

# Dangerous waters

Despite posing a serious threat to the health of local residents in eastern Europe, groundwater pollution is not being tackled.

Pete Sawyer reports

Last June the European Environment Agency (EEA) published the first pan-European overview on groundwater quality, put together with the help of the UK's Water Resources Centre.

The survey was based on information volunteered by EU member states and the accession countries. It concluded that the major threats to groundwater were from the use of pesticides and fertilisers on agricultural land, and more localised 'point source' contamination from industrial sites, land-fills and storage facilities. It noted that there was no harmonised monitoring system in place, nor were there any statutory EU guidelines on groundwater quality.

A casual glance through the report could easily have left the reader with the impression that groundwater problems in the accession countries are no worse than those in the EU. But an examination of the detail reveals that decades of unchecked environmental pollution has left, quite literally, a bitter taste in the mouths of many east Europeans.

Environmental statistics on eastern Europe make depressing reading at the best of times, especially when it comes to water. For instance, according to the EEA, in the accession countries 40 per cent of the population is not connected to sewers, and 18 per cent of waste is discharged untreated, with the attendant threat of bacterial contamination of water supplies. In Bulgaria, Lithuania, the Czech Republic and Poland, more than a quarter of river stretches surveyed were of poor or bad environmental quality.

The effects of groundwater pollution on the health of the population are well documented, and will form part of a report by the World Health Organisation later this year.

As in western Europe, nitrate levels are a worry in many regions of eastern Europe. But the EU regards this as of particular concern because of the higher proportion of rural population, which often depends on shallow wells for its water supply.

In ten regions of Bulgaria, up to 45 per cent of the population is exposed to elevated nitrate levels. In Lithuania, in 1996, more than a third of samples from private groundwater water supplies contained levels of nitrate exceeding

health guidelines. Elevated nitrate levels are also found in groundwater in all but two of 41 districts of Romania. Similar problem areas exist in Slovenia, Hungary and Poland.

These nitrate levels may get worse before they get better, as western European fertiliser companies increasingly target eastern European farmers, much as they did with pesticides, another cause of groundwater pollution.

In Poland, in the early 1990s, the quality of groundwater was not helped by an EU donation of €60 million worth of pesticides, many of which had been taken off the market or restricted in western Europe. Chemical companies even set up a foundation to help Polish agriculture benefit from this 'gift'.

Saltwater intrusion is a major problem, especially along the Baltic coast and in particular the area around Gdansk, as water from local aquifers is abstracted for industry. The irrigation of the Hungarian plain, for instance, has caused salinisation and alkalinisation of more than 20 per cent of the region. In Romania, where huge irrigation schemes were introduced 25 years ago, it is estimated that 200,000ha have been salinised. That represents about 6 per cent of total irrigated land. Salinisation is reversible but reclamation of saline/alkali soils is expensive, as it requires complex amelioration techniques.

Other groundwater problems include: acidification, caused by industrial airborne pollutants, which affects parts of Poland and the Czech republic; high concentrations of arsenic, found in parts of Bulgaria, Hungary and Romania; and high levels of fluoride in Estonia.

Groundwater pollution is not a problem that is easy to fix. Polluted rivers will eventually purify themselves – although, as we have learnt from recent cyanide spills from mine workings, it may take years. Groundwater, however, has only a limited capacity for self-purification. Polluted deep-level groundwater aquifers are virtually impossible to fix. Shallow aquifers can be, but often at a high price. In many cases, the best that can be achieved is a mere containment of the problem.

Nevertheless, many companies and environmental consultancies are marketing solutions to the problem. The methods used usually involve some form of physical or

chemical filtration. Other techniques involve forced aeration and even the use of microbes.

One promising new technology is the use of plants that 'hyper-accumulate' heavy metals. The idea is that the plants remove the pollutants from the soil and can then be 'harvested' and disposed of. The technique is called phytoremediation.

Other plants have been identified that have a liking for diesel fuel, herbicides and even TNT. Scientists are also experimenting with plants that are genetically modified with bacterial genes to make them more resistant to normally toxic concentrations of cadmium and mercury. Eastern Europe may well find itself to be the world's laboratory for these new 'transgenic' pollution-purging plants.

However, all these methods cost money. The inescapable fact is that contaminated groundwater is very difficult and expensive to clean up. The cost means that wholesale remediation is not economically viable.

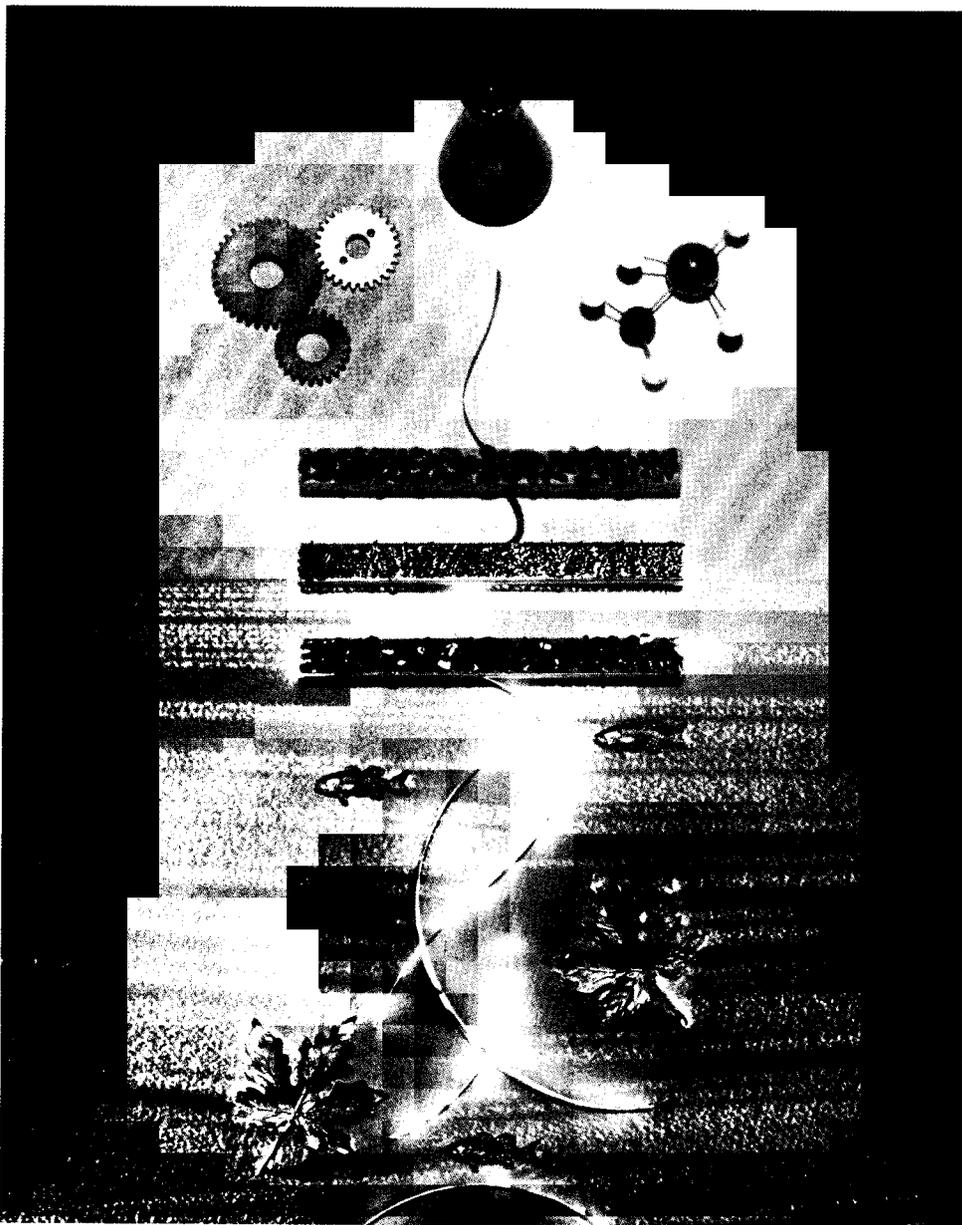
Decades of Soviet-style industrial production, coupled with a scant regard for the environment, has left a legacy of polluted aquifers, soils, rivers and lakes in eastern Europe. The widespread use of poor-quality sulphur-rich coal in industry has exacerbated the problem – as has the Russian military, which, when it pulled out of the region, dumped vast quantities of oil, spent ammunition and other toxic wastes onto the land.

Often, these factors are compounded by poor, sandy soils that allow surface water to quickly reach aquifers. Poland is a case in point. Groundwater accounts for roughly half of Poland's total available water resources. And more than half of the groundwater resources are held in sands and gravels formed as a consequence of the last Ice Age. Because these sediments are near the surface and they are usually covered by poor sandy soils, they are easily contaminated by human activities.

Produce grown around Krakow and Warsaw is seriously contaminated with heavy metals but is eaten regardless, as there is no alternative.

A recent report on the state of Poland's environment, partly funded by the UN and published by the State Inspectorate for Environmental Protection, estimated that a quarter of available water resources were contaminated, especially in the Silesia, Warsaw, Gdansk and Lodz areas. The report recommended the enforced protection of 180 main groundwater reservoirs. If implemented, these would protect 7.35km<sup>3</sup> of water – as much as 58 per cent of Poland's total groundwater resources. However, the report acknowledged that there would be conflicts of interests and

Groundwater pollution is one of the more intractable environmental problems faced by the accession countries



**Deeprooted: groundwater pollution is not easy to fix and has only a limited capacity for self-purification**

priorities. It noted: 'Because of economic realities compromises will have to be reached. Increasing the price of water may compensate the losses stemming from surface utilisation.'

The State Inspectorate estimates that 4 per cent of Polish farmland contains high levels of heavy metals. The largest area of contaminated soil is in Silesia, around the heavily industrialised city of Katowice.

Silesia is, by any benchmark, an environmental disaster area. The area forms part of the so-called 'Black Triangle' extending into Saxony, in eastern Germany, and northern Bohemia in the Czech Republic. The region is blessed – or cursed – with large reserves of brown coal or lignite. The mines in turn spawned steel and chemical industries, which are only now coming to terms with the legacy of pollution they have left behind. The health of the population has suffered as a result. Many of Silesia's environmental problems are caused by several large lignite-fired power stations and their associated large-scale, open-cast mines.

While environmental protection was largely neglected under the former communist regime, progress is now being made, with some help from the US and the EU.

One such collaborative project concerns the area around the industrial town of Czechowice Dziedzice, which is notorious throughout Poland for having one of the highest cancer rates in the country. The area is dominated by an oil refinery that, for more than 80 years, has dumped acidic sludge in a lagoon. The 'chemical plume' from the refinery sludge pond threatens the local groundwater used by the town for its drinking water.

**A** collaboration between the refinery owners, the US Department of Energy, the Institute for Ecology of Industrial Areas, in Katowice, and Florida State University's Institute for International Co-operative Environmental Research, has been working on the problem. The remediation project is now in its third stage, in which hydrocarbon-guzzling microbes are added to the contaminated soils.

Similar schemes are being put in place throughout eastern Europe, with varying degrees of success. However, the cost of cleaning up has been a crippling burden on the new economies of the East.

As the countries broke free from their

shackles, a new environmental regulatory framework had to be put in place that balanced the interests of potential investors, the environment and, of late, the European Union. The problems of site contamination and the likelihood that environmental law will become stricter in the future have put off many a would-be investor.

Nevertheless, protection of water resources has become a main priority. According to the EU-funded Regional Environmental Centre for Eastern Europe, in 1995 Slovakia, Slovenia, Poland, Hungary and the Czech Republic spent more than €1 billion on wastewater and groundwater environmental projects.

Since 1989, the EU has also given substantial grants to help solve groundwater problems in the area, through its Phare programme. The Danish Environmental Protection Agency has also given help, mainly to Poland and the Baltic states. Last year krone500 million (€67 million) was earmarked for projects.

One surprising source of help has been Nato. Former Soviet military sites are a major source of groundwater pollution in eastern Europe. Nato has held seminars and financially supported the international co-operation to find a solution to the problem.

Departing Soviet troops dumped vast quantities of oil on the ground. In Poland, at some locations, they left so much oil that local residents came to dig it up. The Russian Army had 59 bases in Poland covering an area of 70,000ha. The State Environmental Inspectorate estimates that approximately 18.4 million m<sup>3</sup> of soil and 145 million m<sup>3</sup> of groundwater has been contaminated by petrochemicals from the bases.

In Estonia, groundwater under a former Soviet military airfield near Tallin was heavily contaminated with aviation fuel, which was threatening local water supplies. The site was cleaned up with Swedish government aid.

There are similar stories from other east European countries. In Hungary, where the Russians had 170 military bases, the Ministry for the Environment found serious contamination by heavy metals and hydrocarbons during an environmental assessment and damage survey covering 46,000ha of land. In Slovakia, where there were 87 Soviet military bases, an estimated, 2,000ha of groundwater was contaminated.

Groundwater pollution is one of the more intractable environmental problems faced by the accession countries. Simply throwing money at the problem may not be enough. The demand for new technology may make the accession countries the test-bed for new environmental techniques.

However, a difficulty picked out by the Danish Environmental Protection Agency in a recent report was the political weakness and under-funding of many eastern European environment ministries. Poor pay means that many employees just pass through, taking their knowledge with them. When the Czech and Slovak republics split, much information simply disappeared into the crevasse.

This mixture of political pressure and economic necessity, coupled with the technical difficulties, could leave that bitter taste for many years to come. ■

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