

Scientific Way of Disposing Municipal Solid Waste

MUNICIPAL solid waste in Bangladesh is dumped almost anywhere with least consideration of its impact on the environment. The introduction and the implementation of the concept of landfills is already overdue. We must not waste any further time before we start using landfills for the disposal of municipal solid waste.

A landfill is a man-made pit especially designed for the disposal of different types of solid wastes. Both hazardous and non-hazardous solid waste can be disposed off in a landfill depending upon its design and the suitability of the landfill material.

Why Dhaka should use a landfill

Dhaka generates a huge amount of solid municipal waste everyday. None of them are disposed off scientifically at the landfills. Rather, they are dumped almost anywhere without any consideration to the environment. For quite a few years municipal solid waste is being used to fill lowlands for different human uses, e.g. Gabtali bus terminal, Jatrabari dump site etc. Many of these lowlands are potential sites for groundwater recharge. As a result, leachates generated from the waste trickles down the earth, reaches the aquifer and contaminates the ground water. The groundwater, carrying the pollutants travels through the porous media at different velocities and spreads over a wide area with time, eventually polluting the whole region. This water pumped out of the aquifer could be used as potable water, damaging human health.

There are several examples in the United States where people living near an army, air or naval base started having more deadly diseases than people in other regions. After a careful investigation it was found that the drinking water had significant amounts of chemicals or radioactive isotopes that leaked to the aquifer from irresponsible dumping by the bases several years ago when there was no or little restrictions on dumping hazardous wastes. In Bangladesh many chemical companies dispose their chemical wastes directly into the river which is causing irreversible harm to our aquatic life, ecology and human health.

Different types of contaminants can cause different types of diseases depending upon the chemical constitution of the contaminants. Some can cause cancer, some kidney disease, while others can cause skin disease, diabetes, heart diseases etc. Water containing the metal lead can retard a baby if the baby receives the metal at his/her infantile stage. Another disadvantage of dumping the waste is the problem of rodents and mosquitoes. Since these dumping sites are not covered with anything, they are the ideal breeding places for disease causing rodents and mosquitoes.

Factors in choosing a site for a landfill

There are many factors that have to be considered before choosing an appropriate site for the landfill. Some of them are listed below.

- Geographical
- Traffic Condition
- Geological

The geographical location is very important for selecting a landfill site. It has to be conveniently located so that it is neither in the middle of the

by A M M Hebrul Anam

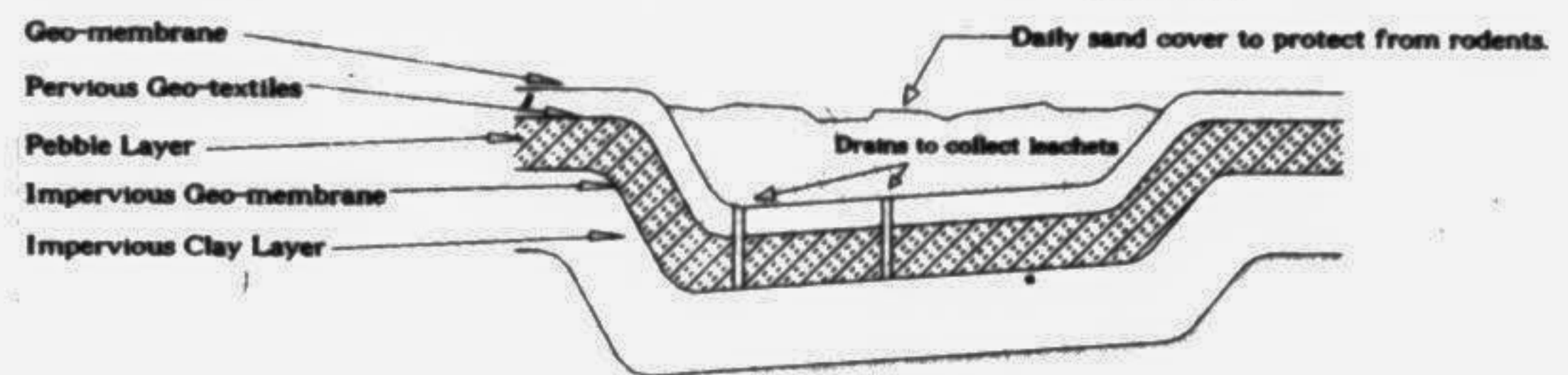
ways congested with unusually heavy traffic. The hauling trucks should not haul the waste during school hours or busy traffic hours. Early morning and late night is a good time for waste hauling.

The geologic condition of the site must be favorable for building the landfill. There should not be any active faults going through the site area. There has to be an appropriate soil type (rock type in geologic term) underneath the landfill. The landfill can't be built in a place where the underlying bed rock is graveliferous, because gravel beds are very porous. The hydraulic conductivity (the ability of the media to let the fluid pass through it) should be very low. Thick dispersed clay is the most favorable bedrock component, because water can hardly travel through dispersed clay. The clay should not be a fat clay, which expands when wet and shrinks when dry. A landfill should not be built in an area where there is an aquifer near the surface.

Types of landfills

There are mainly three types of landfills: a) Landfills

upon its chemical composition. Some waste (toxic) can take 30 years to disintegrate into its component materials and lose the toxicity. If the clay liner is 7 ft thick and the hydraulic conductivity is 2 inches/year, then it will take the leachates 42 years to travel through the clay liner and reach the soil and/or groundwater underlying the landfill. In this case, the above mentioned toxic waste can be safely disposed off at a landfill with 7 ft. clay liner. Geosynthetic liners or geomembranes are plastic liners (sheets), especially designed for the landfills. They are relatively non-reactive to many chemicals. When the waste is disposed off on top of them, the different components of the waste start reacting with each other and gradually break down into components that are non-hazardous to human health. Because of the chemical composition of the synthetic geomembranes, they do not react with the wastes, thus keep the imperviousness intact. A rough sketch showing the typical components of a landfill is presented in the figure below:



Rough Diagram Showing the Basic Components of a Landfill.

city, nor far away from the city. The prime waste generating source areas in the city have to be identified so that the site can be selected near the source.

Traffic condition plays an important role in choosing the site. The site must be easily accessible throughout the year. The road condition has to be good and the route should not be too crowded with heavy traffic. There should not be too many schools and residential areas on the route. A good example of selecting a wrong waste hauling route is the Nababpur Road, which is al-

with only clay liners. b) With clay and geosynthetic liners. c) With only geosynthetic liners.

A liner is a natural/artificial layer used at the bottom of the landfill as a sealant to retard and/or stop the water, produced from the waste (leachates), from leaking, thus protecting the underground aquifer from contamination. It is impossible to totally stop the leachates from leaking. However, with suitable liners, the movement of the leachates can be reduced to less than 2 inches/year. Different materials take different periods of time to disintegrate depending

The earth is excavated at an angle to maintain a stable slope. It is then lined with thick impervious clay layer (usually 5-10 ft.). An impervious geomembrane overlies the clay layer which in turn is covered with a pebble layer. The pebble layer is overlain by a previous geotextile. The final layer is an impervious layer of geomembrane which overlies the geotextile. A thin film of sand is spread on top of the geomembrane to save it from any unwanted puncture due to any friction caused by the waste during dumping.

The bottom of the landfill as

a gentle slope to ensure the down slope movement of the leachates and there are drains at appropriate points to drain the leachates. If by any chance the leachate leaks through the top geomembrane, it travels through the geotextile and the pebble layer and finally is collected by the drains at the bottom of the pebble layer.

Few monitoring wells are installed around the landfills to see if any leachate is leaking from them and contaminating the groundwater. Periodical water sampling is done and sent to the chemical analytical labs for analysis.

Each landfill has a capacity and a fixed life. It can operate for a certain number of years. After the life is over the site is closed for any new disposal, but is kept under monitoring for a certain number of years depending upon the type of waste it contains (how many years it will take for that waste to disintegrate?). If everything goes smoothly and the monitoring wells do not detect any contaminant, closure report is submitted to the appropriate authority to close the landfill site.

Proper disposal of municipal solid waste in the landfills is not an impossible dream for our country. There is a lot of environmental work going on in our country and people conduct a lot of seminars without any solid result. We had enough of these lip services. It is time for some real actions to do something to save our ecology, wildlife, the environment and above all, the people of this country. Instead of just writing reports and doing some paper works, we should work in the real field and enter the era of real world environmental management. We should also make the people aware of our fragile environment and teach them how to save it. I urge the government to seriously think about the introduction of landfills and do something real that is benevolent for us, our children, and the earth.

(The author is a Geological Engineer and is working as an Environmental Geologist for Development Design Consultants Limited (DDC). Before joining DDC he was working in California as a Project Geologist for International Technology Corporation (ITC Corp), an environmental consulting company in the USA.)

How a Community Solved its Fuel Crisis

by Robert Okinyiotani

AN agro-forestry project in Awendo, a fertile chunk of 50,000 square kilometres of land in the south-western corner of Kenya, promises to solve the region's fuel crisis. It is the brainchild of community development officer Olwoch Onyuka and was started two years ago with the help of local women's groups.

Onyuka began organising, with the Forestry Department,

small pieces and leave them to dry for a few days.

Apart from replenishing depleted fuelwood, the project is proving handy for those building new houses. Until now, they have relied on the natural forests for building materials.

Fuelwood accounts for 70 per cent of total domestic energy consumption in Kenya. In 10 years, the use of fuelwood and charcoal has doubled.

200,000 residents of Awendo were overjoyed — and for good reason. For years the farmers had not farmed commercially but grown maize, peas and some sugarcane for jaggery — crude sugar. The sugar factory, they were promised by local politicians, would use up nearly all the available land and make them rich overnight.

That was two decades ago. Today, the South Nyanza sugar factory is a reality. Most residents had to be evacuated to build it. The indiscriminate evacuation separated people from their kinsfolk, those moved being absorbed by communities living in nearby areas. The land near Awendo became so congested that residents now had only four hectares to live on.

The factory proved a big incentive to the local farmers to grow sugarcane. They cleared their fields of forest for cane plantation. The thick woods, especially along the Sare, Kuja and Olare rivers, soon gave way to sugarcane and the water levels on these rivers slowly began to fall.

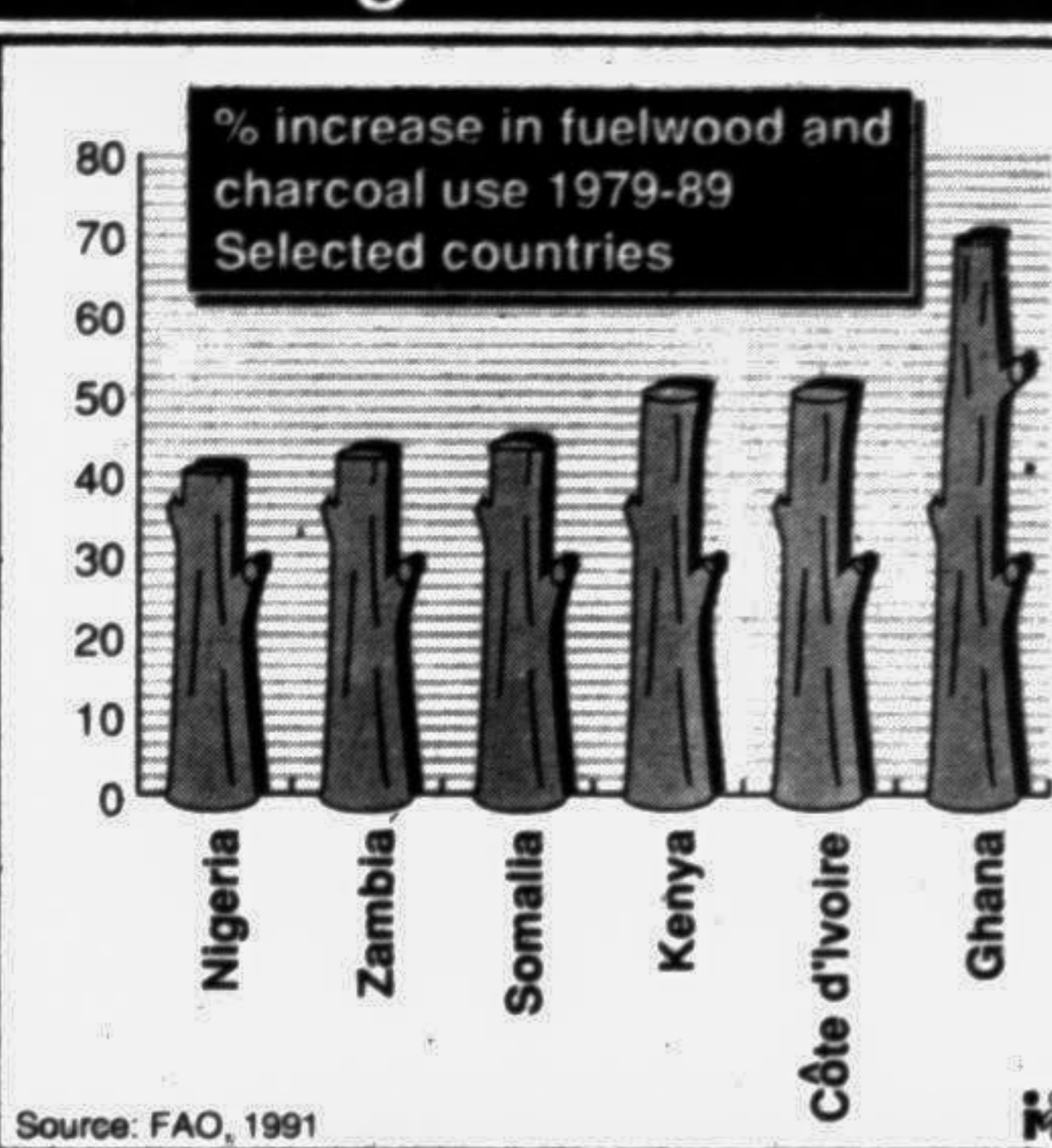
The residents, who were dependent almost wholly on fuelwood from the forests before the factory was built, had to grapple with the falling supplies. The women who had mainly fetched the wood had to change to other energy sources, such as electricity, kerosene and charcoal. The prohibitive price of electric cookers, gas and kerosene are out of reach for most residents.

The first cane harvest raised the residents' hopes, but that was about all. They had no capital, and the cost of inputs they borrowed from the sugar company outstripped their earnings. And what little they earned from the factory, came months after harvest time.

The South Nyanza sugar company is there to stay. So is the poverty of the farmers of the region. One problem that will soon cease to dog the residents of Awendo is lack of fuelwood and building timber, thanks to the ingenuity and dedication of one man — Cemini News.

ROBERT OKINYIOTANI is the bureau chief for western Kenya of the Kenya Times. He specialises in development and environment features.

Lost logs



Source: FAO, 1991

Delivery of cheap, readily available and mostly indigenous seedlings. The women's groups sensitized the residents on the need to replenish the depleted fuelwood.

Forty-year-old Onyuka persuaded the residents to plant at least a quarter of their land with trees. He urged those whose lands border on rivers to plant more because they had larger areas of less arable land.

Within two years the area is already lush green with a new forest cover. Says Onyuka: 'The Awendo woman does not have to worry about firewood now. All she has to do is fell one or two mature trees, chop them into

A study for the Kenyan government by the Beijer Institute of Stockholm found one major cause of deforestation was not rural fuelwood use, but the conversion of wood to charcoal for sale in the cities.

The women's project has succeeded in an area which has had its share of disappointments. One came when a new government-owned sugar factory brought some work to local farmers, but aggravated the fuel crisis as more and more people started to chop trees to grow sugarcane for the factory.

When the plan to build a factory was first mentioned, the

Cranes Lose Havens to Developers

MONGOLIA is often twinned as one of Asia's economic backwaters, but it may be the region's last remaining boomtown for the graceful crane.

Elsewhere in Asia, the long-necked, powerful bird is fast disappearing. But James Harris of the environmental research group Crane Foundation says Mongolia remains a vital nesting place for three species of the crane.

The birds seem to be laying their eggs in record numbers only in Mongolia, says Harris, because the people there still practise traditional pastoral activities instead of intensive farming, which destroy wetlands.

Indeed, in a meeting conducted here in June on the migratory and breeding patterns of the crane, scientists and environmentalists said six out of the eight species of the crane found in Asia are endangered mainly because development and growing populations have taken over vast tracts of the region's wetlands.

The marsh- and plain-dwelling birds usually lay only about two eggs a year, of which just one hatches. Usually migratory, cranes are found all over the world except in South America.

But participants at the Tokyo conference said many Asian variety cranes, which prefer living in marshes, are dying young as their natural habitat continues to shrink.

There are at least 120 million hectares of wetlands in the Asia-Pacific, excluding rice fields. More than 80 per cent of this is in seven countries: Indonesia, China, India, Papua New Guinea, Bangladesh, Burma and Vietnam.

The Japanese green group Kushiro Sarun Trust estimates that at least 500,000 hectares of wetlands are disappearing each year in Asia and Africa, and predicts a bleak future for the cranes.

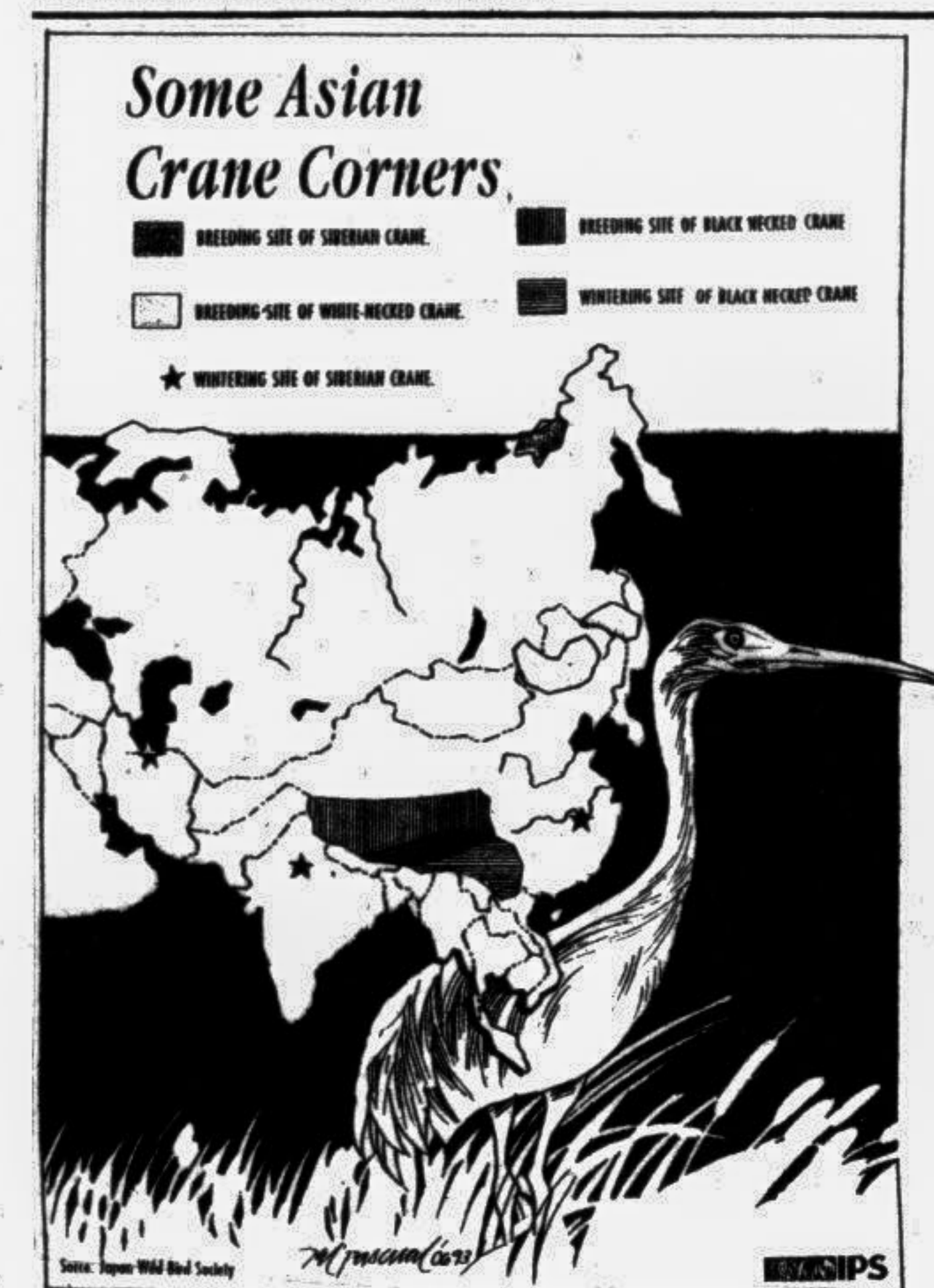
In India, the number of Siberian cranes — the snow white species that are totally dependent on water — has already dwindled to five. There are only ten of it left in Iran.

China has about 2,500 Siberian cranes, said scientists at the conference. But that number may soon be slashed by the rapid economic expansion in that country.

Yutaka Kanai of the Wild Bird Society of Japan says China's red crown or Japanese crane population is already under threat.

He says the vast saline Pajin Marsh area that faces Laodong

Asian cranes disappear along with the region's wetlands. Suwendri Kakuchi of IPS reports.



Bay is the largest reed field in the world and has been a valuable breeding zone for the red crown. But the birds' nesting activities there have been disrupted because of the intense road-building and dam construction near the marshland.

In the Panjin Marsh area, located in China's north-east, the public is participating in an artificial feeding programme to feed the cranes — by simply throwing them corn kernels. This, says Kanai, has helped increase the crane numbers there from about 75 a few years ago to 500 last year.

But he points out that if the people stop feeding the birds, Panjin's crane population will drop drastically. 'The only way to save them is to ensure they have the proper habitat to breed and feed and rest during migration,' says Kanai.

According to the Asian Wetland Bureau, though, many Asian countries have seen almost 80 per cent of birds' favourite habitat disappear due to the clearing of mangroves and filling of swamps to accommodate industrial projects.

In Japan alone, environmentalists estimate that at

least 90 per cent of the country's wetlands have already been destroyed due to the government's vast development projects.

A drainage canal project near Lake Utonai in central Hokkaido, for instance, has also drawn fire from conservation groups. The project would cut subterranean water veins that feed the lake, which is designated as a wild bird sanctuary.

The Kushiro Trust also notes that merely five of Japan's 34 crane nesting sites are protected by the 1971 Ramsar Convention that restricts the use of marshlands for development projects.

Jonathan Holliman of the international green group Friends of the Earth says a glaring discrepancy in Tokyo's environment policy is the need for local government approval before wetlands are protected under the Ramsar Convention.

'By keeping Japan's wetlands dependent on local laws, the government manages to keep off international obligations that demand stringent protection measures,' he said. Holliman added that Tokyo

often seems to push aside environmental considerations in favour of development. The government, for instance, still has no plans to conduct environmental studies at the Fujimae tidal flats at Ise Bay, a crucial link in the migration routes of more than 40,000 shorebirds.

The site has been designated as a garbage site. Local green groups have protested the land reclamation plan in the area and the project has been at a standstill for years.

Meanwhile, during the Tokyo conference, Indian environmentalist Syed Hussain cited the case of Philippine wetlands as another example of development getting too priority before environment.

'In order to pay back its external debts, the Philippines converted mangroves to aquaculture farms,' he said. 'They pumped ground water to supply fresh water for these farms, which resulted in the eventual drying up of these regions. As a result, they were left with nothing.'

Hussain said he led a successful campaign in the Orissa state in India against the planned drilling of a brackish water lake there to make way for an aquaculture project.

He said wetlands are not just providers of valuable habitat for cranes. The marshlands also limit flooding during the monsoon season by acting as reservoirs and provide fresh water during droughts, he said.

Harris of Crane Foundation adds: 'This is not an issue of cranes versus humans. But what we are trying to do is to preserve wetlands so that the cranes can live side by side with humans like they used to do.'

He says aid agencies, transnational and international lending organisations are guilty of promoting the loss of wetlands.

'Rarely do the development projects carry out environmental assessment survey and the ones done are usually sloppy,' says Harris. 'It is important to look at development from a long-term point of view.'

Ironically, Japan, which also hosted the June Ramsar Convention meeting at Kushiro, may be guilty of neglecting to assess the environmental impact of its development aid to other countries.

According to Friends of the Earth, vast areas of mangroves in Indonesia have been wiped out with the construction of shrimp farms supported mainly by Japanese development aid.

Embankment Brings Flood, Mud and Misery

by Masud Hasan Khan

WHEN Dhaka was flooded in 1988, the then president H M Ershad promised to protect the city. But the embankment he built not only keeps floods out — it also keeps floods in.

Whenever it rains, many of Dhaka's citizens know they are going to be flooded or waterlogged again. As well as inconvenience, flooding brings sickness. And citizens, doctors and engineers all point their fin-

gers at a new embankment around Dhaka — built to protect them from floods.

The water spared no one, from the slums around the city to the diplomatic residences; even the home of the president went underwater. The idea was to build a wall around the city to keep out the monsoon floods, in a scheme which was incorporated into the Bangladesh Flood Action Plan.

Critics such as private engineering consultant M Aminur Rahman say that the decision to build the dam was a political stunt by the then military ruler H M Ershad, who wished to impress Dhaka residents and who at the same time awarded the dam-building contract to party members.

Citizens and engineers alike claim the embankment was built without proper technical evaluation or environmental consideration. Professor Ainun Nishat of the Bangladesh University of Engineering and Technology (BUET) pointed out that the design was based on inadequate survey and engineering data dating back to the 1960s. 'Development will inevitably have changed the drainage path inside the city, since then. The final designs should have given special attention to this,' he said.

Other leading engineers, including the vice-chancellor of BUET, Dr M Shajahan, and Dr Syed Mahibuddin Ahmed, Director of the university's Flood Control and Drainage Institute, have joined the criticism, as has Engineering News, bulletin of the 22,000-

member Bangladesh Institute of Engineers.

Critics say the embankment keeps water out, but has no provision to flush out sewage or rainwater originating within the city wall. As a result, flood water polluted with sewage builds up in the low-lying parts of the city. Dr Syed said studies by his institute show that 'the embankment has already

become submerged in flood water, drinking and washing water becomes contaminated and infection spreads. And in the slum areas there is no sanitation, so latrines are constructed over ponds, ditches and rivers.

This situation is likely to get worse as Bangladesh's urban growth rate is 5.8 per cent and basic services such as water, sanitation and garbage disposal are scanty to non-ex-

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'Life becomes a prolonged nightmare when waterlogging occurs in our neighbourhood,' says Syeda Nasrin Murtaza, a resident of the city's Shantinagar area. As one of the lowest-lying areas of the city, Shantinagar collects all the run-off from higher parts. 'The area suffers from acute drainage congestion for more than half of the three-month monsoon season,' Murtaza says.

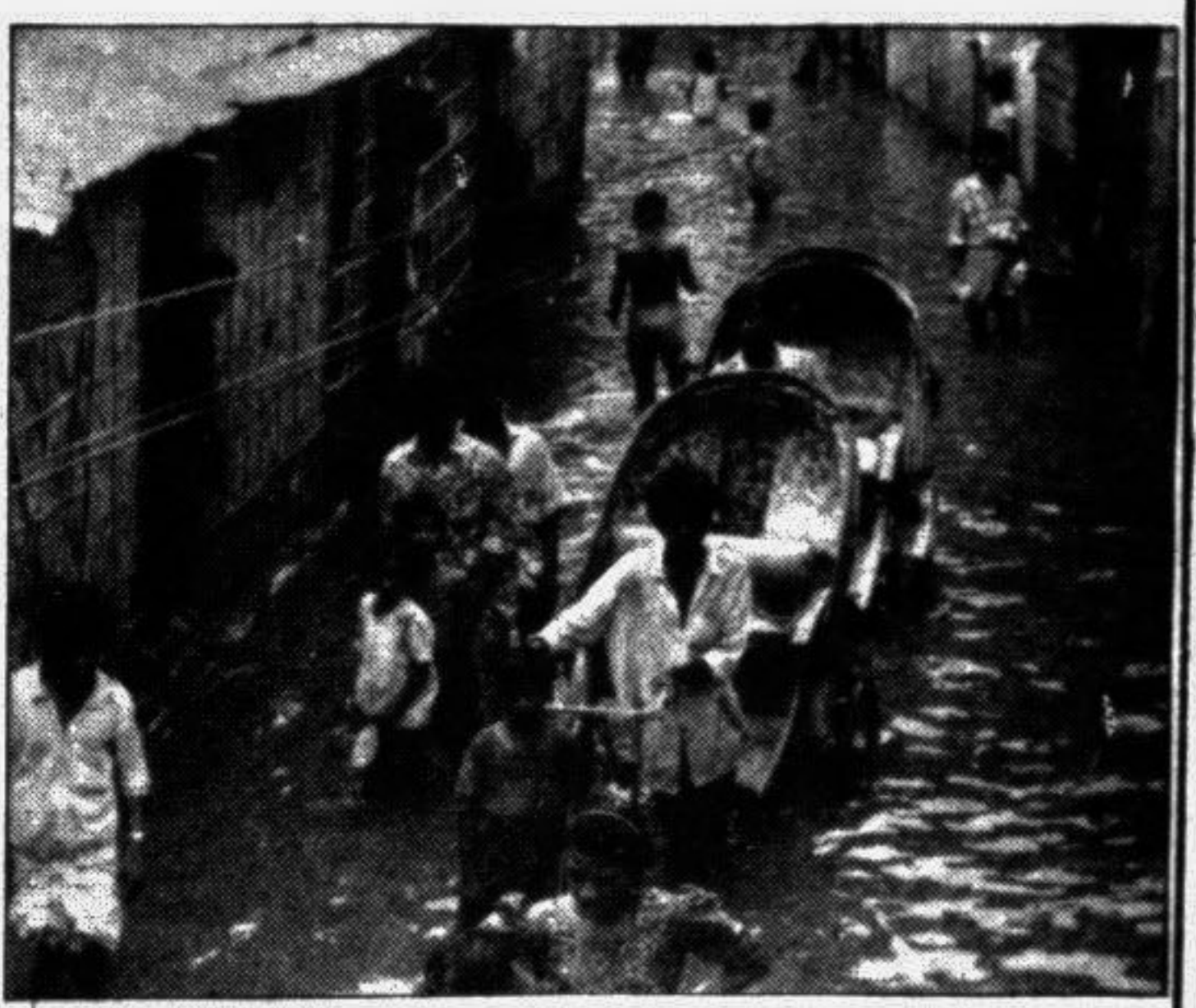
There was a time when the water used to drain away quickly, recalls Badrul Amin of Fakirpur, another waterlogging point in the city. 'Now it takes hours to recede, causing untold misery to citizens,' he says. 'I have a feeling in the ring dam around Dhaka has something to do with it.'

Construction of the 'ring dam' — officially, the Dhaka Integrated Town Protection Project — started after the disastrous floods of 1987-88, which inundated 70 per cent of the city and caused an estimated 9 billion taka (US \$220

million) worth of damage. The water spared no one, from the slums around the city to the diplomatic residences; even the home of the president went underwater. The idea was to build a wall around the city to keep out the monsoon floods, in a scheme which was incorporated into the Bangladesh Flood Action Plan.

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Necrotic: Where smallest amount of rain cause serious water stagnation

begin seriously affecting the environment inside the city, and has worsened the bad water supply and sewage situation in Dhaka.

The water filling the streets and flooding the ground floors of homes and offices smells foul and is quite obviously polluted, carrying every kind of waste from excreta to dead cats.

The polluted water causes sickness, an children are the most vulnerable. Dr Sheikh Muhammad Ali, a private physician in Dhaka, says children suffer from increased rates of diarrhoea, measles and scabies when the flooding is at its worst.

At the height of the flooding, the Dhaka Medical College, which usually admits 10-15 babies a day, admits a daily average of 50. And the International Centre for Diarrhoeal Diseases Research has to put up tents outside its laboratories as there is no room inside for all the sick babies needing treatment.

Diarrhoeal infection is especially likely when the ground and the drinking water is contaminated. Dr Sheikh explained that once tubewells

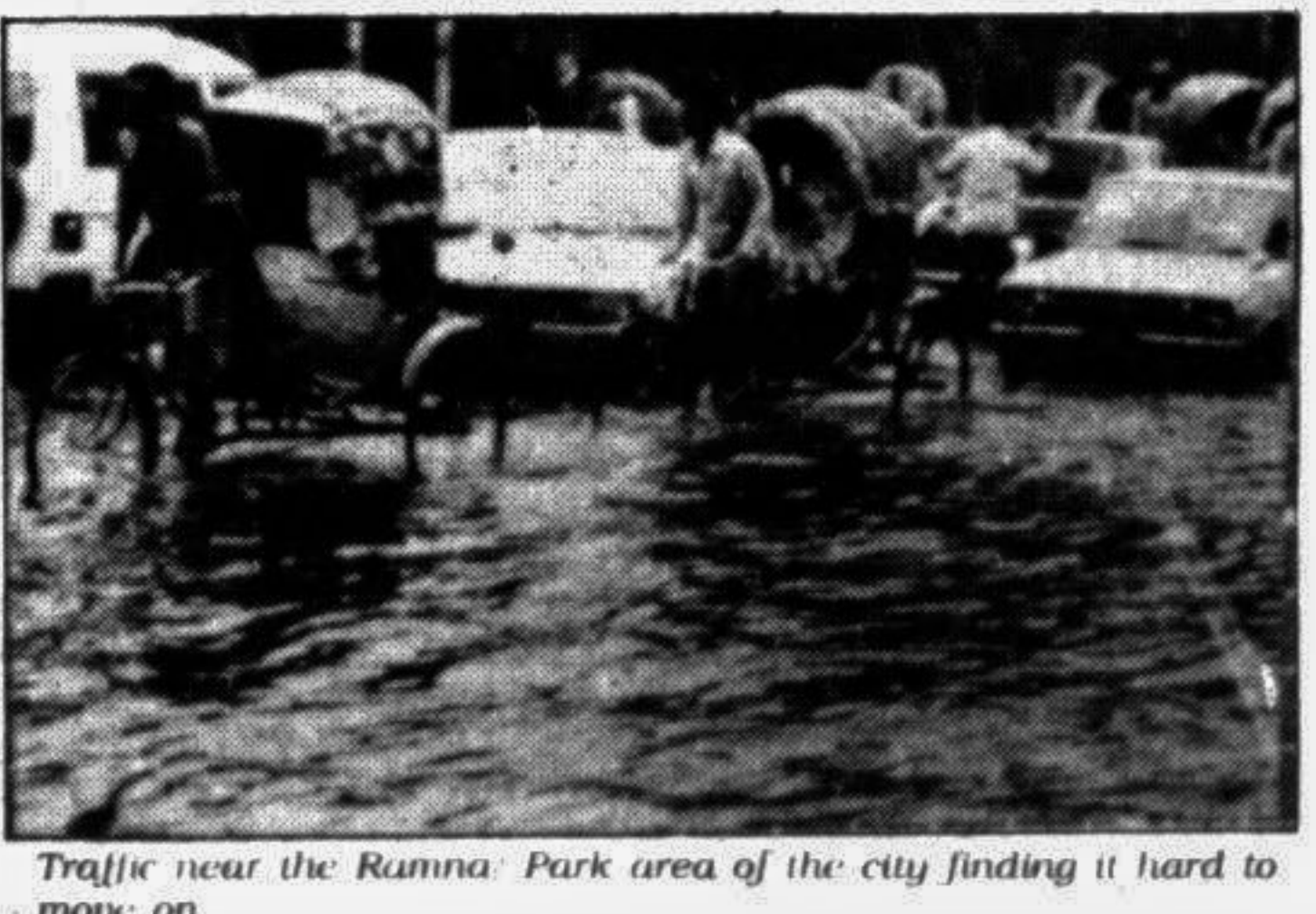
istent in many areas already.

Not only is the urban population expansion adding to the contamination of flood waters confined by the 'ring dam', it is also putting further obstacles in the path of flood — and rainwater attempting to escape from the city. Canals constructed in the old days of Moghul rule to help drain water away have been filled in and built over. The 35-metre-wide Dholaikal canal is now a major highway.

Lakes and marshes which absorbed extra run-off have also been filled in by real-estate developers, in some case reversing the drainage of water towards the city. And smaller drains and ditches have become completely blocked with plastic bags, sanitary towels, coconut shells and all kinds of rubbish.

The Water and Sanitation Authority is now planning to excavate some of the old drains and canals, and pump the water out over the new embankment. However, this will be expensive and the people are going to have to pay.

This report was prepared under a PANOS fellowship.



Traffic near the Ramna Park area of the city finding it hard to move on.