the good news is that, after years of dictatorship and corruption, Indonesia is slowly becoming more democratic. Last year, the country gained its first directly elected president, Susilo Bambang Yudhoyono. And 2007 will see the first direct election for the governor of Jakarta.

For now, many of the city's residents have

more immediate priorities than reducing pollution. "Income is still low," says Basah Her-nowo, director of settlements and housing at the National Development Planning Agency, an arm of the central government. "People do not care about environmental quality. They are still thinking about their stomachs." But problems such as flooding and waste mismanagement are getting so bad that people are beginning to call for change. As democracy takes root, environmental health may slowly move up the list of political priorities. "In the end," Woodcock says, "I feel optimistic that there will be progress."

Jessica Marshall is a science writer currently travelling in Asia.

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