

# The Ecological Situation in Kazakhstan – A Damage Report

The environmental problems in the central and east European countries and in the successor states to the Soviet Union are so serious as to require greater attention from those researching the process of transition in the former Eastern Bloc. Environmental damage in these countries has been caused primarily by the neglect of environmental considerations by the planning process and the serious price distortions, which offered incentives to waste resources. Besides this legacy of the past, these countries now also face 'modern' environmental problems, such as the increase in private transport and domestic waste. Of the successor states to the former Soviet Union, Kazakhstan faces some of the worst environmental problems. In the division of labour that existed between the communist countries, Kazakhstan was a supplier of primary and intermediate goods. As a result the country's economic structure is based primarily on the extraction and processing of primary goods and exhibits a bias in favour of heavy industry. In addition, the large and sparsely populated country was the main site for testing nuclear and biological weapons. Ecological problems clearly constitute a barrier to the country's development; its gravity can scarcely be overestimated.

In the state-socialist economic system prices reflected the relative scarcity of goods to only a limited degree. Rather, their main function was to ensure that the plan was fulfilled, and the plan focused primarily on political objectives, such as promoting certain industries, e.g. armaments or heavy industry. Specifically, the prices of primary and intermediate goods and of basic consumption goods were kept artificially low; as a result such goods were used uneconomically. This, in turn, blocked structural change that would have favoured forms of production that placed less of a burden on the environment and used resources more economically. An 'extensive' mode of production was thus conserved.

A neglect of environmental concerns by the planning process and in its implementation that had its origin in differences in time horizons was highly conducive to environmental pollution in the former state-socialist countries. Whereas environmental damage and protection are primarily long-term in nature, and their impact often cannot be easily determined, plan fulfilment had a time horizon of no more than five years. This structured the incentives for enterprise directors and the state offi-

cialists in the authorities responsible accordingly: non-fulfilment of the plan could seriously damage one's career, whereas only in exceptional cases would environmental pollution have negative repercussions.

## Environmental 'hot spots' in Kazakhstan

Among the most serious aspects of the catastrophic ecological legacy of the Soviet Union are the consequences of nuclear and biological testing in Kazakhstan – and not only there – and the drying out of the Aral Sea.

### Nuclear test areas

After the Second World War the Soviet Union set up its central testing area for the atomic bomb – alongside the island of Novaya Zemlya in the Arctic Ocean – near the town of Semipalatinsk in the steppe of eastern Kazakhstan. Additional nuclear test areas that have also done serious environmental damage were located in the oblast (district) of Atyrau in southern Kazakhstan. According to the Kazakh environment ministry 470 atomic bomb tests<sup>1</sup> – 26 above ground, 90 atmospheric and 354 below ground – were conducted between 1949 and 1989; safety procedures were in some cases crassly inadequate. The direct fall-out was spread over an area of 304 000 km<sup>2</sup>. In 1993 an area of 7 million hectares was classified as extremely heavily contaminated. In almost two-thirds of this area abnormal changes in vegetation were observed.<sup>2</sup> Estimates of the number of people directly affected vary between 700 000 and 1.5 million.<sup>3</sup> The public health situation in this area is correspondingly critical: there has been a marked rise in cancer cases, skin diseases and abdominal complaints. In many cases the ageing process begins far earlier than normal; the immune system of the local population has been seriously weakened. Genetic mutations have been observed, including cases of mental debility. There has been a substantial increase in the suicide rate. Life expectancy is now just 47 years, compared with the national average of 64 years. Apart from the direct radioactive contamination to which the population was exposed, the measures taken by the Soviet authorities to conceal and play down the seriousness of the pollution aggravated the damage done. Although the military investigated the impact on the population relatively quickly and compre-

<sup>1</sup> BBC Online Network, Nuclear nightmare revealed, 19.3.1999. <http://news1.this.bbc.co.uk/hi/english/world/asia>.

<sup>2</sup> Figures from the environment ministry.

<sup>3</sup> BBC Online Network, Nuclear nightmare revealed, 19.3.1999.

Figure 1  
Kazakhstan



Source: <http://www.odci.gov/cia/publications/factbook/kz.html>

ensively, the results of this research were kept under wraps. It was not until 1962 that civilian medical studies began, and even subsequently virtually nothing was done to offer the population effective protection and to provide adequate medical provision.

#### Biological test areas and production plants

Plants located in Kazakhstan played a key role in the Soviet Union's biological weapons programme. Four plants were particularly important: Vozrozhdenye Island in the Aral Sea, the main testing area for biological weapons; the production plant for biological weapons in Stepnogorsk,<sup>4</sup> the institute of agricultural science in Gvardeysky (near the town of Otar and around 180 km from Almaty); and the epidemiological institute in Almaty.

The situation on the island of Vozrozhdenye in the Aral Sea may well prove extremely serious. Since the

1930s open-air testing of anthrax, smallpox and plague pathogens, among others, has been conducted on both animals and bacteria. The island appeared to be ideal for such experiments given its geographical location, the substantial fluctuations in temperature and the low population density in the surrounding area. Even so there were repeated epidemics and the deaths of thousands of animals on the mainland and fish in the Aral Sea. There were also reports of illnesses among persons who had visited the island. After the dissolution of the Soviet Union Moscow abandoned the island and the military installations were destroyed. The authorities had given assurances that the island would be decontaminated before being abandoned, but the lack of financial resources meant that this almost certainly did not occur.<sup>5</sup> The contaminated island poses a threat to Kazakhstan in two respects. Firstly, although it has been declared a no-go area, people have been searching for reusable items in the abandoned facilities since the army was withdrawn; secondly, the continuing fall in the water level of the sea means that the island will soon be linked directly to the mainland (model calculations forecast this will occur in 2010).

The dangers resulting from Kazakhstan's former biological weapons plants are immense. Comprehensive exploratory studies and decontamination need to be

<sup>4</sup> The plant set up in Stepnogorsk in 1982 for the purposes of both production and experimentation was one of the largest plants of its type ever built. Its tasks encompassed research into, developing and testing, producing and storing biological weapons. Specialising primarily in anthrax, capacity was planned so as to be able to produce 300 tonnes within 10 months in the event of an emergency. These figures are taken from: Monterey Institute for International Studies, 'Former Soviet biological weapons facilities in Kazakhstan: Past, present and future', Monterey 1998.

<sup>5</sup> *The Economist*, 'Poisoned island', 10.6.1999.

accomplished, tasks for which the country currently has neither the financial resources nor the know-how. The exodus of scientists from the plants affected and the lack of knowledge on the extent of contamination resulting from years of secrecy and the subsequent abrupt withdrawal of the military are making it even more difficult to resolve the problem.

## Aral Sea

Since 1968 the water level of the Aral Sea, which straddles the territory of both Kazakhstan and Uzbekistan, has fallen by around 16 metres. The sea has now split into two parts, which used to be linked by a small canal. This is the result of the reduced inflow of water from the two rivers Amu Darya and Syr Darya, which in turn results from the intensive irrigation practices in all the former central Asian republics of the Soviet Union. The impact on the region is catastrophic:

- The equilibrating effect of the Aral Sea on the regional climate has been reduced, leading directly to more extreme temperature fluctuations and storms.
- Salt, pesticides and herbicides (the latter resulting from intensive agriculture, particularly cotton production) are blown from the dried-out former seabed, leading to desertification and rising salt levels in areas beyond those immediately affected by the fall in the water level.<sup>6</sup> As a result, more and more sources of drinking water are having to be abandoned.
- Traditional economic sectors, such as fishing and agriculture, are disappearing, while investors are reluctant to commit resources to this structurally weak and ecologically problematic area.
- Infant mortality rates in the Aral Sea region are the highest anywhere in the territory of the former Soviet Union.<sup>7</sup>

The situation in the northern part of the Aral Sea is currently improving somewhat.<sup>8</sup> It is separated from the southern part by a dam, ensuring that it alone benefits from the slightly greater water inflow from the Syr Darya. It is extremely doubtful, however, given the ongoing drying-out of the southern half, whether this stabilisation will lead to a sustained improvement in the ecological situation. In view of the large areas under irrigation and the economic and social interests tied to them

<sup>6</sup> According to the environment ministry, 22% of the soil area is in a critical state and 26% is described as catastrophic.

<sup>7</sup> BBC Online Network: The Aral Sea Crises, 27.3.1998, <http://news1.this.bbc.co.uk/hi/english/world/asia>.

<sup>8</sup> BBC Online Network: The Return of the Aral Sea, 1.3.1999

in the central Asian republics, there are few grounds for expecting any increase in water inflow, particularly from the Amu Darya.<sup>9</sup>

## Resource-specific environmental problems

### Air pollution

Although there has been a reduction in the overall emissions volume, air pollution remains a serious problem. Between 1992 and 1998 the reduction in pollutant emissions lagged behind the fall in industrial output (cf. figure 2). There is no clear correlation between changes in pollutant emissions, industrial output and GDP; the declines and increases in the latter two variables have not always been matched by corresponding changes in emissions. Moreover, the figures given by the official statistics almost certainly indicate the lower limit of actual emissions, as the calculations are based almost exclusively on data provided by firms, whose reports are extremely difficult to verify. It certainly cannot be claimed that total emissions have been lastingly reduced in the wake of industrial contraction or a structural change in output. Given the lack of investment in environmental protection measures, emissions seem set to rise substantially once more when economic growth is resumed. A critical view must be taken of Kazakhstan's wish, expressed at the climate change conference held in Bonn in 1989, to be included in the group of industrialised countries who have made a quantifiable commitment to reduce emissions of greenhouse gases. To a large extent this merely represents an attempt to participate in the emerging trade in emission rights, which promises to be lucrative. Those countries that have reduced their emissions as a result of the decline in output during the transition process will be in a position to sell these quantities as 'pollution rights'.<sup>10</sup>

In almost all the large cities the maximum emission volume is significantly exceeded, in some cases by a factor of two and a half. It is the industrial structure of the country that is largely responsible for the worrying levels of air pollution in Kazakhstan. The rich mineral deposits meant that the country's industry consists largely of raw material processing and – in the north of the country – heavy industry. The most serious emitters

<sup>9</sup> This is shown clearly by the following figures for Uzbekistan: agriculture accounts for 26.8% (1997) of GDP and for 39% (1998) of employment, while cotton exports account for 38.6% (1998) of total exports; *Uzbekistan Economic Trends*, January-March 1999, Brussels 1999.

<sup>10</sup> Article 3 of the Kyoto Climate Change Conference set 1990 as a basis for evaluating measures to reduce emissions in the transition countries.

are to be found in metallurgy and the coal and aluminium industry. Emissions from power plants are also giving cause for concern, as they mostly run on low-quality heating oil. The oil-refining industry is expected to increase in importance as a source of air pollution, as Kazakhstan is becoming increasingly dependent on its exports of petroleum products.

The planned economy traditionally paid little heed to measures to reduce the burden on the environment. As a result, even now around one-third of all industrial enterprises fail to meet legal requirements.<sup>11</sup> On the other hand, the difficult economic situation means that firms currently lack the resources to invest in technology to reduce emissions, so that there is little cause for optimism that a lasting reduction in emissions will be achieved in the near future. The situation is exacerbated by the fact that air pollution is heavily concentrated in a small number of areas. From the districts of Karaganda, Pavlodar and Eastern Kazakhstan came 81% of emissions in 1998. And within these districts the pollution is concentrated on the Pavlodar-Ekibastus-Aksu industrial zone (accounting for 98% of total emissions by the Pavlodar district), with its several coal-fired power stations (60% of the country's total output) and its metallurgical, chemical and engineering combines; on the metallurgy combine in Temirtau (32% of emissions from the Karaganda district); and on the cities of Ust-Kamenogorsk and Leninogorsk. The situation is also extremely critical in Almaty, the largest city in the country, as a result of the increasing use of private cars and the city's geographical situation; the city is surrounded by mountains.

The environmental burden resulting from the use of private cars is posing a problem in many transition countries. In Kazakhstan the number of cars increased by 30% between 1990 and 1998. Estimates suggest that road transport now accounts for around 60% of total emissions in large cities and as much as 90% in Almaty.

## Water

The arid nature of its territory – 64% of which is covered by desert and semi-desert – makes the shortage of water one of the central obstacles to development in Kazakhstan. The country is unable to satisfy the drinking water requirements of the population.<sup>12</sup> Kazakhstan has the most inadequate water supply of all the CIS countries. It is estimated that the supply of drinking water to the population is declining by between 3% and 5% per annum. This problem is being exacerbated by

the increasing levels of water pollution. The water supplied to half of the population exceeds the statutory pollution ceilings. This critical situation is due, alongside the extensive use of water by agriculture and industry, primarily to the poor state of water-related infrastructure. Many of the country's water pipes and distribution systems are outdated and need to be replaced; 20% of water pipes failed to meet the sanitary regulations in mid-1999. As a result, studies have increasingly revealed bacterial pollution of the drinking water. The sewage system is also inadequate, and drinking water has repeatedly been polluted by sewage.

Around three-quarters of total water consumption in 1997 was due to agriculture. The high level of water consumption results primarily from the irrigation systems in the south of the country. In some cases the water used for irrigation flows back into the rivers. This extensive form of irrigation leads directly to nitrate and herbicide pollution of the water supply. In the industry the main threats to water supply come from inadequately treated sewage and inappropriate storage. The worst-affected areas are the districts, mentioned above, of Pavlodar, Karaganda and eastern Kazakhstan. Most (60%) of the total volume of polluted effluent produced by Kazakhstan enters – in some cases via tributaries – the river Irtysh.

The situation in Lake Balkhash, the third largest lake in central Asia, is becoming increasingly problematic. Because large amounts of water are being drawn off its most important inlet, the Ile, the water level of the Lake is falling steadily. Moreover, at the same time the pollution of the lake's water with heavy metals, petroleum products and phenols is rising.

## Waste

Kazakhstan still lacks an effective waste management system. The inadequate collection, storage and processing of waste has a negative effect on water and soil quality. For many years there was no precise legal base for waste disposal; not until the end of 1998 was a bill for a waste law introduced. However, this merely sets out the goals of waste management and the responsibilities of the various administrative levels, while failing to set explicit standards. Thus a number of administrative decrees will be required to ensure its application in practice.

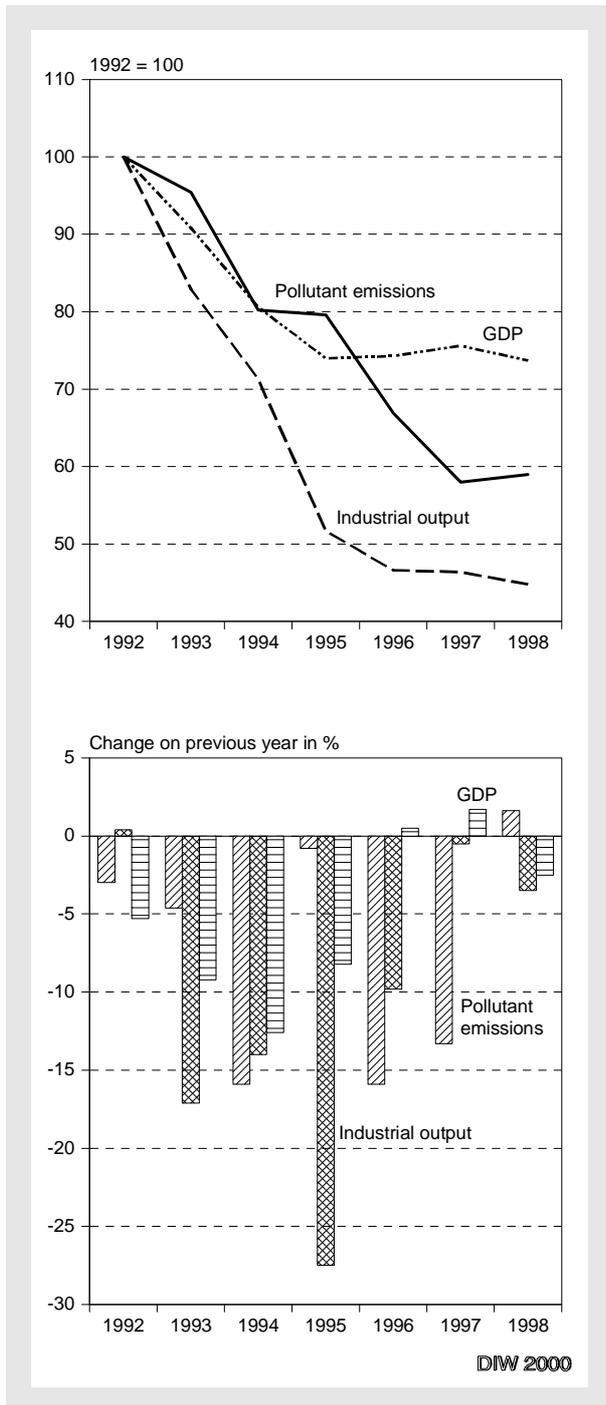
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<sup>11</sup> Figures from the environment ministry.

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<sup>12</sup> In a number of areas (Almaty, Akmola, western Kazakhstan, etc.) the supply of water is just half the level considered necessary by the authorities; 40% of the rural population lack access to the central water supply system. These and the following figures in this section are those provided by the environment ministry.

Figure 2  
Pollution Emissions, Industrial Output  
and GDP in Kazakhstan



Sources: Federal Ministry of Economy, 'Wirtschaftslage in Mittel- und Osteuropa 1998'; Kazakhstan Economic Trends, January-March 1999; State Committee for Statistics of the Republic of Kazakhstan.

inadequately secure facilities. Each year the volume of waste rises by around 1 billion tonnes. In some cases it would be possible to recycle this waste, reintegrating it into the economic process. Particularly problematic is the radioactive waste produced in uranium mining and the uranium industry (totalling around 8 million tonnes); such waste is to be deposited in locations formerly occupied by the uranium industrial complex. The problem of domestic waste is a relatively new one in Kazakhstan. New types of consumer behaviour and the increase in consumer packaging are the main reasons for the increasing difficulties in this area. The volume of domestic waste amounts to around 14 million cubic metres per annum, most of which is simply dumped on unsecured sites. There is as yet no recycling industry to process domestic waste.

## Conclusion

The ecological situation in Kazakhstan must be seen as extremely critical. In almost all areas the burden on the environment is extraordinarily high in international comparative terms. This is not to mention the various hot spots described above, where the damage must be considered irreversible in the medium term. The lack of financial resources and the size of the country both constitute barriers to a sustained campaign to clean up the environment at the present juncture. Against this background it must be considered in what form an at least semi-efficient environmental policy should be cast. For such a policy to be implemented one of the prime tasks must be to set priorities both for coping with the existing environmental damage and for a preventive environmental policy. Such an approach, which has already been introduced in Estonia and Latvia,<sup>13</sup> involves listing all the prevailing environmental problems, weighting them, drawing up a series of strategic options for improving the environmental situation and calculating the cost of each measure. By this means it is possible to identify the strategy that is likely to be most effective and require the least resource input. The prime concerns must be to improve the situation faced by the population as quickly as possible and to deploy scarce resources as efficiently as possible. In view of the factors described above, the most promising strategy for Kazakhstan would appear to be one that focuses primarily on improving air and water quality. In other critical areas there are insufficient capacities to enable the authorities

The total volume of industrial waste amounts to around 20 billion tonnes, much of which is located in

<sup>13</sup> OECD: 'Evaluation of Progress in Developing and Implementing National Environment Action Programmes in CEEC/NIS', Paris 1998, pp. 34ff.

to perform more than an effective crisis management, so as at least to prevent the situation from getting even worse. At the same time the country must draw up concepts to deal with the relatively new environmental problems it faces, such as traffic congestion and domestic waste.

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