Pollution that is increasing even faster than the economy is growing is how China's current environmental situation can be summarized. While the country has taken steps to protect the environment, all efforts are coming to naught in view of the country's tremendous economic growth. However, the environmental costs are now surpassing the economic gain, which requires the country to act not only for ecological but also economic reasons. In its 11th five-year plan, the Chinese government has set itself ambitious goals for environmental protection until the year 2010, opening the environmental market with its huge potential in the medium term to foreign investors.

China's *environmental costs* make action mandatory

About 22 percent of the world's population live in China, having access to only 9 percent of the world's agriculturally usable land, 6 percent of the global water resources, and 4 percent of the forest. For this reason, sustainable growth is vitally important for China. In order to prevent environmental protection measures to be constantly outstripped by economic growth, the Chinese government will have to create the framework for more energy-efficient and resource-efficient economic activities and make major improvements in the environmental infrastructure.

One of China's most severe environmental problems is water shortage and pollution. Water is especially scarce in northern China. Overgrazing, intensive irrigation with the result of groundwater level declines, and the deforestation intensify the problem. Another aggravating factor is the intensive agriculture and the use of large quantities of fertilizers and pesticides.

70 percent of the water bodies in China are considered polluted. According to China's State Environmental Protection Administration (SEPA), 300 million farmers do not have access to clean drinking water. In urban areas, the situation is worse. 90 percent of the rivers are polluted, which is no surprise, as only a quarter of the urban wastewater is treated in wastewater plants. Treating half of China's wastewater according to common environmental standards would require 10,000 wastewater treatment plants and investments of more than US$48 billion.

Air pollution is especially dramatic in China's cities. 20 of the world's 30 cities with the highest air pollution levels are located in China.

The main air polluter is energy generation. Two-thirds of China's energy is supplied by coal. Chinese coal is high in sulfur and produces heavy ash upon combustion. Many factories lack air filters, therefore emissions are released to the atmosphere unfiltered. This results in high levels of air contamination with sulfur dioxides, nitrogen oxides, soot and dust. The outcome of sulfur dioxide emissions is acid rain, which severely damages the vegetation.

As a supplier of 23 percent of China's overall energy needs, oil is the second most important energy resource. With only 3 percent of the overall

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Picture: archives

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energy use, natural gas, which impacts the environment much less than oil, is insignificant.

Making energy generation more efficient and ecological is the prerequisite for better air quality. China, however, plans to expand its energy-generation capacities in the next few years. Even if air filter technologies are introduced in existing power plants and new power plants work more efficiently, the increasing energy demand and production will most likely surpass these efforts.

The same dilemma occurs in transportation. Air pollution caused by individual transportation has been severely increasing for several years. In many cities, such as in the capital city of Beijing, emission limits following European standards have been introduced. However, in view of the 1,300 new licenses for passenger cars that are issued in China every day (2004 statistics), this represents one step ahead in one area and going back two steps in another, which is symptomatic of China's environmental problems.

Chemical accidents: the tip of the iceberg

In 2005, two accidents drew the attention of the media to China's chemical industry. An explosion at a factory in northeastern China in November led to the running of 100 tons of benzene and nitrobenzene into the Songhua River, forming an 80-kilometer-long slick of heavily-contaminated water that hit the city of Harbin and left four million people without public water services for five days. Two weeks later, another blast occurred at a chemical factory in the southeast, killing one worker and requiring the evacuation of 6,000 people after large quantities of benzene were released.

Harbin residents only learned about the danger five days after the accident – an information policy that gives a hint as to how big the iceberg, of which just the tip has become visible, actually is. Every other day, says Pan Yue, deputy director of China's State Environmental Protection Administration, there are "large-scale accidents caused by the chemical industry".

A recent study by SEPA, China's State Environmental Protection Administration, revealed that half of the 7,555 investigated chemical facilities bear the risk of severe chemical accidents. 50 of the factories must even dismantled and reinstalled at different, more suitable locations. 80 percent of the investigated factories are near waterways or in densely populated areas.

The accident that contaminated the Songhua River in November 2005 happened at a chemical factory that is part of the government-owned Jilin Petrochemical, a subsidiary of PetroChina. Many experts view the lack of monitoring and control of industrial activities as a serious problem, as well as the fact that the established state-run companies are not subject to effective controls. A similar neglect of control and monitoring occurs

also at small and medium-size enterprises.

However, for new investments, the Chinese authorities apply stringent rules and regulations. All plants built with foreign investment have to comply with western standards.

The Chinese Government passed its first major environmental enactment, the Environmental Protection Law, in 1979. Since then, a total of nine environmental protection laws and 15 laws for resource protection have been enacted. China has a modern environmental legislation today. For example, in 2002 the Cleaner Production Promotion Law was enacted nationwide to foster production-integrated environmental protection. To date, 5,000 companies, to a large extent companies of the process industry, have received the "Cleaner Production" certificate.

Since 2003, a new law requires all large industrial projects to be checked for environmental compatibility. In 2005, China passed a new law to boost renewable energies. Chinese legislation also includes a detailed list of environmental and emission standards that is continuously expanded.

Planned measures until the year 2010

SEPA estimates that ten percent of the country's GNP is spent on environmental protection today. Other sources estimate environmental expenses ranging between 8 and 12 percent. Pan Yue, SEPA's deputy director, says that due to environmental pollution, the People's Republic of China has lost "almost everything that the country gained since the late 1970s". The Chinese Government has recognized that improved environmental protection is indispensable in order to preserve the foundations of life for the country's 1.3 billion citizens and to prevent exploding environmental costs from jeopardizing the economic growth. The 11th Five-Year Plan for 2006-2010 contains ambitious goals and measures to curb environmental hazards. The goals include:

- to lower energy consumption of per unit GDP by 20%,
- to reduce water per unit of industrial added value by 30 percent,
- to reach a 60% recycling rate of solid industrial wastes,
- to reduce the total emission volume of major air pollutants independent of the economic growth.

Other goals are improving the environmental quality in "key" regions and cities, halting general environmental deterioration, controlling the major pollutants more effectively, improving the air quality in "key" cities, and taking various measures to improve water quality. The plan also includes a "significant reduction" of the emission intensity of "key" industrial sectors. Chinese authorities are to be given more administrative governance in environmental affairs, and the body of environmental legislation and standards is to be completed. An important issue is the building of an ecologic cycle management system and an environmental protection industry.

The European chemical industry is ready

European chemical corporations have ventured early into the Chinese market and invested billions in it. BASF, one of the first European companies in China, has ten subsidiaries and seven joint ventures in China today.

Until 2009, Bayer will be investing US$1.8 billion in facilities at the Shanghai Chemical Industry Park. The Bayer spin-off Lanxess has three production facilities in China, namely in Shanghai, Quingdao and Wuxi. In 2005, Bayer achieved a turnover of €1.26 billion in China.

With production plants all over China, Degussa is planning to reach an annual turnover in China of €800 million by the year 2009. Other companies with production plants in China are Altana and Südchemie.

The European chemical corporations bring with them extensive know-how in environmental protection. Their facilities in China comply with both the current global standards according to Responsible Care, the chemical industry's

global voluntary initiative, and the high standards that the Chinese authorities are enforcing upon new industrial installations.

While China and its industries urgently need this know-how, the cooperation in environmental protection is rather difficult. "There is great interest in environmental technologies from Germany," says Dr. Armin Knors, head of Bayer Technology and Engineering Shanghai, a subsidiary of Bayer Technology Services, "but when it comes to signing an agreement and costs occur, it's over." Knors thinks that environmental protection on the local level plays only a minor role, and there is no money for installing plants with higher safety standards.

However, there is some progress. For example, in October 2006 Bayer Technology Services and the management of the Shanghai Chemical Industry Park signed an agreement to jointly pursue environmental protection projects and cooperate in the conversion of biomass. Projects are currently under planning.

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The environmental market in motion?

If China wants to get somewhat close to reaching its environmental goals and a sustainable economy, the Chinese environmental technology market must grow faster than the rest of the economy. Then it will take China only a few years to implement what western industrial countries have developed and built for decades. Germany is an important partner for China in this field. In December 2006, the German Federal Environment Minister and the head of China's SEPA established a German-Chinese environmental dialog and agreed on the expansion of the cooperation in chemicals management as well as on other cooperation projects.

In the coming years, an entire environmental infrastructure with a large number of wastewater purification plants, waste incineration and treatment plants will have to be built in China in order to keep up with the pace of the booming market. An ecologic cycle management system is to be established. Reaching the goals of increased energy and resource efficiency and "Cleaner Production" will require significant efforts, in terms of financing as well as infrastructure and organization.

Western companies of the process industry are ready. For them, the development in China offers many opportunities in many sectors, from plant engineering to catalyst production, filter materials, chemicals for wastewater treatment, or consulting and services. The potential of the environmental market in China is huge. ■