SHORT COMMUNICATIONS & REPORTS

Acidification Threatens Southern Regions

Acidification, a pollution problem associated mainly with Northern Europe and North America, could also menace areas around industrial centres nearer the Equator and in the southern hemisphere. A 'round-robin' enquiry conducted by IUCN has revealed that acidification of soil has already been recorded at danger levels in some areas of Brazil, while air pollution of a kind that is likely to cause acidification is rife in the Eastern Transvaal Highveld of South Africa. Elsewhere, careful monitoring is in progress to detect signs of the problem well in advance. Australia and Thailand, for example, are both potential victims of their own industrial fallout, yet both are determined to be forewarned and forearmed.

The main active ingredients of acid precipitation are dissolved oxides of sulphur and nitrogen—waste products of fossil-fuel burning and of certain industrial refining processes. In Europe and North America, acid rain has already killed or damaged very many millions of forest trees and rendered hundreds of lakes and rivers too sour to support fish and most other forms of life. The 'macerating action' of acidic ground-water can release aluminium, cadmium, and other poisonous elements, into the environment when they would normally have stayed bound in the soil in quite harmless chemical combinations. Acid rain can also cause breakdown reactions in stone- and brickwork, eating away the distinguishing features of statues and monuments.

The causes of acid rain are still debated in countries which have suffered few of these appalling effects: elsewhere, the industrial connection is plainly admitted. The Federal Republic of Germany, which may be losing anything up to half its forest cover as a result of acidification, is taking urgent steps to curb emissions of airborne wastes from coal- or oil-burning power-stations, factories, refineries, domestic furnaces, traffic, and other possible sources.

Acid rain is not the only potential medium of acidification from atmospheric precipitation: there are also acid snow, acid fog (smog), and—not least—acid soot, which is the direct, dry fallout from smokestacks and exhausts. Just add water, and these wastes become instant acid brews. This is potentially the most serious acidification problem in South Africa: enormous oil-from-coal refineries, coal-burning power-stations, and other industrial complexes clustered around Johannesburg and Witwatersrand, are the source. Most of the pollution occurs during South Africa's dry (winter) season, when atmospheric conditions are very stable. The airborne sulphur and nitrogen oxides remain in one place for sufficient time for some to be inevitably deposited on the veld, where they harm the vegetation directly or react with water to form sulphuric and other acids. Now planned expansion of coal-burning power-plants in the region may soon result in a potential fallout that is estimated at 221 tonnes of sulphur dioxide per square kilometre per year from them alone. The equivalent figure for the Ruhr basin in Germany, a notorious source of acidic rain pollution, is 260 t/km^2/year from all sources.

Although no firm data are yet available on the effect on the pH of the rain-water, local ground-water, rivers, and other waters, these levels of pollution are almost bound to set the Eastern Transvaal at grave risk of acidification in the near future, if indeed the process has not already begun. Work is in hand to set up a chain of automated sampling stations to measure rain-water pH ('counter-acidity score') and dry deposition in the Eastern Transvaal and adjacent areas. These are being established by the Council for Industrial and Scientific Research, which also plans a five-years' study to relate pollution to the climatology of the area. Other monitoring sites have been established at Cape Point and in the Kruger National Park. These sites form parts of a Global Precipitation Chemistry Monitoring Network, which is currently being organized from the University of Virginia, Charlottesville, USA.

In Australia, acid rain is not considered a problem at present but the Commonwealth Government is taking no chances and is establishing six rain-water pH monitoring stations around the country in areas where air pollution might be expected to result in acidification. The Department of Home Affairs and Environment has several projects in hand to find out exactly what the *status quo* of acidification in Australia might be. Only one area, near Sydney, has so far yielded serious signs of acidification.

In Brazil, strong evidence of acidification exists in the low pH values of soil sampled in the eastern part of São Paulo State, but it has not yet been firmly established whether the origin is industrial or not. The lowest pH values (3.7–4.7, compared with a state norm of about 5–7) were found in Cubatão and São José dos Campos—both within an hour's drive of São Paulo and its seaport Santos, where air pollution is an old and self-evident problem.

In Thailand, where air pollution is equally self-evident in many urban areas, no reliable data are yet available, but the Office of the National Environment Board has begun an air pollution research programme, which includes modelling to take account of meteorological conditions. It is pointed out that the research techniques and models used for air pollution studies in the USA or Europe do not fit the case of tropical regions, where violent rainstorms and strong land–sea interactions characterize the weather. Pollution is far more likely to be diluted and harmlessly dispersed by these kinds of weather than by the 'closed-circuit' continental effects and large, slow-moving, high-pressure systems which dominate climates in the northern hemisphere. Another, more obvious, reason why acidification is unlikely ever to become such a menace in the tropics or in the southern as in the northern hemisphere, is the small scale of industrialization in most of the tropical South.

Nevertheless, the problem exists and can only get worse unless the lessons which the North has learned the hard way can be applied in the South to help throttle the phenomenon in its cradle. It takes some time before acidification accumulates enough to break down the natural buffer-effect of soil and streams. Only when it is virtually too late does the problem abruptly manifest itself in low pH readings in the field and in biological damage. Tree-ring and pollen-deposit data have shown that in Northern Europe, for instance, the acidification process has been at work almost since industry itself began, and that it has been having an ever-more-harmful effect on the environment all along.

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