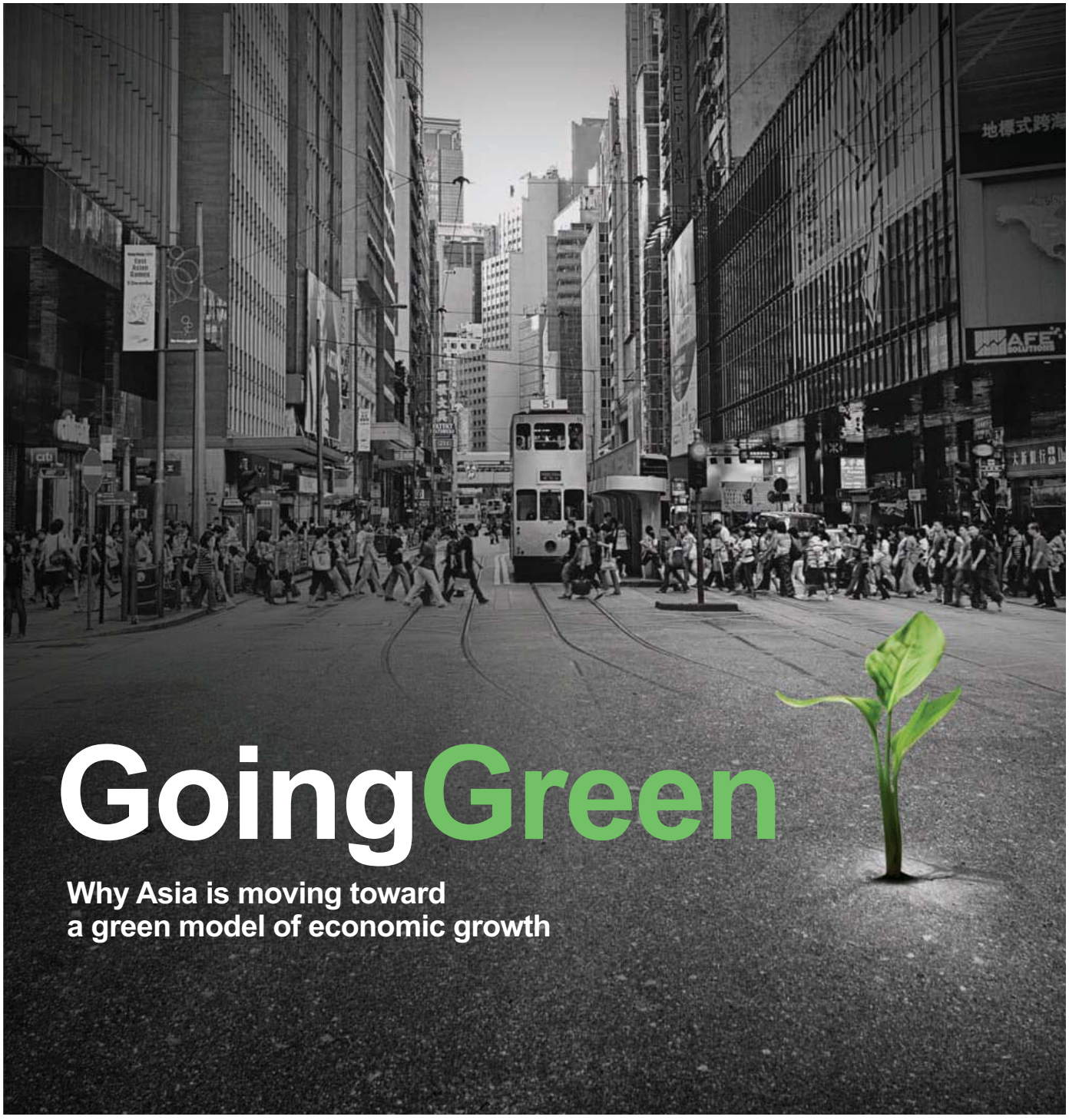
development asia

A publication of the Asian Development Bank

January–March 2012

Also in this edition...

- *Ashok Khosla on the limits to infinite growth*
- *Why greed is good for development*
- *How soda can save lives*



Going Green

Why Asia is moving toward a green model of economic growth

Murky Water

Water pollution threatens millions in Asia but innovative solutions are being found

BY Jade Lee-Duffy and Karen Emmons

After a heavy rainstorm in June, farmers around the townships of Qujing City in Yunnan Province in the southwest People's Republic of China's (PRC), woke to a disturbing scene. Their goats, sheep, horses, and cattle lay dead on hillsides. The livestock had consumed water tainted by toxic waste.

An investigation found that a local company had hired truck drivers to dispose of the waste at a treatment plant in the bordering Guizhou Province. To save on transport costs, the drivers instead unloaded the heavy-metal-laden slurry near a reservoir in Qujing's rural areas. The rain washed the toxic sludge into a tributary of the Pearl River, one of the country's extensive river systems.

No human deaths or injuries were reported, but the waste turned the water in a nearby reservoir yellow and villagers up and downstream became afraid of all water.

According to one of the world's foremost water experts, a man who advises prime ministers and the United Nations, people in developing countries have many reasons to fear their water—beyond the reckless disregard of truck drivers.

Asit Biswas believes the planet is choking on water pollution but that water quality "has disappeared from the radar as a critical environmental issue," according to an editorial he cowrote that appeared in the *Bangkok Post* in June 2011. He also believes water experts, the media, and other influential sectors unnecessarily focus on a coming water crisis from the angle of physical scarcity.

"If there is a water crisis in the future, it will not be due to physical lack of this resource but because of its quality which is deteriorating continuously in nearly all developing countries," he wrote with his wife, Cecilia Tortajada, in the May 2011 issue of *Asian Water.* Both water experts founded the Third World Centre for Water Management in Mexico and are visiting professors

FISH KILL **Workers remove over 50,000 kilograms of dead fish from the Donghu lake in Wuhan in 2007. The People's Republic of China admitted in 2010 that water pollution in 2007 was twice as bad.**

PICTURE CREDIT: AFP

at the Lee Kuan Yew School of Public Policy in Singapore, among a variety of prominent positions. In 2006, Biswas, who was born in India, was awarded the Stockholm Water Prize.

Biswas and his wife are not the only water experts speaking out about quality issues. A recent report from the Asian Development Bank, *Greening Growth in Asia and the Pacific,* notes that the precarious water situation will further be complicated by climate change.

"Many large Asian river basins are particularly vulnerable to regional warming, given the critical role of glaciers and snowfields that serve as 'water towers,' in supporting dry season and drought year flows upon which hundreds of millions of Asians depend," the report says. "Climate change is also warming water in large lakes in the region. In past decades, temperatures have increased by 0.45°C on average, which, while seemingly modest, can have dramatic effects on water quality and ecosystems in lakes. Further warming could result in rapid biodiversity loss in freshwater ecosystems."

"If there is a water crisis in the future, it will not be due to physical lack of this resource but because of its quality which is deteriorating continuously in nearly all developing countries"

—Asit Biswas, founder of the Third World Centre for Water Management in Mexico

GARBAGE DUMP A boy throws garbage into the already polluted Yamuna river in New Delhi. The river has become a liquid garbage dump with 3 billion liters of waste and raw sewage (over half of the city's daily waste) pumped into the 1,300-kilometer river every day, choking most of its aquatic life.

"The statistics on water pollution paint a grim picture—approximately 40% of [the PRC's] waterways are Grade IV to V+, meaning that the water is unsuitable for drinking, industry, or agriculture," wrote Jennifer Turner, director of the China Environment Forum at the Woodrow Wilson International Center for Scholars, Washington D.C., in Asia Society's *2006 Water Security Report.*

One of the report's writers, Upmanu Lall, director of the Columbia Water Center at Columbia University in New York City, says he suspects the situation is worse in India, much better in the Republic of Korea and Japan and somewhere in between among Southeast Asian countries.

The *Challenges to International Waters—Regional Assessments in a Global Perspective* report declares that water pollution along with freshwater shortage are two of five "serious worldwide problems that are expected to increase in severity by 2020." The assessments used eight transboundary indicators when looking at pollutants: suspended solids, eutrophication (excessive nutrients in aquatic systems caused largely by sewage and fertilizer runoff), microbial pollution, solid wastes, chemical pollution, oil spills, radionuclides, and thermal pollution. The report, produced by the United Nations Environment Programme, also attributes the root causes of pollution to agricultural development, population growth, urbanization and industrialization, and market and policy failures.

According to the UN, pollutants include pathogens, organic matter, nutrients, heavy metals (including arsenic) and toxic chemicals, sediments and suspended solids, silts, and salts.

POLLUTERS

Industry is certainly a major polluter, due to both accidents and the direct release of toxic waste into water resources. In the PRC in 2005, an oil company was blamed for an 80-kilometer spill of toxic benzene in the Songhua River that supplies water to Harbin, a city of 4 million people. Elsewhere in the PRC, according to the *Water Security Report,* as of 2006 some 2,800 chemical factories are located around Lake Tai near the PRC's southeastern coast, the country's third-largest freshwater body now "devastated by agricultural and industrial pollution as a consequence of [the PRC's] economic boom and poor management of waste." The report noted that 2 million people had lost access to their primary freshwater source and fish yields, rice production, and tourism had declined.

While industrial accidents and reckless truck drivers get headlines, water experts point to municipal wastewater and agricultural runoff as the main sources of pollution of both surface and groundwater supplies.

In 2010, the PRC government reported that water pollution in 2007 was more than twice as damaging as

official figures originally indicated. Instead of 13.8 million metric tons of polluted discharges into the country's water systems, a total of 30.3 million metric tons flowed into the water bodies that year. The change in numbers was due to the recent inclusion of agricultural waste into the report: agricultural effluents laced with fertilizers and pesticides and fluids leaking from landfills.

In India, large stretches of rivers are dying. New Delhi's Yamuna River has become a liquid garbage dump with 3 billion liters of waste and raw sewage (over half of the city's daily waste) pumped into the 1,300-kilometer river every day, choking most of its aquatic life. To the east, the Ganges River is one of the 10 most polluted rivers in the world. At the northeastern city of Varanasi, the Ganges' fecal coliform levels are more than 100 times the official Indian government limit.

In the Philippines, densely populated areas have created highly polluted bodies of water. In the four urban areas of Metro Manila, Central Luzon, Southern Tagalog, and Central Visayas, approximately 58% of sampled groundwater was contaminated with coliform bacteria and required treatment.

Treatment, however, is poor across the region as it is around the world. Research by the Third World Centre for Water Management in Latin America found that 10% of wastewater point sources (such as sewage and industrial effluent outfalls) had proper treatment facilities, and Biswas has estimated the situation was similar in Asia's developing countries.

In terms of controlling what are known as non-point sources of pollution (diffused sources such as runoff), Biswas writes that "the record of developed countries is poor, and that of developing countries… abysmal." The source of this type of pollution source is primarily agricultural activities, such as the use of pesticides and chemical fertilizers (although human waste due to open defecation is a serious problem also).

About a billion people still lack safe drinking water and the Millennium Development Goal targets halving that number by 2015. But the *Water Security Report* raises a flag, contending there has been "a focus on ensuring adequate supplies of water without appropriate consideration for water supply safety and security, water treatment and disposal, and demand management." The result, the report says, "is dependence on increasingly contaminated water sources."

According to the United Nations Children's Fund (UNICEF), only 53% of Indonesia's population in 2004 obtained water from sources that were more than 10 meters from a waste disposal site. In Jakarta alone, fecal coliform was found in 84% of shallow well samples.

Climate change is exacerbating many of these situations. Particularly in developing countries, where governments have limited human, institutional, and financial resources, the negative impact of torrential rains, rising sea levels, cyclones, and flash floods adds additional challenges to safe drinking water and improved sanitation for both groundwater and surface water supply.

LOW-COST SOLUTIONS **A farmer plants saplings at paddy fields on the outskirts of Hyderabad, India. To prevent the pollution of water by agricultural runoff, the Columbia Water Center in New York is testing the use of low-cost tools that helps farmers minimize the application of fertilizers and pesticide.**

PICTURE CREDIT: AFP

IMPACTS

When he thinks of water pollution, Lall says he thinks of cancer impacts and the loss of biodiversity: the loss of aquatic ecosystems and food sources (fish in particular), disease (high incidence of cancer, blue baby syndrome, blindness, and maternal and infant mortality) and economics (treatment costs for drinking water are inordinately high for the polluted water).

A World Bank study found that PRC farmers were almost four times more likely to die of liver cancer and twice as likely to die of stomach cancer compared with the global average. Lall says "cancer villages" are also evident in India's Punjab state.

CONVERTING WASTE INTO ENERGY
A man cooks his meal on a biogas-powered stove in Yunnan, the People's Republic of China. A company has set up the province's first large-scale biogas digester, which treats up to 150 tons of pig waste a day.

While Biswas and his wife find that anecdotal evidence also indicates that the health and environmental costs of water-quality deterioration are already in the billions of dollars each year, other experts find the human cost to be deadly. Diarrhea contracted from sewage-contaminated water is one of the biggest killers in the region. The World Bank estimates that diarrhea kills about 110,000 Bangladeshi children younger than 5 years every year. Dirty water is one of the leading causes of death for children in India, according to the World Health Organization.

POTENTIAL SOLUTIONS

Although Biswas wrote in the *Asian Water* commentary that "there are no signs that governments and people are aware of the seriousness of this problem and the dangers they pose to human health and ecosystems," there are many reports of innovations in pockets of Asia working to better manage the problem.

In India, most sewage treatment plants suspend operations for months at a time due to power cuts and erratic floodwaters. A Hindu priest and professor of hydraulics and water resources engineering, Veer Bhadra Mishra, won approval and support from the government for a gravity-operated pilot sewage-treatment program that aims to remove waste and disease from the Ganges River. Mishra's cheap, sustainable system uses the gradient, instead of electric pumps, to divert sewage into four big pools outside the city of Varanasi, where harmful pollutants are broken down by algae, bacteria, and sunlight. Most treatment plants along the Ganges River only remove solid waste and not microorganisms.

The Huijia Peike Pig Breeding Company set up Yunnan Province's first large-scale biogas digester. The company's large anaerobic digester treats up to 150 tons of pig waste a day, generating an average of 250 cubic square meters of biogas. The energy is used to power the on-site facilities, and the surplus is diverted, at no cost, to 42 households nearby, where they will save about $92 annually in fuel costs. This eco-friendly process removes about 90% of livestock pollutants that would otherwise end up on nearby farmland and in waterways.

Lall and his group of researchers at the Columbia Water Center are working on strategies that confront the pollution of water by agricultural runoff. One solution involves the use of very cheap and simple sensors to detect soil moisture and the presence of the wetting front during irrigation, and nitrate in the soil water, so that the timing and depth of irrigation, and the need for application of fertilizer and pesticide can be determined by the farmer in the field and hence reduce the amount used, save money, and also reduce pollution. As the climate changes, this approach would provide an adaptation strategy by tuning to the changing conditions.

"In our experiments with 6,000 or so farmers, one can easily save 30% of water this way and recruiting and training farmers does not require a transformation," Lall says. His research group is working in Brazil, the PRC, India, Ethiopia, Mali, and the United States, where agricultural pollution is also a huge problem. In Asia, he adds, "the problem is exacerbated by the monsoon—high-intensity rainfall that is episodic leads to a high rate of wash-off of fertilizer and pesticides and a reapplication, thus creating a cycle of pollution that is hard to manage."

Environmental activism, though hardly innovative, is popping up in unexpected places. *Discover* magazine reported that more than 3,500 environmental organizations now have legal status in the PRC. "Through a program called the Green Choice Alliance, environmental groups publish lists of companies in violation of environmental regulations and offer to conduct a third-party audit if a company chooses to clean up its act," says the magazine in March 2011.

Biswas recently applauded a new resource for innovative solutions. The Asian Institute of Technology in Thailand is setting up the Asian Water Research and Education Center with experts from different disciplines looking to find Asia-specific solutions to Asia's water problems, current and future.

"If the proper management of water quality continues to be neglected," Biswas concludes in his *Bangkok Post* editorial, "there is no question that the world is likely to face a water crisis." ■