A high environmental price has been paid for Asia's rapid economic development, including the loss of natural resources such as forests and an increase in acid rain.

14 Asia: economic growth and environmental deterioration

If any region can be seen as a microcosm of the environment and development problems and opportunities facing the world, particularly the developing countries, it is Asia. Despite the recent difficulties experienced by some countries, the region has enjoyed rapid economic growth, which has gone hand-in-hand with increasing environmental deterioration. The need for environmentally sound technologies (ESTs) has become enormous – and remains so, notwithstanding current economic and financial problems. Countries have been investing in ESTs, but have they done enough given the scale of the problems? Where can they find the finance for new technologies? And, in comparison with Asia, what is happening in other regions?

Asia is home to 2.5 billion people, half the planet's population. It has some of the richest and poorest countries on Earth, including several that – until recently – have achieved staggering economic success, with levels of growth far outstripping the performance of western countries. The region is a mixed bag in terms of development, including Japan (a developed nation); Hong Kong, the Republic of Korea, Singapore and Taiwan ('Asian Tigers'); Indonesia, Malaysia, Pakistan, the Philippines, Thailand and Viet Nam ('Tiger Cubs'); China and India ('Awakening Giants'); and Bangladesh, Cambodia, Laos, Myanmar, Nepal and Papua New Guinea ('In Waiting'). Those areas that have achieved rapid industrialization and economic development have done so at the cost of extensive environmental damage and deterioration, as just a few examples show.

- The air in Beijing is 35 times dirtier than in London, and 16 times more contaminated than in Tokyo. China is the only country outside the industrialized world with a serious acid rain problem.
- In Bangkok and Jakarta, ambient levels of particulate matter exceed World Health Organization standards for 100 or more days a year, while sulphur dioxide standards are exceeded for more than 50 days a year in several Southeast Asian cities.
- Levels of faecal coliform and dissolved mercury in many Asian rivers are 50-100 times above recommended safety levels.
- According to one study, 85 per cent of river water in China is unsuitable for drinking because of pollution.
- Solid waste volumes in Bangkok have increased 200 per cent in the last ten years. In many areas of the country, waste is simply not collected but dumped in rivers, canals and on the street, while waste that is collected is often dumped without proper controls.
- Between 1961 and 1985, Thailand cut down 45 per cent of its forests, including almost all its virgin rainforests.

Nor do the signs seem encouraging. During the 1980s, energy consumption in the region grew at a faster rate than anywhere else, and Asia could account for 35 per cent of the world's total energy demand by 2015. By then, Asian demand will have expanded by 150 per cent compared with 1993, with China and India leading the way. Carbon dioxide emissions, which have increased by 30 per cent in the region since 1995, are also set to continue rising.

Massive investments needed

While the situation seems grim, it does provide the opportunity to introduce environmentally sound technology (EST) solutions on a massive

Interactive Water Management Planning – the DHV approach

Times are changing faster than ever – and people's acceptance of change is no longer uncritical. This certainly applies to their environment: now, they are ready to stand up and be counted, and expect to be informed, consulted and, above all, involved in key decisions.

So, the decision-making process across the world must be handled with care. The effects of a project – redeveloping an urban area, building a high-speed rail link, locating a water treatment plant – on the local population and environment have to be thoroughly thought through *from the outset.*

The role of consultants has changed too. DHV used to be engineers commissioned simply to solve a specific problem. We still provide engineers: but we are also multidisciplinary consultants working alongside our clients to provide planning, development and strategic advice from a project's conceptual state.

The DHV Group ranks amongst the top 20 international consultancies in its field. We have been working for large and small companies, international financiers, government agencies and non-profit organizations for 80 years. We employ 2,500 people in over 40 locations worldwide – focused on transport, infrastructure, water, the environment, physical planning, agriculture, industrial accommodation, construction and institutional strengthening and development.

Clients expect us to understand local circumstances: our permanent presence in 16 European, Asian, African and Latin American countries ensures this. But our local people are also backed up by DHV's central knowledge centres: for transport and infrastructure, water and environment, accommodation building and international development (which carries out projects for organizations such as the World Bank). Clients take their specific demands to their nearest DHV office, which organizes the right mix of local knowledge and specialist expertise. This is the key to DHV's success.

DHV has almost 80 years' experience with all kinds of water issues – and we have been working on environmental problems for more than 30 years. Our efforts are focusing on water pollution control in public and private sectors, water supply and distribution, promoting the re-use of purified waste water and transforming waste into products with an economic value.

Today, we are introducing a new interactive approach to water management planning which – because we are the largest consultancy for water in the Netherlands – is becoming the established norm in the country and abroad. It involves nine different but interrelated steps. These nine steps create the structure of a plan cycle, on the strategic, tactical and operational levels – advancing the interchange of knowledge and know-how, easing decision-making, setting the framework for a potential water management network in which everyone concerned can participate, and providing a comprehensive and integrated system for balancing diverse interests.

We believe this new approach can address many of the water problems worldwide: indeed, we are using it in our water management rehabilitation study in Bosnia and our water basin management project in Indonesia.

As issues of water availability and quality move to the top of the sustainable development agenda, the task in the years ahead will be the total management of water and the environment, with an eye for economic and social factors. Our approach is an increasingly important contribution to achieving this goal.

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BOX 14.1

Progress on cleaner production in China

Nowhere in Asia is the need for action greater and more urgent than in China, whose emergence as an industrial 'super power' is having, and will continue to have, an increasing economic and environmental impact, not only on the region but on the world.

By 1992, China was producing an estimated 14.4 million tonnes of dust a year and 16.85 million tonnes of sulphur dioxide; and solid wastes were increasing by 20 million tonnes annually. China is set to become the world's leading source of carbon emissions by 2010. By the early 1990s, the pollution control budget, mainly end-of-pipe measures, had reached 0.8 per cent of gross national product. Many of the fastest-growing enterprises are based on high energy and high materials consumption, while rural enterprises (and there are 25 million of them, employing 125 million people and accounting for a quarter of the national economy) are among the heaviest polluters.

The Chinese authorities and the international community are alert to the challenge, and a project launched by the National Environmental Protection Agency, which ran from 1993 to 1995, has achieved some important results. It has also acted as a springboard for further efforts to promote cleaner production and the use of environmentally sound technologies (ESTs) more widely throughout the country.

- Stage one involved choosing a national centre to deal with cleaner production (this later became the Chinese National Cleaner Production Centre). The first Chinese experts were trained in cleaner production techniques; materials and manuals were produced; and audits were conducted in 11 companies in Beijing, Changsha and Shaoxing.
- Stage two was a demonstration phase: audits were carried out in 18 companies in Beijing, Shaoxing and Yantai, and options that required little or no investment were implemented, producing substantial economic and environmental savings.
- Stage three evaluated the policy obstacles to cleaner production in China, and set out a strategy for a long-term approach.
- Stage four began in March 1995 and aimed at the large-scale dissemination of cleaner production through several workshops, and a batch of materials, including sectoral guides, and general information brochures and newsletters.

The following has been achieved since 1993.

- A National Cleaner Production Centre has been established.
- Six hundred people have attended training sessions, with 150 professionals now officially qualified in cleaner production auditing.
- A network of Chinese institutions has been established.
- Twenty-nine cleaner production audits have been conducted in 27 enterprises, resulting in:
  - annual economic benefits of US$2.9 million from adopting management or technology changes which required little or no investment;
  - pollution reductions averaging 30-40 per cent, and reaching 95 per cent in some cases;
  - identifying technology changes that could save more than US$215 million a year for a US$200 million investment.

These results demonstrate not only the value of cleaner production and ESTs, but the successful cooperation between the national and local authorities in China and international organizations. UNEP's Industry and Environment Centre (UNEP IE), the World Bank and the United Nations Industrial Development Organization (UNIDO) have all been involved.

Now, with a national system in place, the goal is to introduce the cleaner production approach and ESTs to 3,000 companies over the next five years, with the top 100 polluters in China the main target. Already, the UNEP Regional Office for Asia and the Pacific is assisting in a project for the pulp and paper industry in six Chinese provinces; a number of bilateral projects have been introduced to other industrial sectors; and the World Bank and UNEP IE are establishing funds to help finance future projects.

scale. The enormity of the need is clear (for example, it has been estimated that China alone should invest US$50 billion in new technologies to mitigate greenhouse gas and acid rain emissions), and there is a growing recognition by many governments that they must invest in ESTs because further environmental deterioration will actually hurt their continuing economic growth.

Such investment is already beginning to

happen. The United Nations Development Programme (UNDP) estimates that China (including Hong Kong and Taiwan) and Singapore will between them spend approximately US$2 billion a year on air pollution control by 2000. And, according to the Regional Institute of Environmental Technology (RIET) in Singapore, overall expenditure on ESTs in China (including Taiwan), India, Indonesia, the Republic of Korea, Malaysia, the Philippines, Singapore and Thailand, is increasing at between 6 and 25 per cent a year. Hong Kong, for example, has recently developed three fully lined landfills with leachate and gas collection as advanced as anywhere in the world; Taiwan is building 21 waste-to-energy plants for treating the majority of its solid wastes; and Singapore, long a pacesetter in providing primary and secondary treatment of all sewage, is upgrading its systems even further.

However, the picture is a mixed one. The fact is that only the 'Asian Tigers' and a few of the 'Tiger Cubs' (as well as Japan) can afford to import ESTs from the western world – and their ability to do so has now been compromised by their recent economic difficulties. Nor is lack of money the only problem. The Confederation of Indian Industry has complained that many ESTs are still not available in India, and has stressed that many western technologies need to be adapted to local conditions. For example, a US$16 million incineration plant in New Delhi had to be scrapped when it was realized that Indian waste is highly organic and too moist to be burned properly.

What is happening?

According to the RIET report, providing efficient waste collection services and landfill sites is a municipal waste management priority in most countries: nowhere more so than in China and India, where most solid waste is simply dumped in open sites. The Republic of Korea is also investing heavily in waste incineration. The report notes that a number of local companies in India have shown interest in investing in waste treatment technologies, "although there appears to be a predisposition towards complex solutions not necessarily appropriate to the prevailing situation".

All types of wastewater treatment equipment are needed in the region, but each country has its own specific requirements. For instance, technologically-advanced Singapore does not need the high-volume primary treatment systems so badly required in India, where only 8 out of 3,119 cities and towns have full sewage collection and treatment facilities. Some countries lack the finance to invest in wastewater ESTs. They include China, where there is an urgent need to build facilities to treat sewage that is polluting water supplies. China's first survey of industrial pollution, conducted in 1988, found the country had 165,000 polluting factories, and the government estimates it would cost US$3.7 billion to retrofit these factories with pollution control equipment. Another problem in China is that several individual factories share one building so any pollution control equipment has to be compact enough to fit into the limited available space.

Providing clean water supplies to the rapidly growing populations is a priority in the region where, in some countries, 50 per cent of the people living in rural areas still have no access to safe drinking water. There is a major requirement for water treatment plants, including on the many newly established industrial estates, because companies cannot rely on the poor quality and erratic supply of public water for their processes.

Many countries in the region are suffering severe air pollution problems. The major pollutants are carbon dioxide, nitrogen dioxide, sulphur dioxide, lead and suspended particulates, mainly from vehicles, manufacturing operations and power generation plants. At the moment, the market for end-of-pipe air pollution technologies is relatively small, although this is

expected to change quite quickly as governments begin to enforce regulations and standards more rigorously. Indonesia, for example, is focusing on the chemical, cement and steel industries, which are considered to have enough capital to invest in air pollution control equipment. Since many firms in these sectors are state-owned, they are under direct pressure to comply.

Many Southeast Asian countries have implemented measures to tackle air pollution, such as requiring new cars to have catalytic converters and making unleaded fuels more readily available, although the latter can require significant investment. The technologies most in demand at present are simple dust extraction and filtration equipment, pulse fabric filters, and high-tech electrostatic precipitators, scrubbers and bag filters. There is also some limited demand for flue-gas desulphurization for coal-fired thermal plants.

The driving forces

RIET points out that the driving forces towards environmental improvement in the region are diverse. In the Republic of Korea, Singapore and Taiwan, the market for ESTs is being driven mainly by:

- pressure from central governments, including increasingly stringent regulations;
- improved enforcement of environmental regulations by newly empowered and resourced 'policing agencies';
- public pressure;
- the corporate environmental policies and programmes of the larger international companies;
- the emergence of ISO 14001.

In the less developed countries, the driving forces are 'softer' and less effective, resulting in environmental improvement being given a lower priority. Typical forces are:

- local and national regulation, though the level of enforcement is low;
- the corporate environmental policies of international companies, which require local partners and suppliers to meet their standards;
- international donor-assisted initiatives in environmental protection.

RIET predicts that as these countries get richer, the driving forces will become 'harder'.

BOX 14.2

Japan provides lessons for the whole region

Japan obviously offers some lessons to the other countries in Asia and the Pacific. Immediately after the Second World War, Japanese policy makers gave priority to economic recovery and industrial growth, and the environment was of low importance. But real annual growth in Japan of 12 per cent in the second half of the 1960s was matched by an increasing amount of pollution of the air, water and soil, particularly in the major cities. In response to mounting pressure from the public and local governments, the central government introduced, in 1958 and then in 1962, the first major pieces of national environmental legislation. The foundations for Japan's current system of tough pollution control laws and regulations were laid in 1967, and the regulations have been progressively tightened since then.

Private sector investments in pollution control started to become significant in the late 1960s and peaked sharply in the mid-1970s: in 1975, they represented about 14 per cent of total private capital investment, and 0.63 per cent of gross national product (GNP). The government first began to provide subsidized loans towards pollution control investment in 1963, but by 1991, 71 per cent of the investment by private companies in pollution control was financed either by the firms themselves, or by commercial bank loans, and only 24 per cent was funded by government lending institutions. In addition, there has been massive public investment – in sewerage and sewage treatment, and solid waste disposal, for example – which during 1986-1991 averaged 0.74 per cent of GNP a year.

Many of the pollution problems caused by conventional industrial pollutants were brought under control during the mid-1970s, when pollution levels started to fall rapidly. However, some problems persist, with toxic chemicals, solid and hazardous wastes, and water pollution from non-point sources. Various studies have shown that the volume of pollution control investment has had, at worst, a negligible effect on growth of gross domestic product. In the mid-1970s, the costs were high for such industries as textiles, pulp and paper, iron and steel, non-ferrous metals and electric power. Since then, the impact has fallen sharply, finally becoming insignificant.

> "The South feels that sacrificing growth will only perpetuate injustice. Developing countries deem it unreasonable that they are required to address long-term environmental problems at the expense of immediate needs"
>
> Goh Chok Tong, Prime Minister of Singapore

The report states: "Another significant driver could develop with the 'voluntary greening' of large local and regional companies – as happened with their European, American and Japanese counterparts. For example, in Hong Kong, one of the large electricity producers in Asia has voluntarily developed its own environment management system. Many other companies are also proceeding down this road and, as part of this, are often requiring better performance from suppliers. Corporate policy and programmes could become an even more significant pressure for change in a developed Asia than they were in Europe and the United States."

Reluctance on cleaner production

The RIET report also assesses the demand and opportunities for moving to clean as opposed to end-of-pipe technologies in Asia. It gives a number of reasons why companies are reluctant to move to these ESTs:

- end-of-pipe approaches are generally cheaper in the short term;
- they often have a higher profile and are usually less disruptive to current production processes;
- there is a well-developed market for end-of-pipe technologies, whereas clean technologies are more process-specific and the expertise to implement and maintain them may not exist;
- the longer-term nature of the return on investment can make it difficult for companies to commit themselves to clean technologies;
- emission standards may be less stringent than in developed countries, so companies may not think such investments are worthwhile;
- investment in production equipment has often not been amortized, so companies are unwilling to reinvest in wholesale changes.

One way forward, says RIET, is for governments in the region to avoid the "rigid" command-and-control regulations used in the United States and Europe, which force companies to use end-of-pipe technologies to meet specific emissions targets. In Asia, "legislation could be geared so that companies could divert resources to process changes that reduce environmental impacts – rather than trying to meet specific standards". However, the report warns that those trying to sell clean technology applications to companies in the poorer countries in the region will have to "prove that they could produce greater financial returns in the short to medium term over other technologies", and that the applications will have to be "robust, relatively easy to service and able to utilize readily available processes and chemicals, and equipment to be viable".

Finding the finance

Finding the finance to pay for ESTs and other environmental improvements is of course an issue for most countries in the region. The Asian Development Bank (AsDB) in Manila has warned that if industrialization continues to be at the expense of the environment, its benefits will be outweighed by the costs of environmental degradation. In response, it has undertaken to allocate 40 per cent of its annual lending of US$3.5 billion to environmental projects. The AsDB recognizes that this is only a fraction of what is needed, but says its investments will stimulate action and spending

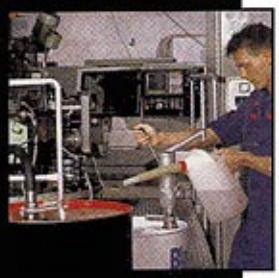
by governments and the private sector. The AsDB sees its main role as helping governments to introduce and enforce tough environmental standards and rules, as well as a system of economic instruments, such as 'green' taxes and the pricing of resources so their use more closely reflects their true cost.

Other sources of finance could be domestic capital markets and co-financing with the private sector. ECO ASIA is an informal meeting of environment ministers from 24 countries, including Australia, China, India, Japan and the United States, and ten international organizations including UNEP, the AsDB, the Organisation for Economic Co-operation and Development (OECD) and the Economic and Social Commission for Asia and the Pacific. A report from ECO ASIA in May 1996 said that, under a 'business as usual' scenario, by 2025 the manufacturing sectors of countries in the region would increase between 300 and 800 per cent, primary energy consumption would rise to 2.3-3.8 times the 1990 level, there would be serious air and water pollution as well as an increase in industrial waste, and carbon dioxide emissions would account for 36 per cent of the world's total. The report called for a number of reforms, including more investment in environmental protection and energy conservation, and also urged the private sector to transfer ESTs to subsidiaries or joint ventures in developing countries.

Other regions in brief

In order to provide a comparison with Asia, environmental problems in other regions are examined briefly below.

- In Northern Europe, the main concerns are acid rain and pollution from both industry and traffic, and water quality. While industrial pollution is decreasing, natural resources continue to face pressure from urbanization and pollution. This is the largest regional market for environmental protection in the world, estimated at US$15-20 billion a year, and growing at over 4 per cent annually. The fastest growing sectors are desulphurization, emission controls, wastewater and sewage clean-up, waste treatment and incineration. Longer term, the growth areas will be 'greener' transport, plastics recycling, energy efficiency and 'soft' energies. The European Union (EU) is the main driving force for environmental action, but individual member states – notably Finland, Germany, the Netherlands and Sweden – often set an aggressive pace on policies through their national legislation. 'Polluter pays' has gradually become accepted as the basic tenet of government policy.
- Southern Europe is not as advanced environmentally, but this is changing, largely due to the EU. Italy, for instance, has introduced a number of environmental laws in the last few years, and Greece, Portugal and Spain are also plugging gaps. However, the regulations are not always enforced rigorously, even by the EU. Water and waste treatment are two expanding sectors, while end-of-pipe ESTs are in demand by industry as companies move to comply with tightening standards. The extent to which Southern Europe moves more rapidly will mainly depend on whether the EU insists on these countries complying with EU-wide rules.
- The major problems in Central and Eastern Europe (including Russia) are massive air pollution, contamination of millions of hectares of land by industrial wastes, and poisoning of rivers and seas by chemicals. The state of many of the region's ageing nuclear reactors is a critical concern. Most countries are gradually developing legislative and structural frameworks, mixing a 'polluter pays' approach with a blend of tax incentives, subsidies and fines. While the need for ESTs is unlimited, the problem is 'Who pays for them?'
- Environmental awareness is growing, but only slowly, in the Middle East, and the



MICRO MATIC A/S: CLOSING THE LOOP ON ENVIRONMENTAL PROTECTION

The prudent use of chemicals in agriculture and industry is essential to economic growth in both the developed and the developing nations. A clean environment is also essential to long-term viability, and modern technology is beginning to make these two needs compatible. With this object in view, Micro Matic A/S, headquartered in Odense, Denmark, is helping foster a cleaner world and a safer workplace with its closed system technology for liquid transfer.

Micro Matic established its expertise with the design and manufacture of extractor valves and coupler heads for the beverage industry. It now leads the world in supplying dispensing equipment for beer, wine and soft drinks. But helping people around the world relax and enjoy a drink is only part of the Micro Matic mission. Micro Matic knows the importance of environmental quality and worker safety. That's why the engineers at Micro Matic have adapted their technology to the task of liquid chemical packaging.

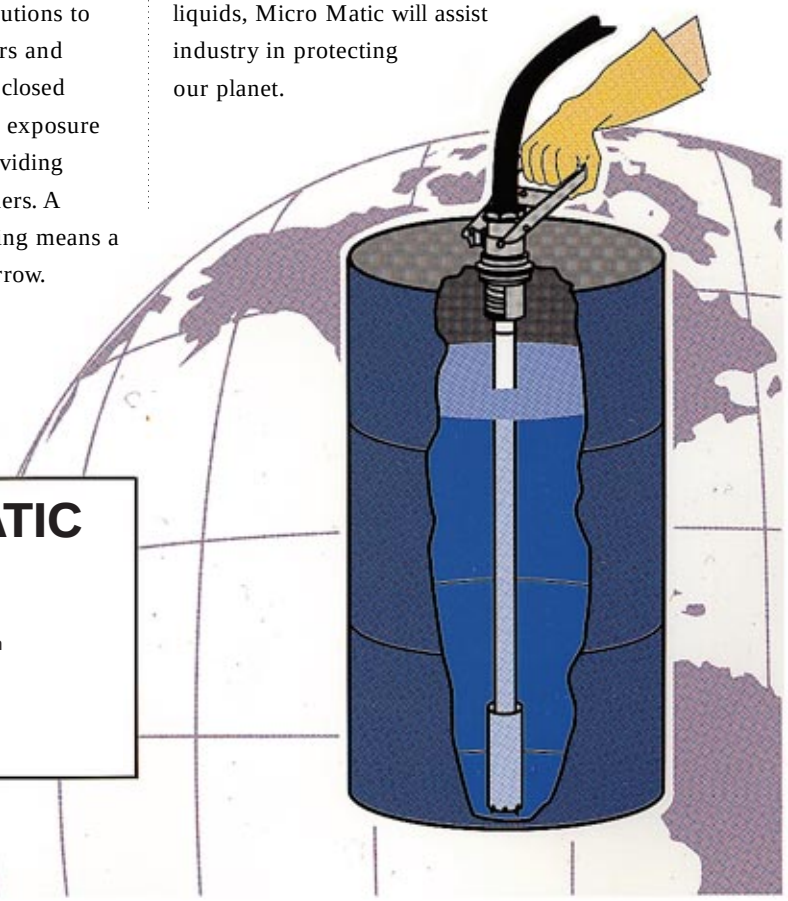
With nearly 100,000 chemicals now in commercial use, the need for secure containment of liquid chemicals is a top priority. The Micro Matic Drum Valve System and Macro Valve System offer environmentally safe solutions to the standardization of liquid containers and drums for returnable packaging. The closed liquid transfer system reduces worker exposure and product contamination while providing reusable, refillable drums and containers. A closed system with recyclable packaging means a commitment to a cleaner, safer tomorrow.

The Drum Valve System and the Macro Valve System both passed UN group I, II and III tests for hazardous materials packaging.

As defined in the Earth Summit report, Micro Matic technology helps "to stimulate industrial innovation towards cleaner production methods, to encourage industry to invest in preventive and/or recycling technologies so as to ensure environmentally sound management of all hazardous wastes, including recyclable wastes, and to encourage waste minimization investments."

Production of the industrial product portfolio occurs at the Micro Matic plant in the United States, Micro Matic USA, Inc. Environmental concerns and corresponding governmental regulations in the USA have created high demand for safe, secure, reusable packaging for industrial liquids, particularly commodity agricultural chemicals such as herbicides and insecticides.

As the first principle of the 1992 Rio Declaration on Environment and Development stated, "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." As other global markets begin to adopt closed system standards of safety and reliability in the packaging of hazardous liquids, Micro Matic will assist industry in protecting our planet.



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environment comes well down the list of government priorities. But the region faces enormous and potentially unsustainable pressures on its water supplies (salinity is a growing problem because of poor irrigation techniques) and the major cities face increasing air pollution problems. The main opportunities for ESTs are for water conservation technologies, the development of drought-tolerant crop varieties and solar energy generation.

- Air and water pollution top the environmental concerns in Latin America, where three-quarters of the people live in urban areas. In southern Brazil and Mexico, pollution from factories and cars has reached crisis proportions in the cities. The industrial conglomerate of Cubatão, near São Paulo, has been called the most polluted city on Earth, while Mexico City has the worst air quality of any world capital. However, while most governments in the region have an environmental policy in place, enforcement generally lags well behind legislation and this is likely to hinder the widescale adoption of ESTs in industry.
- Sub-Saharan Africa is the world's poorest region. It faces a multitude of environmental problems, desertification and water shortages being the most urgent. Industrial pollution is less of an issue generally in the region, although chemical contamination of rivers and coastal waters is becoming a major concern in Nigeria, Ghana and Kenya. Smokestack pollution is severe in parts of South Africa, which relies on coal for 80 per cent of its energy. The main needs for ESTs are for water conservation, recycling and, in some parts, pollution prevention, but most African governments show little means or will to enforce an environmental agenda.
- North America has some of the toughest environmental legislation in the world, and the United States Environmental Protection Agency is arguably the most powerful environmental regulatory body. Air quality is the major issue, while water pollution is another serious concern. Water supply is an emerging problem. United States companies continue to invest hugely in ESTs both in response to federal and state legislation (for example, in California) and because of the now ingrained culture of corporate environmentalism. Regulations have driven technological innovation, and with the expected shift from command-and-control to market-based economic incentives, there is unlikely to be any let-up.

There is no region without its environmental problems. Some areas, such as North America and Western Europe, have more experience with addressing environmental issues, whether through legislation or economic means. Others, such as Asia, now have the economic clout to begin addressing their environmental problems. The question is their willingness to do so. Given that the region will remain an economic powerhouse, Asia remains a key litmus test of whether economic and environmental interests and needs can be balanced successfully.

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