

NATURE IN FOCUS

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Cover - The spectacular lung of a coal miner who worked in Wales. The black mass in coal, so-called massive pneumoconiosis. This form of the disease causes death from heart failure after years of increasing shortness of breath.

EDITORIAL



WERNER FIGGEN
Minister for Labour, Public Health
and Social Affairs,
North Rhineland and Westphalia

Man can survive for five weeks without solid food, five days without water, but is incapable of living for five minutes without air. Rightly or wrongly, this has given air first place in the environment stakes. The general public is therefore extremely sensitive to any deterioration in the quality of air. Industrial progress is often slowed down, not to say halted, by conflict between economists and the public, but if our standard of living is to be maintained there must be technical progress, higher production and economic growth. On the other hand, natural resources which are not unlimited must not be sacrificed to living standards and progress. Air and water, flora and fauna provide a heritage which is essential for the survival of our generation and generations to come. This realisation places a political obligation on every country.

Pure air is an important part of that obligation. There will have to be drastic reductions of exhaust fumes in densely-populated areas, whatever their source — industrial or commercial, means of transport or domestic heating. Industrial gases contain hundreds of pollutants, and at the moment we know only a few of them. It is important to take into consideration not only emission content and quantity, but also technical progress and industrial technology. Before manufacturing new products, industrialists must analyse their effects on air quality. Industry will have to balance the requirements of technical progress and those of the environment.

Exhaust gases from domestic and commercial heating appliances give rise to problems because of the low altitudes of chimneys. In the last few years the trend has been towards purer air because of different fuel patterns. Less use is made of solid fuels for heating purposes etc., on the one

hand, and on the other there is an increasing tendency to install central heating powered by electricity, gas or steam, etc. The effects of means of transport on the quality of air are by no means uniform, and considerable progress has been marked with railway electrification (75% of railways in the Federal Republic of Germany are electrified). The problem of pollution caused by road traffic still awaits an answer. Rising traffic levels have brought about an increase in pollutant emissions.

Legislation governing such pollution is still inadequate, and will not begin to produce results until round about the end of the year, which even then will be somewhat piece-meal. The most serious threat is still to city centres, because exhaust fumes are produced at street level, or rather respiration level. Air taken into the lungs in city centres may contain 100 times as many polluting substances as that in non-built-up areas. There must be strict statutory controls in order to deal with this problem, of purification appliances fitted to exhausts tanks in vehicles with petrol or diesel engines, or other forms of propulsions must be introduced, such as electric motors.

Air pollution problems still await solutions. It is true some progress has been made, but there is a great deal still to be done. Cooperation is the only means of making real advances, at national, European or international level.



AIR POLLUTION TODAY

Fox Photos Ltd.

Dr. P.C. BLOKKER
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Most of the air pollutants now causing concern, such as smoke, dust, carbon monoxide, carbon dioxide, oxides of sulphur and of nitrogen, hydrocarbons and evil-smelling gases, have been known for many centuries, but in the past these pollutants were only of local importance, such as the coal smoke in the mid-13th century in several British towns. In the present century a few serious incidents have occurred, which could conceivably also be considered as being of only local importance, but in addition many cities have begun to suffer from air pollution of a more chronic nature. This is due to the higher and more widespread concentrations in which the above-mentioned pollutants are now occurring.

The causes of this last phenomenon, and this is also true for water and soil

pollution, are the increase in population density, the even greater increase in energy consumption per capita, the intensified production of pollutants due to economic growth in certain areas of the world and, until recently, a lack of regard for the effects of these pollutants on the environment. This has led to such an enormous increase in gaseous, liquid and solid waste that many now consider it a very serious future threat to our environment and even to human life. Others are more optimistic and trust that advanced technical knowledge and the growing pressure of public opinion will solve the problem. There are very good reasons for this latter point of view. On principle, potentially harmful inorganic material can be converted to insoluble compounds able to be stored or dumped quite easily. The most im-

portant examples are compounds containing heavy metals, convertible to insoluble salts or oxides, and sulphurous gases like sulphur dioxide, convertible to elemental sulphur. Another possibility is regeneration of harmful material into new, useful products. Organic material can, in fact, always be burned to water and carbon dioxide. Only if the latter compound were to become a problem, which is by no means certain, might the situation become serious in the long term. Of course, in order to apply these principles it is essential to prevent the pollutants from initially entering the biosphere and hence to begin by collecting as many of them as possible. Techniques for this are available. The main problems are cost and organisation. The cost may be very high, but in the long run we may have to make

available a significant part of the gross national product for these purposes in order to have a world in which people can live without suffering from pollutants.

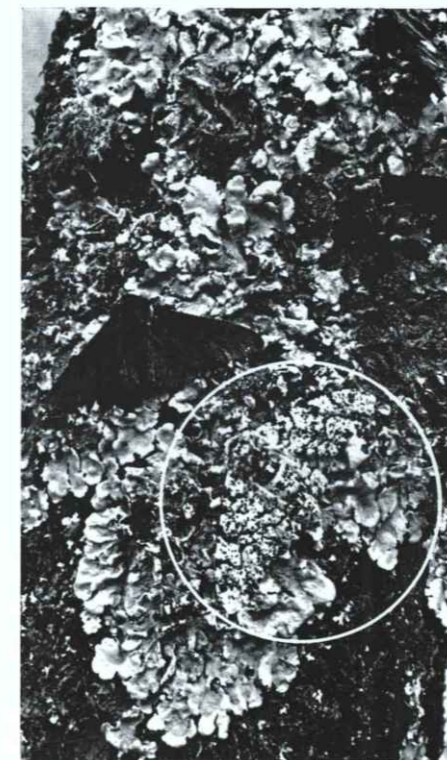
This imposes a heavy burden on toxicologists and ecologists who will have to indicate which levels of pollutants and mixtures of pollutants are admissible for the weakest individuals of the population and for the ecosystem as a whole. It has come to be realised during the last decade that ecological systems tend to be vulnerable to pollution which can reduce stability by diminishing the diversity of species. In one respect air pollution is not quite so serious a problem as water pollution where pollutants tend to persist (e.g. heavy metals, chlorinated hydrocarbons), whereas the lifetime of most air pollutants is relatively short (the estimate for sulphur dioxide for instance is four days). Nevertheless, it should be realised that although the capacity of air and oceans to receive pollutants is enormous, it is by no means inexhaustible. Even if the present level of air pollution is considered tolerable, it will undoubtedly become a very serious problem unless rigorous measures are taken. The rate of population growth and rising standard of living, particularly in developing countries, will intensify pollution still further, mainly due to a greater energy production, more industry, more cars, etc. If the universal standard of living were to be raised to that of the industrialised countries, the pollution problem would be colossal, especially with respect to persistent water and air pollutants, such as mercury, lead and certain chlorinated hydrocarbons.

It must also be stressed that the source of community air pollution problems has and always will be the by-products of energy production. The nature of these products is closely related to the type of fuel used and methods of consumption. If in the future, therefore, fossil fuel were to be largely replaced by nuclear energy, totally different kinds of air and water pollution problems would have to be faced, but there is no reason to believe that these problems would be any more difficult to solve than the present ones.

EVALUATION OF THE PROBLEMS IN GENERAL

Both confrontation of the problems at hand and their solution require a quantitative knowledge of the hazards, to indicate the extent to which measures must be taken. The contribution of responsible toxicologists and ecologists is of very great importance because the cost of pollution abatement in general rises exponentially with the degree of removal desired. Moreover, international agreement and co-ordination are essential. While the acute effects of many single pollutants are reasonably well known and understood, our knowledge of their joint effects, of reactions between them and of their long-term effects on human health and the ecosystem as a whole is very limited. This lack of information has understandably led to the questionable theory that concentrations of pollutants should not rise much above those in the natural background. But is the natural background level really a good yardstick and moreover, which background level is really natural? Just how difficult the concept of natural background can be is well-illustrated in the case of lead. Patterson from the Department of Geology and Geophysics in California has estimated the natural level in air as being 0.0005 microgrammes per m³, whereas in remote mountain areas the present level is approximately 0.1 microgrammes per m³.

The most difficult problem of air pollution is its long-term effects on health as will be further elaborated by Dr. Lob. Stokinger from the U.S. Public Health Department in Ohio considers respiratory irritants (ozone and other oxidants) and carcinogens (partly from air) to be the most important air pollutants with a general geographic distribution, and asthmatic agents and asbestos to be the most serious pollutants with a more localised distribution. Goldsmith from the Public Health Department in California stresses the importance of non disease effects, such as some respiratory reactions, sensory irritation, reaction to odours, central nervous system reactions, altered responses to high demand, biochemical changes.



From the experiments of Dr. H.B.D. Kettlewell, University of Oxford

Industrial pollution has caused the Peppered Moth, *Biston betularia* to evolve a melanic form carbonaria which is prominent in clean areas where the trees are covered with lichens. However in industrial areas where the trees are blackened and fewer lichens occur, it is inconspicuous and has a survival rate about 50% higher than the normal form typica (circled).

PROBLEMS WITH SPECIFIC POLLUTANTS

Pollutants that are of only local importance (e.g. fluoride emissions, artificial asthmatic agents) will not be discussed in this survey. Pollutants that may affect wider areas are:

Coal smoke

This has been the chief pollutant for centuries and is still a major contributor to air pollution in many urban areas, but the great improvements obtained in British and American cities have demonstrated that severe smoke pollution is preventable, although the cost may be high.

For Europe, as a whole, due to the replacement of coal by other fuels and improved control technology, emission of particulate matter is expected to decrease by approximately 10% during this decade. However, for the Mediterranean group of countries, where this replacement is not occurring, emissions will increase sharply, by about 80%*.

Sulphur dioxide

Pollution by sulphur dioxide emitted by domestic and industrial burning of fuel has been a problem for many decades and is still serious. The estimated amount of sulphur emitted as sulphur dioxide in the northern hemisphere is now about equal to the natural emission of sulphur in the form of hydrogen sulphide. A new aspect is that some scientists believe that the increased acidity of rain-water due to the drift of sulphur dioxide from one country to another may have serious consequences for certain areas, although others believe this is exaggerated. Elaborate studies are to be carried out in different countries under the auspices of the OECD.

Only by maximum exploitation of the best available means would it be possible during the 1970s, to hold the overall level of sulphur oxides at, or around, those of 1968-70. These means include heavy reliance on the use of clean fuels, such as gas and low sul-

phur oil, as well as abatement techniques, such as desulphurisation.* According to Stokinger, no effects on health are anticipated from sulphur dioxide per se at its present community level, but through interaction with other air pollutants acute effects may be produced and even long-term effects cannot be excluded in the light of our present knowledge. However, plants can be seriously affected by sulphur dioxide, and it is estimated that in Europe about 400 000 ha of forest are affected by air pollution, mainly by sulphur dioxide, which is also the chief cause of the decline of the very sensitive epiphytic flora in several areas with large towns. The extent of damage to plants by sulphur dioxide is further elaborated by Dr. Bovay.

Technically it is possible to remove most of the sulphur from liquid fuels or to remove sulphur dioxide from flue gases, but the costs are high.

The oxides of nitrogen, ozone and other oxidants

Oxides of nitrogen per se, the total emission of which is estimated to be roughly 1/3 that of sulphur dioxide, would not appear to endanger health at present levels, but their capacity to react photochemically with unsaturated hydrocarbons from car exhausts, giving rise to the formation of different kinds of semi-stable compounds and other secondary pollutants such as ozone and photochemical oxidants, is causing concern. Many toxicologists, basing their opinion mainly on animal studies, consider these latter compounds to be potentially the most hazardous of all pollutants, and in California most crop losses are due to them. The emission of nitrogen oxides is expected to increase, with the growing consumption of fossil fuels in Europe, at a rate slightly lower than the increase in sulphur oxides emissions. However, there is considerable doubt about the accuracy of emission factors for nitrogen oxides and this may obscure the true situation. It is considered essential that accurate, standardised, techniques be developed to measure these emissions to confirm whether, or not, they are increasing almost as fast as the increase in energy demand. This would also facilitate the development of control techniques. Up till now, all measures have been aimed at decreasing the concentration of unsaturated hydrocarbons in car exhausts by more efficient combustion. A reduction in the concentration of nitrogen oxides in car exhaust gases is also being considered. It

seems doubtful whether this is justified in view of the present uncertainty about the benefits to be gained, the technical difficulties involved and the economic consequences.

Lead

The general opinion among toxicological experts is that there is no valid evidence of a hazard to human health at the prevailing levels of lead pollution in the atmosphere. However, since there is still some doubt about the possibility of interference with certain enzyme systems at higher levels, an increase in the lead levels in the atmosphere is considered undesirable. A technical reduction of lead in petrol to lead-free petrol for other reasons is feasible but to obtain an equal fuel performance would mean very high investments and a subsequent increase in the price of petrol, as well as a new set of combustion problems to be solved. However, several governments have seen fit recently to introduce legislation limiting the lead contents of gasolines. In the USA this has been done primarily to facilitate the use of sophisticated techniques to control the emissions of other pollutants in the exhaust. In some European countries restrictions have been applied to limit the atmospheric burden of lead for reasons of public health.

Carbon monoxide

In urban atmospheres levels of 50 ppm carbon monoxide in the air and 4-5% carboxy-haemoglobin in the blood have been recorded. Concern for such levels found in slow-moving traffic is mainly centred around how people suffering from diseases associated with an impaired oxygen saturation of the blood, or with certain types of anaemia, will react. A reduced reaction to sensory stimuli has also been observed in individuals exposed to high carbon monoxide concentration. As in the case of the unsaturated hydrocarbons, a reduction in the present carbon monoxide concentrations in car exhausts can be achieved by better combustion or «afterburning».

Carbon dioxide and submicron particulates

Carbon dioxide is not normally considered a pollutant. This is probably because carbon dioxide is a natural constituent of the air at a fairly high concentration (300 ppm) and is an integral factor in the life cycle of the earth. Nevertheless, changes in the atmospheric content could be very important for man's environment, a fact pointed out by Tyndall as early as the middle of the 19th century and by Arrhenius in 1896. Investigations have shown that the carbon dioxide content of the atmosphere has increased by 10% in the northern hemisphere since the 19th century. This shows that the balance between the



Claude Nardin / JACANA

Domestic heating is one of the main sources of sulphur dioxide pollution.

release of carbon dioxide by fuel burning and the consumption by photosynthesis in plants has been disturbed. Some scientists suggest that this could cause an increase in temperature resulting in a gradual melting of the polar ice caps, causing inundation of coastal areas and a change in the world climate. Other investigators have indicated that a possible increase in fine particulate material, some of which is caused by man-made pollution, may reduce the amount of radiation received from the sun and have a cooling effect.

Whether the carbon dioxide-warming up theory or the particulate-cooling theory is right, the possibility that the abundant pollutants (carbon dioxide

and submicron particles) will have a much greater and more widespread effect than the pollutants with which we normally deal, should not be overlooked.

Urban air pollutants

The decrease in smoke in formerly heavily polluted urbanised areas has reduced the concern with respect to bronchitis and emphysema, but there is a higher incidence of lung cancer in urban areas than in rural ones. It is not known what the urban «factor» really is and to what extent it is due to air pollution, but the greater concentration of known carcinogens in urban air compared to that in non-urban air is causing concern. Toxicologists disagree as to whether or not exposure to community air pollution is a causal factor affecting lung cancer rates. Although due to our increasing analytical and toxicological knowledge, the number and types of carcinogens, cancer promoters, cancer inhibitors, etc. found experimentally in very small quantities in air are increasing annually, the main problem is that very little is known about the effects of these substances in their present concentrations on human health, and not whether the concentrations are actually higher now than they were previously. Much more research will therefore have to be carried out before any real conclusions can be drawn.

* OECD estimates

the effects of air pollution

Dr. ERNEST BOVAY

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The main reasons for the sharp rise in environmental pollution—the population explosion, increased industrialisation, etc.,—have already been elaborated by Dr. Blokker. The increase in air pollution in particular has caused serious damage to many plants and animals, and through accumulation in the soil, some air pollutants also create a permanent threat of poisoning both to plants and to animals for which the plants serve as fodder.

As well as sulphur dioxide, one of the oldest and commonest factors in air pollution, there are other industrial emissions which also have ill-effects on plant and animal life. This is particularly true of emissions of fluorine and chlorine compounds, particulate metals, the various types of organic chemical compounds, dust (such as from chemical works) and fumes and particles from the combustion engines of petrol-driven motor vehicles.

The concentration of sulphur dioxide in the air is subject to considerable seasonal fluctuations, because of the extensive use of domestic heating in winter. Concentrations in a confined area, such as the Rhone Valley above Lake Geneva, may vary by up to a factor of 10 between July and January. Such increases represent only a limited threat to most plants because of their winter dormancy. Evergreens, however, such as the resinous species whose leaves retain some biological activity throughout the cold season, can be adversely affected when there are high concentrations of sulphur dioxide in the surrounding atmosphere.

Sulphur dioxide penetrates plant tissues through the stomata. Its toxicity to plants is mainly due to its reducing action, which destroys the chlorophyll in the chloroplasts. The contents become plasmolyzed and the cells themselves collapse and are destroyed. The areas affected become chlorotic, then necrotic. Symptoms of sulphur dioxide poisoning vary: in the case of dicotyledons (such as fruit trees), chlorotic or necrotic patches are

usually to be observed between the secondary veins, whereas with monocotyledons (such as cereals) the patches appear as stripes running parallel to the main vein. Different species of plants vary widely in their resistance to sulphur dioxide. Some are highly sensitive, such as lucerne, barley, oats, wheat, spinach and tobacco, whilst others, such as vines, strawberry plants, gladioli, roses and lilac are far more resistant. This sensitivity also varies between the different organs in the same plant and according to the stage of development. Sulphur pollution of the air is often to blame for the withering of vegetation, especially forests, conifers being affected more than broad-leaved trees because their needles are renewed only every 3-5 years (chronic pollution). Although it is responsible for the acidification of water in certain regions, sulphur pollution does not yet seem to have any appreciable influence on the chemical composition of soils, particularly chalky soils, which are normally capable of neutralising any such acidity. Fortunately, some success has already been achieved in dealing with air pollution from sulphur dioxide, both by installing filtration units, a method used in Switzerland for instance, especially in the cement industry—and by providing district heating systems to replace private domestic heating. The main sources of fluorine compounds include aluminium refineries, phosphate fertilisers, factories, glassworks, potteries and tile works, where the basic materials frequently contain fairly high proportions of fluorine. The gaseous forms of fluorine (hydrofluoric acid, silicon fluoride, etc.) are extremely toxic to plants at concentrations a thousand times less than that of sulphur dioxide, i.e. approximately 0.001 mg of fluorine per cubic metre of air.

Fluorine penetrates the aerial tissue of plants mainly through the stomata of the leaves. A fairly rapid migration then occurs towards the periphery of the lamina or leaf blade, resulting in

excessive concentrations of fluoride at the tip and edges of the lamina. Under the effects of constant pollution by fluorine compounds, the concentration of fluorine in aerial plant organs increases the longer they are exposed. When the concentration limits for the various tissues have been reached, distinctive signs of necrosis appear at the tip and edges of the leaves, due to the collapse of the palisade and parenchymatous cells. The areas affected take on a brownish, reddish-brown or blackish colour and stand out clearly from the parts which have remained green. With certain species, for example *Prunoideae*, the affected parts tend to break away and widespread defoliation occurs on new branches; the apricot tree is a case in point.

Certain fruits, such as plums, cherries, pears, peaches may also be thus affected, showing the brownish necrotic patches. As with sulphur dioxide, the sensitivity of these various plant species to fluorine is very variable. Some, such as *Vitaceae*, *Rosaceae*, *Caryophyllaceae* and *Berberidaceae* react even to very small concentrations, whereas the *Cruciferae* and *Compositae* seldom present any visible signs of poisoning. There have been cases of fluorine emissions causing severe damage to nearby crops, especially in the path of prevailing winds. Meteorological conditions, incidentally, have considerable influence on the toxicity of fluorine emissions, as high summer temperatures and low relative humidity are highly conducive to the appearance of the symptoms of poisoning.

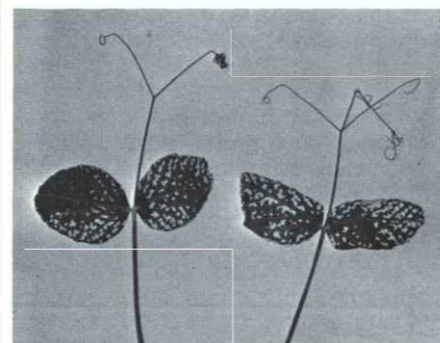
Fluorine compounds are also known to cause poisoning amongst animals, especially herbivores. This normally occurs as a result of an animal ingesting excessive amounts of fluorine with daily food intake. The fluorine is generally in the fodder itself, either on account of the permanent or accidental presence of fluorine compounds in the atmosphere in gaseous or particular form or because of ex-

on plants

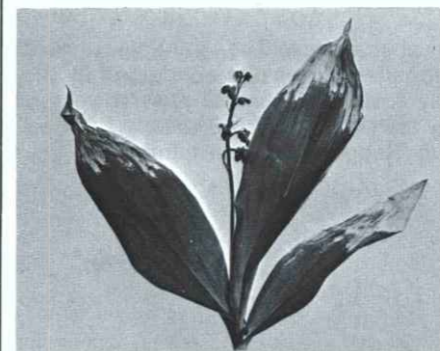
animals



Necrosis caused by sulphur dioxide on tobacco leaves.



Necrosis on pea leaves due to sulphur dioxide.

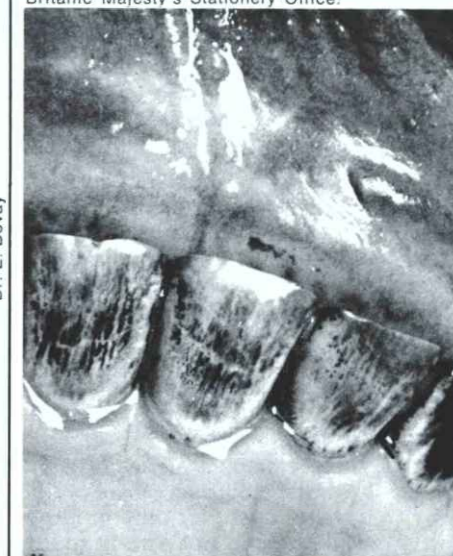


Necrosis caused by fluorine gases on Lily of the Valley.



Damage to plums, due to fluorine gases.

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Blackening of teeth in cattle due to fluorosis in the United Kingdom, where industrial fluorosis tends to be limited to a mile or two around a small number of industrial sites.

**and
soil**

cessive absorption of fluorine by plant roots from fluorine-containing fertilizers (e.g. fluoborate).

The symptoms of fluorosis in cattle are mottling or blackening of the teeth, followed by rapid abrasion of the teeth, osteofluorosis, lameness, a reduction in milk yield and the appearance of abnormally high levels of fluorine in the bones and urine. In serious cases, the result may be total general debility. Damage from fluorine compounds is tending to become more widespread with the increase in aluminium production, in spite of the precautions taken such as the installation of filtering plants capable of collecting as much as 95% or more of gases and dust.

The steady increase in the volume of household and industrial waste is inevitably creating new public health problems with regard to finding methods of disposal that are not harmful to the environment. Allowing such waste to accumulate gives rise to considerable water pollution hazards, whilst incineration merely transfers the difficulties elsewhere. For instance, certain plastics, such as polyvinylchloride (PVC) contain high proportions of chlorine which is liberated in the form of hydrochloric acid and is only partially neutralised by the basic combinations present. The incineration of household and industrial waste may also release a certain amount of toxic metals, such as zinc, copper, mercury, lead, arsenic and molybdenum. There have been reports of cases of livestock poisoning caused by the consumption of pasture contaminated by metallic deposits in the vicinity of metal works.

Motor vehicle exhausts are at present one of the main sources of air pollution. This is the case not only in large towns but also along busy trunk roads (motorways). The lead-based anti-knock substances which are added to petrol in concentrations of about 0.5 gm per litre are decomposed and released into the atmosphere in the proportion of about 70-75% of the

exhaust gases. The amounts of lead deposited along the roadsides in this way total roughly 700 tons a year in Switzerland and 7 000 tons in the Federal Republic of Germany.

Some of the lead absorbed by the plants enters through the roots, but the greater part enters through the leaves from the surface deposits, the size of which depends on the shape of the foliage (broad leaves, finely serrated leaves, etc). Whilst a certain amount (up to 50%) of the lead on a plant may be washed off, the rest will remain. Tests involving the feeding of cattle and sheep with lead-contaminated hay have shown that lead consumed by an animal accumulates mainly in its kidneys, liver and bones, but that much of the lead is also expelled with the animal's urine and solid waste. Other components of exhaust fumes, such as nitrogen compounds (nitrogen oxides), cause the formation, through a photochemical reaction, of oxidising agents that are highly toxic to plants, an example being para-acetylnitrate (PAN) which, along with ozone, is one of the ingredients of Californian-type smog. Recent surveys in the USA have revealed that hazards due to excessive levels of oxidising compounds are now more frequent than those due to excessive levels of sulphurous gases.

Agricultural pesticides form a highly dangerous class of pollutants, because of their persistence in the soil and their ability to accumulate in certain substances consumed by human beings, such as fats. The hazard is particularly serious when pesticides are sprayed over wide areas by rapid methods and the spraying is not strictly confined to the relevant plant organs.

Insecticides incorporating chlorine hydrocarbons, such as DDT, aldrin, dieldrin and lindane, decompose only very slowly in the soil. Fortunately, the use of these toxic products is being increasingly restricted in most countries and they are being replaced

by specific pesticides which are readily degradable.

Air pollution, both a product and a scourge of modern society, can and must be reduced to tolerable levels, and the accumulation of toxic products in water, soil and plants thus avoided. Drastic measures, though costly, must be taken if we are to save the biosphere from becoming totally poisoned and asphyxiated.

AIR POLLUTION

and its effects on human health

Dr. MARC LOB

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The problem of the effects of air pollution on human health is a very complex one, involving many unknown factors, and needs to be examined objectively and unemotionally. Several aspects of pollution have been clearly established, viz. the nature and origin of polluting agents, their acute effect on animals and human beings and, in some cases, their chronic effect on animals. On the other hand, almost nothing is known about their long-term effects on human beings. Some of pollution's acute and immediate effects on health were observed during the well-known disasters in the Meuse Valley (1930), in Donora (1948) and London (1952). In all three cases there were similar atmospheric conditions: thermal inversion, the absence of any wind, and the presence of fog. As a result those exposed were, so to speak, trapped in a bowl of pollution. In all three cases, too, the number of deaths exceeded the statistically expected number and the victims were mainly persons enfeebled by old age or chronic diseases of the lungs and heart. The exact nature of the pollutants responsible has not been clearly established, though there is good reason to suspect sulphurous gases from nearby industrial and heating plants.

As a result of the 1952 disaster, the London health authorities drew up a detailed plan for reducing pollution and obtaining objective data on the relationship between pollution and morbidity/mortality. By 1958 it had been concluded that any increase in pollution from smoke and fog was accompanied by a slight but unmistakable increase in mortality and morbidity. Recent studies have confirmed this conclusion. In London, for instance, it was found that bronchitis



Pollution has also aggravated the natural decay of many irreplaceable monuments, such as the Strasbourg Cathedral.

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who had been asked to keep a daily record of their health experienced greater breathing difficulties whenever there was an increase in pollution from sulphur dioxide and smoke. It has also been shown in New York that mortality from respiratory and heart diseases is clearly related to atmospheric pollution; a sharp increase in deaths has been observed on day when the pollution level rises, though no accumulative or delayed effect has been established. This damage to health probably results from the combined or potentialised effects of various pollutants — dust, sulphurous bodies, nitrogen oxides, ozone, peroxides, hydrochloric acid (from PVC!) etc. — acting on surfaces which may already be sensitised. Unfortunately, a study of the relationship between chronic bronchitis and atmospheric pollution is hampered by a major difficulty, viz. the role of cigarette smoking, which is itself a major factor in the cause of any aggravation of this very common disease. This made several studies carried out on young children all the more significant: in Genoa, for instance, it has been shown that the incidence of bronchitis is greater amongst school children living in highly polluted districts than amongst those living in cleaner districts. Here too, however, there is a need for caution, as social and economic factors may also come into the reckoning; indeed, a similar study in Boston produced completely different results. In Durham, USA, significantly greater morbidity from bronchitis has been observed amongst children aged 2-3 living in areas polluted by nitrogen oxide. The relationship between bronchitis and pollution is perhaps the only fact which seems clearly established, at least in certain cases.

The relationship between air pollution and lung cancer, on the other hand, is very doubtful. It was pointed out at a symposium held in Copenhagen in 1967 that, despite a marked decrease in the concentration of polycyclic hydrocarbons in the atmosphere in Great Britain, an increase has been observed in the incidence of lung cancer.

Moreover, mortality from lung cancer amongst non-smokers living in greater London shows no difference from that amongst non-smokers living in rural areas. Nor do surveys carried out in the USA reveal any higher urban incidences once the results have been adjusted to allow for smoking. The conclusion reached was as follows: «Although 3,4-Benzopyrene and other polycyclic hydrocarbons undoubtedly possess carcinogenic properties and seem capable of causing occupational cancers when absorbed in sufficient quantities, there is nothing to show that they play a detectable part in the origin of lung cancer in the quantities normally present in the air».

Hence no relationship has yet been proved. This does not mean, however, that, air pollution does not play any role at all; but at present, at least, its role seems negligible compared with that of cigarette smoking. Cigarette smoking also plays a leading part in the absorption of carbon monoxide into the blood. For instance, in an air pollution study carried out by the Prefecture of Police in Paris in 1970, 965 persons were examined at the Paris Fair at the French Radio and Television Centre. Amongst the 383 non-smokers, 326 normal cases were found, 56 cases of slight absorption (0.4 to 1.2 ml of carbon monoxide per 100 ml of blood) and only one case of moderate absorption (1.6 to 2 ml). Of the 582 smokers, on the other hand, 184 were found to have absorption levels varying between moderate and very high (1.2 to 3.6 ml of carbon monoxide per 100 ml of blood). We ourselves have made similar observations amongst garage employees; all the employees in whom disorders were detected were heavy smokers. According to the various publications to date, air pollution from carbon monoxide does not seem as yet to have had any detectable effect on health. Another problem is that of the effects of pollution from lead in exhaust fumes. No evidence has come to light of any damage to health, if «health» is taken to mean the absence of clinically detectable disorders. On the other hand, there have been reports of higher concentrations of lead in the blood or urine of people who live near roads carrying heavy traffic.

As lead is a poison which acts on



«... almost nothing is known about the long term effects of pollutants on human beings...»

certain enzymes needed for the formation of haemoglobin, due consideration should be given to its potential long-term effects on health should this form of pollution continue at its present level or increase still further. Albeit, Hernberg and others recently proved that one enzyme, aminolevulinic acid dehydrase (ALA-D), is already inhibited by very small concentrations of lead in the blood. A study on this subject which my colleagues and I will shortly be publishing presents some very cogent conclusions conducive to the adoption of a cautious attitude, as there is no doubt that lead in petrol represents a potential hazard.

Mention should also be made of the problem of asbestos. It is well known that asbestos workers are prone to a serious lung disease, asbestosis, which is frequently complicated by cancer of the bronchi and the pleura. However, cases of damage to the pleura and lungs have also been observed in the neighbourhood of asbestos factories and amongst the families of asbestos workers. It is possible, therefore, that asbestos dust, which is very widespread (from break linings, for instance), has an effect on health; but prolonged epidemiological studies will be needed to confirm this.

Lastly, it is important not to disregard the psychological effects of air pollution, since nauseating smells, dirt and a loss of sunshine undoubtedly have an impact on a person's well-being. To live in «clean» surroundings is man's aspiration.

From these few remarks it can be seen that, with the present level of knowledge and means of investigation, it is impossible to assess accurately the effects of air pollution on health. The alarmist views expressed almost daily are based on extrapolations and interpretations rather than on concrete facts. We nevertheless believe that clean-air campaigns are necessary in order to create an awareness of the problem, to rally public opinion and to persuade authorities to take the appropriate steps; for, in our present ignorance, it is our duty to take immediate measures to control or reduce the various exogenous factors whose carcinogenic or irritative effects have been proved experimentally, before the critical threshold is reached. Vigorous action of the kind used to combat smoking is also needed to fight against air pollution.

The atmosphere must no longer be regarded as an endless sewer capable of absorbing and purifying all the waste products form modern life, for tomorrow, it may be too late to act.

CONCLUSIONS

Dr. AURELIO PECCEI



Dr. Peccei is the original founder of the Club of Rome, an informal international organisation that seeks to foster understanding of the varied but interdependent components of our global system, to bring new understanding to the attention of policy makers and the public world-wide and thereby to promote new policy initiatives and action.

In Europe there is hardly a citizen, old or young, who is not convinced that man is out and about polluting practically everything — our collective habitat, our foodstuffs and finally our minds and bodies. In this field what, just a few years back, was an awareness of the few, is now the concern of the many. This development is to be welcomed. However, as often occurs with difficult situations, while remedial action is still haphazard, and even knowledge about where to start and what to do is hopelessly rudimentary, indictments are cast here and there — and in the case of pollution, industry is held as the main culprit.

Undoubtedly, industrial areas and the large conurbations built around them do foul air, soil and water more than anything else. Litter is found even on the high seas and particles in the upper atmosphere because of the huge volume of fuels and minerals industry moves around the world and burns or transforms to keep going. But the simplistic conclusion that it is industry that must be held responsible for a state of affairs apparently reaching dangerous points is misleading. For one thing, industry is nothing more than the secular, productive arm of society, whose objectives it must serve. And furthermore, its good or bad performance results from the combined activity of the most diverse segments of modern society, from scientists and researchers to managers and workers, from shareholders to unions, from industrial legislators and planners to the municipalities which vote alluring incentives to attract industrial settlements, and also including the mood or expectations of the marketplace.

This observation does not, of course, imply that the industrial establishment in itself is without fault in the generation of pollution. As a matter of fact, it is not rare to discover that it uses its dominant position to avoid control of its discharges, or to exploit the defencelessness or credulity of consumers, or to excite their caprices and weaknesses, paying little heed to the welfare of the general public. But these are excesses, and better law enforce-

ment or ombudsman intervention should be enough to curb them.

Apart from strictly abiding by antipollution regulations and increasing its research effort, industry cannot do very much in a market economy. The principle that the burden of anti-pollution measures should be borne by the enterprises (or municipalities, public agencies, etc.) causing pollution may be helpful, but it will not be enough to redress the situation. Likewise, the expectation that the higher costs of research and development, and of processes and products is the only price to be paid to get rid of pollution, is illusory.

The truth is that to understand the threats posed by pollution generally to our quality of life and our health and the dire consequences which perhaps will be felt by our children and grandchildren, and to trace its causes and devise action plans, this entire issue must be placed in a broader context. At the root of the serious and worsening situation modern society is facing in this field, as well as of the other grave social, psychological and political issues which it is at a loss to control, there is a basic discrepancy between what our small planet can offer in the way of size of natural environment, its life-supporting capacity and physical resources, and man's growing numbers and insatiable demands. Intuitively, we understand that, by increasing its population and standard of life, mankind will one day reach the saturation limits of its terrestrial habitat. The time has now come to find out, by objective scientific method, whether in some cases these limits have not been reached or even passed — in the world system, or in some of its subsystems, such as Europe is one.

To grapple with pollution problems without this overarching view of the human condition may perhaps allow local or temporary results to be obtained, but certainly not results for the much wider communities, even the global one, which ought to be the concern of every responsible citizen.

ROBERT POUJADE

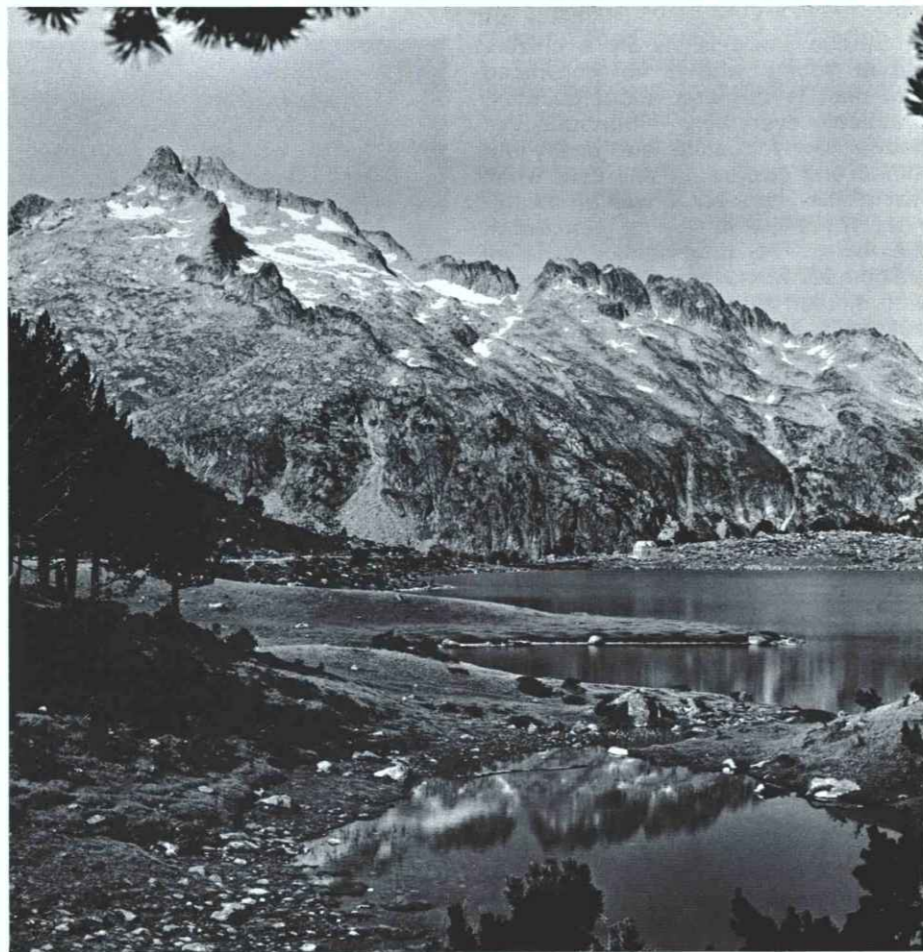
Deputy Minister to the Prime Minister
in charge of the Protection
of Nature and the Environment, France

FRENCH POLICY ON THE ENVIRONMENT

Since France is a country of great geographical variety, consisting of old provinces each of which has its own distinct individuality, it is obliged to adopt a highly diversified environment policy adjusted to the regions of which it is composed.

While there must be a broad policy worked out for the country as a whole, we must bear in mind the great number and diversity of the problems that have to be solved, each of which requires a particular solution of its own. There are however certain general principles applying to the whole area of France, by which we are guided in our actions. And first of all there is the key principle that protection of nature and of the environment must go hand in hand with economic expansion.

It is easy enough to oversimplify the issue and say that industry destroys or pollutes nature; and since industrial areas are usually in towns, some people extend the idea and see town and country as things opposed to one another.



H. Salmont / Ministère de l'Agriculture

The Pyrenees National Park and its peripheral zone contain over 250 mountain lakes and hundreds of kilometres of mountain streams where fishing is permitted.

But French experience shows that environmental policy cannot stop short at the preservation of natural resources and natural surroundings and the control of nuisances; it must also extend to the way in which our towns develop: to the planning of new parks in and near towns, the preservation of large green belts between built-up areas and the restoration of areas of peace and quiet at the heart of our cities.

Similarly, industrial development need not conflict with a policy of improving the environment. Increased productivity makes money available which can be spent on techniques for eliminating pollution, on processes for recycling polluted substances to prevent this discharge into the natural environment, sometimes with re-use of the recycled materials in «clean» production, and on the quest for a certain industrial aesthetic.

This then is one of the basic principles of our environment policy: to promote, on the one hand, gradually increasing protection of nature and the environment, and on the other a productivity which, while first and foremost maintaining the necessary economic expansion, also removes the polluting aspects from the instruments of that expansion.

Experiments, attended with some success, have already been made along these lines, with State aid, in various industrial undertakings, in particular at cement works and fibreboard and cardboard factories.

This aspect of French policy relates particularly to the large cities, towns and urban areas in which 80% of French people will be living by the end of the century. There, concern for the urban environment must go hand in hand with industrial economic growth: for the two things are not opposed but complementary.

The other side of our policy is protection and improvement of the countryside. Improvement of the environment has to be an all-embracing concept. Not a plot of land can be excluded. Moreover, the environment is always changing, because it is an expression of life which is constantly developing. What we have to do then is to preserve the wealth of the past, and pass it on to future generations. This is being done by setting aside certain parks and areas in which nature is left undisturbed: parks and reserves. Measures have also been taken to protect places of particular natural beauty which are nevertheless more seriously endangered than many others, such as the coasts of the Mediterranean and of Brittany. These activities are not ends in them-

selves; their object is the steady improvement of our surroundings and encouragement of the things that go to make up an environment of high quality. Endeavours — experimental at first and then applied generally — to secure purer air, less contaminated water and quieter towns, and to preserve a balance in nature, together result in effecting an improvement in the quality of life.

The island of Port-Cros national park, with a surface area of about 640 ha., has a very rich flora which is also a good example of the vegetation peculiar to Provence crystalline rock.



Eaux et Forêts

One of the most original achievements of France's policy here is in connection with water, which is of such great importance in rural and urban areas alike. The problems involved in supplying all the country's activities with water of a suitable quality have to be mastered, so water boards (Agences de Bassin) have been set up; these, which are primarily financial bodies, are six in number: the Artois-Picardy, Seine - Normandy, Loire - Brittany, Adour-Garonne, Rhône-Mediterranean-Corsica, and Rhine - Meuse water boards. They at the same time collect dues from firms which pollute rivers, and provide financial help in de-polluting the rivers through subsidies to local authorities and industrial firms for carrying out pollution - control

continued on page 16



On 20 July a royal decree put an end to bird netting in Belgium, in application of the International Convention for the Protection of Birds, Paris, 1950 and the Benelux Convention concerning the hunting and protection of birds, Brussels, 1970.

In some other European countries the capture of millions of birds of all species is still authorised.





Société Fives-Lille Call

measures and establishing facilities for the quantitative improvement of water resources.

Protection of the countryside has been taken to substantial lengths, as part of France's environment policy, by the creation and development of parks: four national parks have already been set up (Vanoise, Port-Cros, Western Pyrenees and Cevennes national parks) and two more (Les Ecrins and le Mercantour parks) are being planned, while eighteen regional parks have been set up or are at the planning stage.

Unlike nature reserves which are real nature sanctuaries, these parks have an important social function, since their object is to enable people, provided they do not break certain rules, to get in touch again with the natural environment.

Such, briefly, are the main principles behind our policy toward the surroundings in which we live.

But another vital aspect of our policy concerns the moral and civic meaning which the idea of the environment ought to have for the public.

At Chicago President Pompidou referred to «environment morality».

This morality we are endeavouring

gradually to inculcate at the various levels of society. For the essential thing in these matters is to open people's eyes. Gilbert Cesbron, the author, writing about a country area in the Vendée, said that «children brought up in towns, whom no one taught to love that which will outlive us, have innocently helped to mutilate the woods». What is true of the children also applies to the adults.

The townsman, who suffers from the «disease of city life», often has a false idea of environmental values, irrespective of his social position and educational background. For example, an engineer often fails to learn the aspect of his profession which should make him a man who, in addition to pursuing his economic objectives, is particularly anxious to produce without polluting.

It is necessary therefore to educate the rising generations by teaching, at all levels of the educational system, certain principles concerning the protection of nature and improvement of the physical world in which we live. We are trying to adapt this education to various age levels, starting with the simple rule of thumb for small children and working up to a gradual-

«... protection of nature and the environment must go hand in hand with economic expansion...».

ly attained feeling of responsibility. If we are to be successful in doing this we must not regard the subject as an additional special one tacked on to the curriculum. We must evoke the idea that we owe a certain duty to our fellow man, as well as to trees and animals. There is no need at all to train a new band of specialists: what we have to do is to include the question in our teachers' training. Such, broadly, are the major principles of French environment policy. Acting upon them will not just be a matter for the authorities; it is something all those can do who would like to see the physical world around us improved and who are consequently willing to work with the authorities to bring about that improvement. The effect of the action taken will then be still greater.

The present problems of waste disposal and the future of waste management in Europe.

Prof. Dr. O. JAAG, Zürich

Where people live and work, wastes are generated in a solid, liquid and gaseous form. To keep our environment healthy and enjoyable, these wastes must be disposed of in such a way that they are neither objectionable from an aesthetic or hygienic point of view, cause emissions, nor harm the health and life of mankind in any way.

To provide adequate refuse removal, the cities have established a collection service, and industry has provided more hygienic and more efficient collection vehicles which are still being improved. A recently devised questionnaire revealed that in practically all European countries the duty to dispose of solid, liquid and sludgy wastes in a non-objectionable way rests with the local authorities and industries.

HOW TO TACKLE THE SOLID WASTES PROBLEM

The duty to protect our habitat involves the following particular and inevitable measures:

- the protection and, where necessary, the purification of our water by treating the sewage from residential areas and industries before it is discharged into a receiving water body;
- the elimination of solid wastes, i.e. domestic refuse, street refuse, oil waste, various industrial waters, and animal carcasses together with the raw and digested sludge

that accumulates in the sewage treatment plants, without harming the human environment;

- and finally the protection of air and soil against excessive noise and other emissions of all kinds.

The need for order and cleanliness has, with the passing of time, undergone various changes. Thus our task must be adapted to the circumstances, particularly in times like ours, where on the one hand the need for amenities is extremely great and seems to be increasing, and on the other hand, the mass production industry floods the market with commodities of all kinds — kitchen dishes, radio and television sets, washing machines, refrigerators and cars of various makes. This entails unimaginable waste with which the local authorities and regions must deal in an economical way and, if possible, without polluting the human environment. The rapid economic development that became apparent after the last world war, as well as automation and the accelerated population growth has resulted in a new avalanche of waste, the end of which is not yet in sight.

During the last 15 years, the volume of domestic refuse has doubled or even tripled, mainly because of the great increase in packaging material used both in town and country.

This means that the way to treat solid waste must be adapted to the changing requirements and the given circumstances. This presupposes that the competent authorities adapt their po-

licy to the rapid development of science and technology to the advantage of all those involved. This however requires continuous exchange of information, documentation and discussion in order to choose the best technical means that competition offers.

The problem of waste disposal is a very important, because we must take decisions about the organization of the collection, the treatment, the processing for re-use and finally the complete disposal of the remaining useless material.

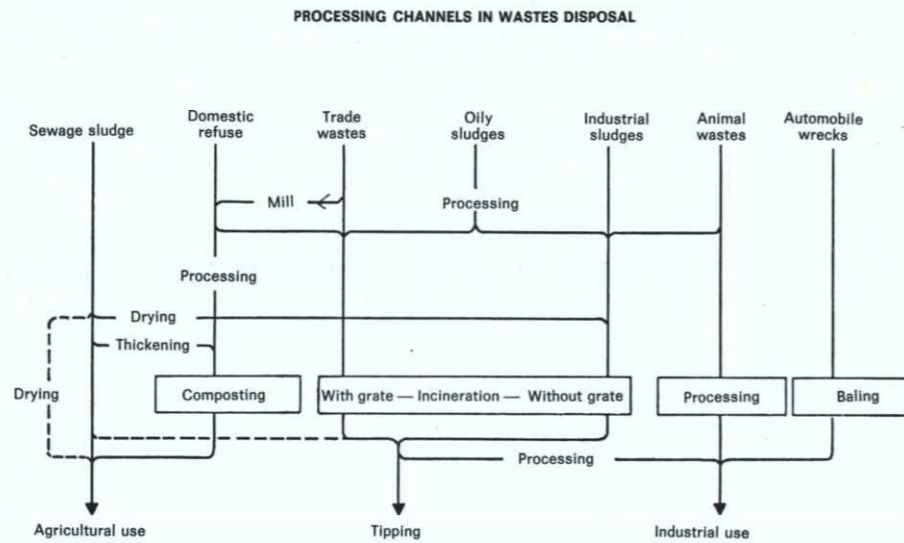
For collection and transportation, the municipal cleansing departments have found solutions practicable for their purposes. The problem of the disposal of collected waste is already a much more difficult one. In this respect we have several fundamentally different possibilities:

- a) *open dumping,*
- b) *controlled tipping (sanitary landfill),*
- c) *composting,*
- d) *incineration.*

The principal factors to be considered in determining future needs for solid wastes management are industrial development, population growth and land planning. Forecasts are usually developed on a regional or interregional basis.

At all events close cooperation between the authorities engaged in water and wastewater management and those occupied with solid waste disposal is indispensable.

Figure 1 represents a review of the processing channels in waste disposal. The first task consists in determining thoroughly the amount of municipal, industrial and agricultural waste to be disposed of per year or per week in the course of the different seasons. Industrial waste surveys must conform with typical production programmes and should make every effort to obtain data on production rates as well as on waste generation. Waste from agricultural activities indicates strong seasonal variations and change in quantity from one year to the other.



PLANNING OF WASTE DISPOSAL FACILITIES

The usual design periods for waste disposal facilities vary from 10 to 40 years. In order to make the best of the money invested it is advisable to secure the area necessary for the treatment of the refuse after 20 years. The surface for a second furnace and/or a second composting installation being already at hand, the enlargement of the plant can be projected in time. Furthermore, two sets of treatment machines are preferable in order to ensure the running of the plant in case of a break-down of one set. Methods for sampling procedures, determination of the moisture content, separation into waste fractions, refuse components analysis, calorific value determination are the most important parameters which determine the choice of the final method of treatment. The calorific value increases with the amount of cardboard, paper and particularly plastics in the refuse. Polyvinylchloride (PVC), now present in greater and greater quantities in refuse, often causes corrosion damages on boilers. Combustion residues from incineration should not contain any fermentable matter and the water soluble compounds should be sintered in the slag.

THE MAIN SYSTEMS OF SOLID WASTE DISPOSAL

1. Open dumping

has become very widespread in recent years, but has often meant the contamination and disfiguration of the countryside and sometimes the production of obnoxious smells. It is now generally recognised that this method of waste disposal can no longer be applied.



Prof. Dr. O. Jaag

2. Controlled tipping

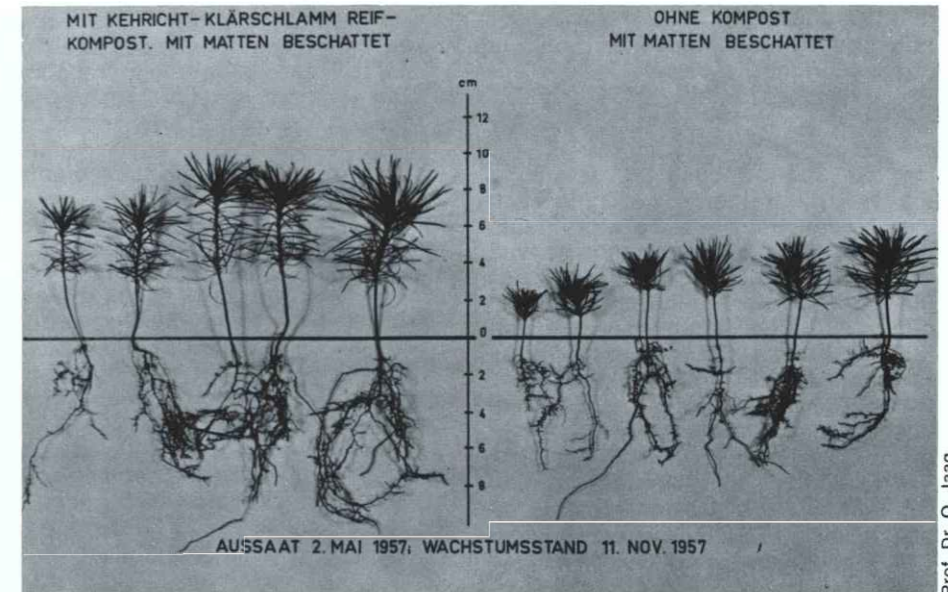
A further step in waste disposal has been taken in France and in Great Britain with the system of controlled tipping or sanitary landfill. This method is more complicated and more costly, since it requires special machines and personnel, but it protects the deposit surfaces and the surroundings from practically all emissions; moreover, it uses land which has so far been unproductive (Fig. 2).

3. Composting

As far as waste management is concerned, we live in a closed environment of soil, water and air. Disposal of wastes means discharging them into one or more of these sectors of the biosphere. Thus, proper waste management involves deciding which of these sectors can accept refuse without detriment. 40 to 80% of domestic refuse consists of fermentable matter which can be transformed into compost, but unfortunately the situation is not as simple as it may seem. The technical biological and marketing problems have often been underestimated and have subsequently led to disillusionment. When applied properly, mature compost has a manifold influence on cultivated soil, for example preventing water and wind erosion, retaining soil moisture during dry periods and many other positive effects (Fig. 3).

The best known and most thoroughly tested field of compost application is that of viticulture. Since the vines are often cultivated on a slope, prevention of erosion plays a very important part. Furthermore compost is welcome in horticulture, cultivation of vegetables, fruit culture, tree nursery and forestry. A very interesting use made of waste compost is in pig breeding. Pigs are often anaemic. In Holland specially treated compost has already been given to piglets as a source of iron for some time. By adding compost mixtures with various preparations rich in iron, anaemia and diarrhoea in piglets can be prevented. Weight increase can also be stimulated more effectively and cheaply with mature compost than with other preparations tested.

Although composting has caused much disenchantment for various reasons, it still represents the most significant possibility for making use of waste if done properly. Indeed we all know that agriculture is in need of humus, and there is no way of producing humus more economically. A reasonable selling price covers part of the expenditure, and compost treated grounds may absorb a certain percentage of toxic industrial mineral refuse which cannot be disposed of otherwise. However, actual marketing must be planned on a long-term basis (Fig. 4).



Pine shoots after 6 months:
Left: grown on refuse-composted soil / Right: non-composted.

Prof. Dr. O. Jaag

4. Incineration

It was recognised at a very early stage that big cities, particularly those situated in densely populated conglomerations could not apply the above mentioned methods to solve their waste problem. They chose therefore the most radical way of waste disposal, i.e. incineration, a method now used by numerous cities all over the world. This development has advanced considerably with the availability of incinerators and powerful machinery. Suppliers of several countries have for decades been engaged

in a healthy competition in this market. Depending on local and regional circumstances, the competent authorities are left with the choice of incineration with or without utilization of the energy generated. This energy can be used for the production of heat, steam or electric power. The fact that there are several possibilities of waste disposal serves our purpose extremely well, since the amount of waste produced today could hardly be absorbed by agriculture. We have to seek the optimal solution for each individual case and its spe-



Prof. Dr. O. Jaag

cial circumstances. This requires research in various fields as well as publication of its results in the authorised groups.

Concerning the characteristics of combustibility the three components water, ash and combustibles determine the calorific value of waste. In fact, incineration will never be a profitable business. Indeed, the proceeds derived from the sale of the waste heat does not cover the prime costs of the incineration plant disregarding the collecting service. This is particularly relevant for the biggest plants.

If heat recovery is not economical the heat produced by incineration must be destroyed. Plants of this character are frequently used for incinerating the screen residue of composting installations and municipal incinerators with capacities below 100 tons per day.

Refuse incineration with heat recovery will never be self-supporting. When comparing the results of waste disposal by incineration with those by composting, it is obvious that the soil conditioner «compost» cannot be replaced by any other means, whereas heat is produced more cheaply and easily from fuel.

The decision of whether an incineration plant should be built with or without heat recovery depends chiefly on the local conditions. The most favourable conditions for heat recovery are given when the incineration plant can be established within the premises of a power station.

The most convenient way to deliver thermal energy for industrial purposes is to locate the incineration plant in the neighbourhood of a heat-taking industry. The heat must be taken all year round and the incineration plant ought to be built very close to the industry.

Another possibility of using the heat produced directly is the feeding of a long distance heating system.

Instead of using the thermal energy produced for the generation of electricity, heating purposes or instead of wasting the heat, the resulting energy may be used for drying the sludge generated in a sewage treatment plant. For this purpose a hearth furnace, where municipal and industrial refuse, pumpable sewage sludge and waste oils may be incinerated simultaneously, is suitable.

Sewage sludges turn to solid wastes when they are dewatered or thickened. The combustion of oil waste, slaughterhouse wastes and dead animals presupposes special mechanical devices in the furnace. As for industrial sludges and further noncombustible wastes like galvanic residues, lacquers,

varnish removers etc., it has been shown that these substances are absorbed to a certain degree in the composting process, although it has not yet been proved whether compost with the addition of industrial sludges is suitable for cultivating food plants.

COSTING AND CONCLUSIONS

Much data have been collected to find a common denominator for comparing the investment and operating costs between the three main ways of waste disposal, i.e. landfilling, composting, incineration.

Even taking into consideration the numerous constituents which interfere in the various technical systems and the different local conditions, few mean values have been established even for one single country. Even greater difficulties must arise in evaluating these costs on an international basis. Each of the above-mentioned possibilities of waste management should be calculated separately, taking into account that all the waste must be eliminated.

In Europe, until recently, any suggestion of re-using refuse was considered unreasonable and reminiscent of war time. But more and more it has become a particular concern to all the people of our generation which is inevitably compelled to keep our environment clean and prevent future disaster.



...NEWS...NE FROM

EUROPEAN SOIL CHARTER

The day on which man discovered that a seed, if planted in the ground, could germinate and yield a plant like the one which had produced it, witnessed the birth of agriculture and the total upheaval of civilisation. In more recent times, those of the Greeks, the «ancients» regarded earth as one of the elements, the other three being water, air and fire.

Soil is thus a natural resource that is essential to humanity's survival. It has well-defined physical, physico-chemical and biological properties which can rapidly be destroyed. It is a limited resource, highly vulnerable to the consequences of human activities. Even in Europe, soil is by no means safe from deterioration, and such deterioration is often all but irreversible.

It is for this reason that the Council of Europe Committee of Ministers adopted Resolution (72) 19 in May of this year, on the European Soil Charter. Attention is drawn in the Charter, consisting of twelve principles and comments, to the vulnerability of soil and the dangers to which it is exposed as a result of the expansion of our industrial society. Lastly, the Charter indicates various measures for the consideration of authorities, mainly in connection with regional planning, where account must be taken of soil qualities and the purposes to which the soil is put.

THE 12 PRINCIPLES OF THE CHARTER

1. Soil is one of humanity's most precious assets. It allows plants, animals and man to live on the earth's surface.
2. Soil is a limited resource which is easily destroyed.
3. Industrial society uses land for agriculture as well as for industrial and other purposes. A regional planning policy must be conceived in terms of

...NEWS...NEWS...NEWS...NEWS...NEWS... FROM STRASBOURG

the properties of the soil and the needs of today's and tomorrow's society.

4. Farmers and foresters must apply methods that preserve the quality of the soil.
5. Soil must be protected against erosion.
6. Soil must be protected against pollution.
7. Urban development must be planned so that it causes as little damage as possible to adjoining areas.
8. In civil engineering projects, the effects on adjacent land must be as-

sessed during planning, so that adequate protective measures can be reckoned in the cost.

9. An inventory of soil resources is indispensable.
10. Further research and interdisciplinary collaboration are required to ensure wise use and conservation of the soil.
11. Soil conservation must be taught at all levels and be kept to an ever-increasing extent in the public eye.
12. Governments and those in authority must purposefully plan and administer soil resources.



Ministry of Agriculture and Natural Resources, Cyprus

IMPROVING CO-OPERATION IN FRONTIER REGIONS

The improvement of concentration and the institutionalising of co-operation across national frontiers were the main concerns of the European Symposium on Frontier Regions which took place in Strasbourg from 29 June to 1 July.

This Symposium, organised by the parliamentary Assembly of the Council of Europe and the European Conference of Local Authorities, enabled approximately 150 participants, including elected representatives of the local and regional government, as well as those responsible for technical aspects of co-operation in frontier regions, to put forward in a Final Declaration, a number of concrete proposals:

- close collaboration should take place between both local and regional officials as well as national authorities in drawing up and implementing regional planning in frontier areas. Supra-frontier regional committees should be rapidly established for this purpose as provided for by the European Conference of Ministers responsible for Regional Planning (Bonn 1970);
- confrontation between States for the solution of supra-frontier problems should be extended to the European level by the action, within the Council of Europe, of the European Conference of Ministers responsible for Regional Planning as a permanent body possessing adequate means of research and secretariat facilities;
- a committee for frontier regions connected with the European Conference of Local Authorities should be set up to co-ordinate regional planning schemes at European level and to represent frontier regions at the European Conference of Ministers responsible for Regional Planning.

For the cultural, social and economic aspects of co-operation between frontier regions, the Final Declaration of the Strasbourg Symposium called for:

- the regionalisation of geography, history and ecology teaching at primary and secondary levels and an effort to be made on the basis of immediate and visible realities to develop consciousness of the presence in the world of the common cultural heritage of Europeans;
- the introduction into schools of the teaching of economic and social realities to demonstrate the necessity of transfrontier regional co-operation;
- special arrangements for the teaching of frontier-area languages;
- special arrangements for the mobility of frontier workers.
- facilitation of joint endeavours for sport and tourism.

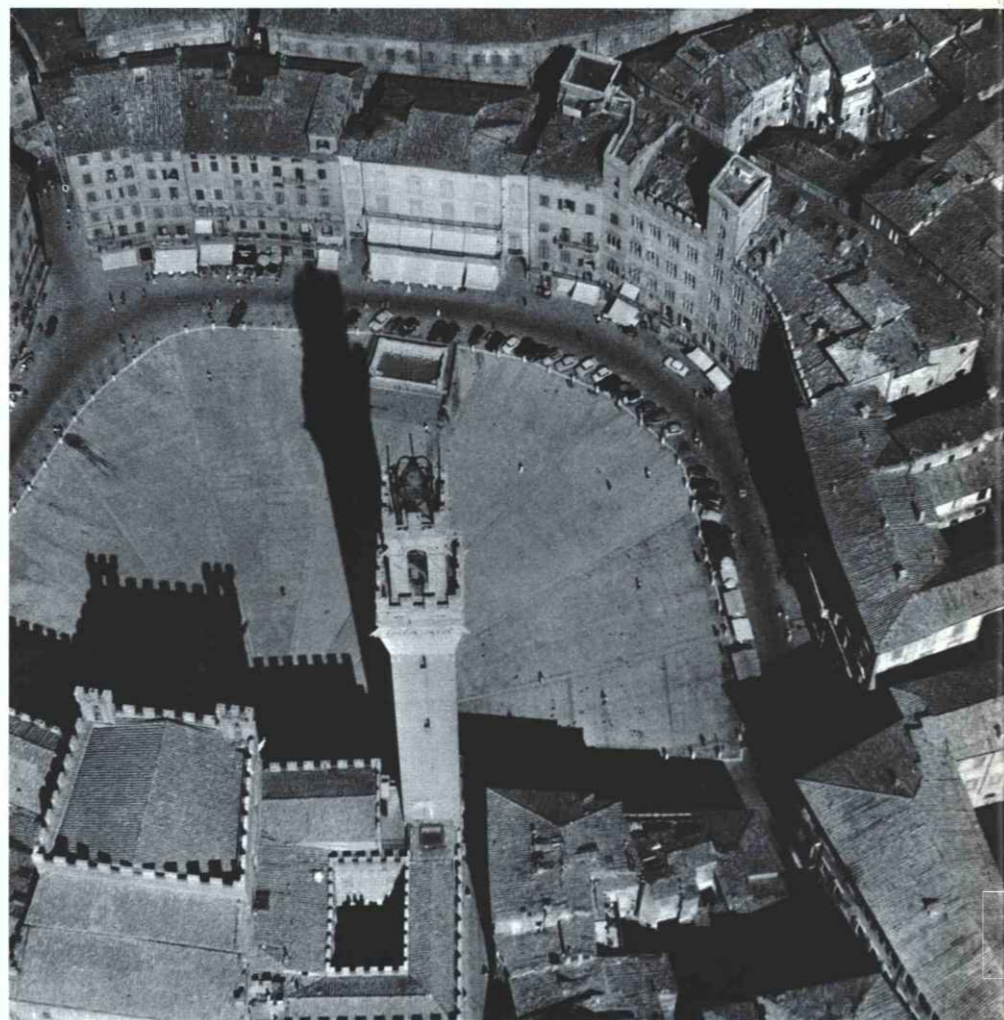
This Symposium, the third organised by the Council of Europe as part of its local authorities activities, followed those of Brest, on peripheral regions, and of Split, on historic towns.

It may be added here that transfrontier national parks, as well as promoting nature conservation, also play an important role in furthering direct contact between different countries and in helping to solve some of the problems of frontier regions. They thus represent an important factor in the unification of Europe. The setting-up of various transfrontier national parks in Europe has shown how it is possible to develop such projects through joint harmonious planning and to make a recreation area available for people living on both sides of the frontier (see *Nature in Focus* No. 11 pages 2-4).

CALLING A HALT TO DETERIORATION OF THE ARCHITECTURAL HERITAGE IN EUROPE

An appeal to preserve historical buildings, towns and villages has recently been launched by the Council of Europe. The Committee of Ministers has called on [Resolution (72) 20] the seventeen member governments to introduce urgent measures to prevent the demolition of historic or artistic monuments and sites.

Between now and 1975, which has been declared «European Architectural Heritage Year» (see *Nature in*



Ente provinciale per il turismo, Siena

Focus no. 12 page 24), the Council of Europe will draw up a series of detailed recommendations on safeguarding and reviving groups of historic buildings. Meanwhile, even before the introduction of new model legislation, it is essential that all those responsible at national, regional and local level take urgent steps using all the administrative, legal and financial means at their disposal, to meet the threat of demolition hanging over an irreplaceable heritage.

An intensive, large-scale campaign of information and education at the international, national and local level has been launched by the Council to safeguard and revive historic monuments

and groups of buildings and to give them a new lease of life. By 1975 the campaign will, amongst other measures, include a series of recommendations to governments, a Charter directed at the public, conferences, seminars, festivals, films, travelling exhibitions, radio and television programmes, competitions commemorative postage stamps and special tours of historic towns and villages. A special handbook for local authorities will also be issued in four languages. Furthermore, a European network of «show-pieces» of restoration and revival of exemplary groups of buildings will be formed to demonstrate, both to the responsible authorities and the

public, that historic areas can be adapted to the present needs of society whilst maintaining their own character.

A conference of local authorities will be convened in 1973 to review the progress of the campaign and to plan further activities.

THE RESPONSIBILITIES OF LOCAL AUTHORITIES FOR WATER POLLUTION CONTROL

In 1968 the Committee on Co-operation in Municipal and Regional Matters, acting in conjunction with the European Committee for the Conservation of Nature and Natural Resources undertook a survey on the subject of the division of responsibility, between the central government and local authorities, for the prevention of water pollution.

An analysis of the replies has been received from the following countries: Belgium, Denmark, the Federal Republic of Germany, France, Ireland, Italy, Luxembourg, The Netherlands, Norway, Sweden, Turkey and the United Kingdom.

This distinguishes three types of responsibilities:

1. Town planning regulations on the siting of industrial activities likely to contaminate water supplies;
2. Regulations prohibiting the discharge of anything likely to pollute watercourses or ground water, and preventive and punitive measures;
3. Special technical equipment for the prevention or reduction of water pollution.

The analysis also deals with the problems raised by the existence of river authorities and their relations (financial relations included) with local authorities.



SHORT NOTES

Environmental education

The importance of environmental education as an essential stage in the solution of environmental problems has been increasingly emphasised and actively demonstrated over the past few years, independently of the Council of Europe, notably by such international organisations as IUCN (in collaboration with WWF) and UNESCO. Both organisations, in their recently published Draft Programme of plans for the next few years, outline their activities in the field of environmental education and show their increasing commitment to the promotion of environmental awareness and understanding of the biosphere and its problems. IUCN's programme, already under way in the development of curricula, teaching materials and teaching methods for environmental education at primary, secondary and tertiary levels of formal education elaborated through meetings such as those at Rüschtikon in December 1971 (see *Nature in Focus* No. 12 page 26) and London, Ontario in October 1972, will continue. This programme has already produced concrete results by changes introduced in a number of countries and will be actively developed with national groups in collaboration with UNESCO. Also in collaboration with UNESCO and the Council of Europe, IUCN hope to arrange a World Conference on Environmental Education in 1974.

In collaboration with WWF, increased effort will be devoted to public education and the task of propagating conservation ideas. Plans have been made for a growing flow of articles and material designed for specialised media.

At the same time, IUCN intend to extend the involvement in out of school activities in collaboration with UNESCO and IYF, the Boy Scouts and other international youth organisations, through various working meetings, courses, seminars and publications.

UNESCO hopes to begin a long-range programme on environmental education in 1973-74. Initial activities will concentrate in co-operation with other agencies, on the collection and dissemination of information and on the formation of a long-term programme. An annotated bibliography of the literature on environmental education with a listing of available teaching materials in the field and a directory of groups active in it will be published in 1974. Also in the next biennium a joint social science and education project will involve the study of the reactions of students to new teaching materials and techniques designed

to influence personal attitudes and heighten the sense of social responsibility towards problems of the environment; the results will be incorporated in educational curricula programmes in subsequent bienna.

The programmes for specialist education already underway will continue. In addition, the importance of the environment in engineering will be stressed, and a joint project in collaboration with WHO and UNIDO, on environmental engineering, will be started next year.

UNESCO also emphasises that the role of architecture in shaping the aesthetics of the environment should not be overlooked. Among its various projects in this discipline, the pilot project on architecture education in Africa, initiated this year, is expected to lead to the establishment of a modern school of architecture concerning a number of African countries.

Since environmental education has not only a scientific component but also social and cultural dimensions, UNESCO's environmental programme will thus be developed in close cooperation with the activities described in the programmes of science and of social sciences, human sciences and culture.

The battle for the bats

Two of the 14 species of British bat, the Greater Horseshoe (*Rhinolophus ferrum equinam*) and the Mouse-eared (*Myotis myotis*), are in serious danger of extinction, according to P.A. Racey of Liverpool University and R.E. Stebbings of the Nature Conservancy, UK. Other species are also suffering serious losses. This warning results from a recent survey by the Mammal Society, which suggests there may only be 500 horseshoe bats left in Britain, compared with 2,500 in 1955.

The main causes for the decline are pesticidal pollution, particularly by DDT, destruction of habitat, sometimes for superstitious reasons, and disturbance of hibernation. D.J. Jefferies, in a recent study in Huntingdonshire, UK, found 30 bats of five species, mainly pipistrelles, to be carrying one-third of the lethal level of organochlorine pesticide residues (DDT and DDE) in their bodies and almost the lethal level after hibernation.

Both the endangered species are cave dwellers and are affected by caves being blocked up or used for rubbish dumps. In southern England many bat habitats have been destroyed, often because the roosts were in man-made tunnels which have been



The Large Mouse-Eared bat (*Myotis myotis*), the second largest European bat, turns a somersault before alighting.

Hans Dossenbach / WWF

filled in. Again, many miles of tunnels in the North Downs are soon to be blocked during the building of the M23 motorway.

Frequent disturbances to hibernating bats can also be disastrous, often leading to premature death since waking them causes them to use energy needed to last the winter. Horseshoe bats are particularly prone to disturbances as they hibernate hanging free from the ceilings of caves, where they can easily be seen and consequently disturbed. It has been suggested that grilles, allowing bats but not man to enter, should be placed across the entrances to the caves where the bats hibernate, such has already been done by the Gloucestershire Trust, U.K.

Deliberate destruction of bats by man is often due to psychological reasons rather than physical. In one case a colony of about 300 bats which together would weigh about 2 kilogrammes were blamed for the displacement of wall capping stones weighing 150 kilogrammes each, a physical impossibility. The bad public image presented by bats is based largely on ignorance, fear and superstition, which is not helped by their frequent portrayal as large, blood-sucking monsters in the current vogue of horror films, or the old wife's tale that they are prone to tangling themselves in ladies' hair.

The answer to the situation of Britain's diminishing bat numbers may well have to lie in legislation if these species are to be effectively saved. Britain is one of the few major countries in Europe not to protect bats by at least some legislation, whereas Austria, Bulgaria, Czechoslovakia, Denmark, the Federal Republic and the German Democratic Republic, Finland, Hungary, Italy, Mexico (where the guano bats provide local inhabitants with vast quantities of one of the world's richest fertilisers), Poland, Switzerland, USA (some states), USSR and Yugoslavia all have laws to protect them.

A more promising aspect of the situation is that attempts are now being made to make use of bats' voracious appetite for insects. Insects make up the bulk of bat diets and the smaller bats may consume over half their weight of insects per night. In Russia, special breeding grounds have been set aside to try and increase the country's bat population as predators on crop-destroying insects with the aim of reducing the use of pesticides. Similar methods are being tried in Dorset, UK, as part of the effort to conserve the threatened species of Britain's bat population.

Still more threats to birds of prey?

It would seem that, if birds of prey are given both full direct protection — legislation prohibiting their capture, killing, destruction, transport, import, export, habitat destruction, stealing of their eggs, together with surveillance of the endangered species during the breeding season to ensure their successful reproduction, and full indirect protection — strict control of the use of pesticides (e.g. DDT, Dieldrin etc.) and poisons (e.g. strychnine) used to kill other animals, publicity campaigns to make the killing of birds of prey a social crime, more financial assistance both at the national and international level, a stop to the demand for live specimens by zoological gardens, private displays, etc., — they do in fact stand a chance of escaping the threat of extinction that has been hanging over so many of their species for the last decade. Indeed, Britain's rarer birds, including ospreys and eagles, have had a moderately successful breeding season due to the implementation of special protection measures, say the Royal Society for the Protection of Birds, U.K. Apart from the famous Loch Garten pair, which raised two young ospreys were more successful than in previous years, five other pairs (all in Scotland) having raised a total of 12 young. For the third successive year, a pair of golden eagles nested in England — in the Lake District — and raised one young bird; prior to 1970, eagles had not bred in England for more than 200 years. Also in the Lake District, 23 peregrine falcon young were fledged, a result which, despite bad weather during the crucial time when the chicks were being reared, compares well with those of recent years. In Wales, 26 pairs of kites attempted to breed and the 15 which succeeded raised 18 young between them, a



Rijkinstituut voor Natuurbeheer

slight improvement on the previous year.

But a number of kites' nests failed because the eggs were stolen, and egg thieves and would-be falconers are believed to be mainly responsible for the failure of a number of unprotected peregrine falcon eyries on the borders between England and Scotland from which very few young were fledged.

However, commenting on results received so far RSPB Director Peter Conder states:

«The task of maintaining day and night watches on nests which are usually located in remote or difficult areas is such that we cannot hope to cover more than a small percentage of the birds which are threatened. Consequently, it is all the more worrying that the activities of egg thieves and other law-breakers seem to continue unabated and, if anything, to be on the increase.»

Obviously a rigorous enforcement of existing protective laws is still needed together with a greater assistance in the surveillance of the rarer species at all times possible, if these animals are to be saved.

Whale conservation continues

The 24th annual meeting of the International Whaling Commission took place in London on 26-30 June, one week after the end of the United Nations Conference at Stockholm, which had recommended, by an overwhelming majority, a 10-year moratorium on commercial whaling.

The Commission rejected the moratorium on the grounds that there was no scientific justification for a blanket ban on whaling. The United Kingdom, Mexico, Argentina and the United States voted in favour of the moratorium whereas Russia, Japan, Iceland, Norway, Panama and South Africa voted against it. Canada, France, Denmark and Australia abstained, though the first three voted in favour at Stockholm.

Despite the rejection, the effect of the Stockholm Conference has nevertheless resulted in a far more acute concern for the resource for which the IWC is ultimately responsible. During the meeting, the IWC either took or initiated action on virtually all the subjects contained in the IUCN Policy on Whale Conservation (IUCN Bulletin 2 (21) p. 185-188) and on the recommendations made by the International Conference on Whale Biology in 1971. Immediate implementation of the International Observer Scheme was of-



Evisceration of a sperm whale (*Physeter catodon*).

J. & S. Brownlie/Bruce Coleman Ltd.

ficially approved and the Blue Whale Unit system used in the Antarctic was replaced by catch quotas by species. Quotas for sperm whales (by sex) and for sei and Bryde's whales in the Antarctic and north Pacific were set at a sustainable yield. Quotas for fin whales were, however, set somewhat below the sustainable yield although an undertaking was given that further reductions would be made next year. A quota, at the estimated sustainable yield level, was set for virtually unexploited minke whale stocks in the Antarctic.

The Commission requested its Scientific Committee to examine the problem of making estimates of individual stock sizes and yields for species in each region, with a view to setting quotas by stocks in the foreseeable future.

Approval was given to the appointment of a sub-committee of scientists on small cetaceans, to improve data collection on all world catches and to review the status of these species. Incidental kills of small cetaceans in tuna fisheries, for example, has risen alarmingly in recent years, 250 thousand porpoises and dolphins are estimated to be killed each year in the US tuna fishery alone. The proposal for a decade of intensified research on cetaceans was also approved.

Protection for prohibited species whose term of protection was due for review was extended indefinitely. A recommendation was made to the Secretary General of the UN, to press non-member whaling nations to join the IWC. Nations possessing pelagic whaling fleets were also requested to

prevent as far as possible the sale of redundant fleets to non-member countries.

Lastly, a committee was appointed to review the Commission with the aim of improving its organisation and efficiency.

The detergents case in Switzerland

A new water protection law came into force on 1 July 1972 and lays down the extent of the responsibilities of the Cantons in this regard. Under this Federal act, an Ordinance on the Degradability of Washing, Rinsing and Cleaning Products also came into force on the same date.

In Switzerland, as elsewhere, the increasing use of synthetic washing products has created problems of water pollution, which first appeared as long as ten years ago. An expert committee was set up to investigate water pollution by synthetic washing products and, on the basis of research results, to draft a special ordinance with a view to eliminating or at least reducing the harmful effects of the use of washing, rinsing and cleaning products (i.e. detergents).

In order to improve the quality of waste water as quickly as possible, manufacturers of Swiss washing products have been requested, after a suitable transitional period, to market only easily degradable products (i.e. products capable of being degraded by micro-organisms both in biological water treatment plants and in water and without the formation of sub-

stances liable to interfere with the operation of those plants or to worsen water quality). This they have agreed to do. The agreement indicates that Swiss detergent manufacturers are prepared to incorporate into their products anionic substances which are at least 80 per cent biodegradable. This successful agreement, however, does not remove the need for a special ordinance since regulations are also needed for imported washing products, and questions other than that of anionic substances must also be considered. Thus the Swiss Ordinance on detergents refers to all detergents manufactured in or imported into Switzerland, and is not restricted to organic anionic substances but regulates all organic surface active substances contained in washing, rinsing and cleaning products.

The Recommendation on the determination of biodegradability of anionic synthetic surface active agents [C(71) 83] adopted by the OECD Council on 13 July 1971 is the method adopted by the Swiss authorities in the implementation of the above Ordinance.

It is recalled that in 1968 the Council of Europe signed a Partial Agreement on the Restriction of the Use of Certain Detergents in Washing and Cleaning Products (Public Health, Partial Agreement 64). This Agreement also laid down, among other things, that washing or cleaning products should not be put on the market unless the detergents are at least 80% susceptible to biological degradation (see also *Nature in Focus* No. 11 page 19).

NATURE IN FOCUS LOOKS AT BOOKS

EUROPE TODAY

This report presents the findings of a survey carried out for the Times in 1963 and 1971, amongst European politicians and businessmen listed in the International Who's Who. The purpose was to obtain general views on topics of international interest, environmental and political, and to obtain information on the readership habits. The overall response rate (38%) was lower than for comparable surveys conducted in the United Kingdom but in view of the response problems involved in international research, it was reasonably successful.

For statisticians in particular, details of the sample characteristics are given together with a technical appendix, the questionnaire and covering letter are reproduced in full and the answers to the various questions are tabulated both according to membership of EEC/EFTA and occupation, and according to country. Otherwise the results are clearly and concisely summarised on three pages where, for example, it appears that top European opinion considers industrial effluents, conservation of water resources and motor vehicle exhausts to be the most serious environmental problems in Western Europe, with aircraft noise and shipping control the least serious — these last two being considered the most suitable for international legislation.

Naturally a survey of this kind can only ask opinions on environmental topics of a very general nature, but it does succeed in giving an overall view of how Europe's elite views Europe today.

EUROPE TODAY
Prepared by Research Service Ltd, London
Published by Times Newspapers Ltd., 1972.
Price £ 5.0
(Text in English)

THE SNAKES OF EUROPE

This book, based on the author's extensive research and his own field experience, is a completely up to date guide to European snakes. It shows where each snake can be found, how it can be identified (with the assistance of the illustrated head scalation patterns) together with information on general habits and habitat preference.

General chapters include an explanation of some of the factors affecting the present day distribution of snakes in Europe, and the physical evolution of the snake. An appendix gives the common names of the various species in all major European languages.

The last book dealing exclusively and in detail with European snakes was published in 1913, since which time classifications have changed, new discovered and more knowledge gained about their distribution, ecology and behaviour. This book was written primarily to stimulate further interest in the subject, with a view to obtaining more of the information still lacking. The full life cycle of most species is not understood, and more needs to be learned about their ecology, demography and behaviour. Such information is becoming increasingly necessary to support the conservation measures needed to save some of the threatened species, at least in parts of their ranges.

THE SNAKES OF EUROPE
by J.W. Steward - 238 pages, illustrated
Price £ 2.75
David & Charles: Newton Abbot,
United Kingdom 1972
(Text in English)

PROTECTION OF MAMMALS

This book will have a general appeal to non-specialists who are concerned with the conservation and protection of mammals, and at the same time serve as a valuable reference work on the extinction of various species of mammals.

In the second part, devoted to the classification or enumeration of mammals, Gustav Kirk indicates in considerable detail the different families of mammals and breeds to be found in different parts of the world that are currently becoming extinct or declining sharply in numbers.

Lengthy bibliographies are provided for each example, but it is unfortunate that these are in alphabetical order; it would have been better and more accurate, if they had been arranged by chapter. For instance, Latin names are given in the text but not in the index.

SAUGETIERSCHUTZ: ERHALTUNG, BEWAHRUNG, SCHUTZ
by Gustav Kirk, 1968 - 216 pages - Price £ 2.50
Gustav Fischer Verlag, Stuttgart
(Text in German)

BIOLOGICAL PEST CONTROL

Professor J.M. Franz, the principal author, is a research worker who for several decades has been concerned with the biological control of pests. The book summarises in some detail

the range of biological and similar (microbiological, bio-technical, etc.) working methods, and an attempt is made by the joint authors (two chapters have been written by Dr. A. Krieg) to formulate a synopsis between biological and non-biological methods of work.

The book is aimed primarily at students and research workers, i.e. those directly concerned in this field, but it is devised in such a way that it can be read with relative ease by non-experts. The authors give especial consideration to working methods, and provide a small number of practical instances illustrating biological pest control.

The different chapters are planned in such a way that they can be regarded as basic themes. This scientific book on biological pest control also contains a detailed bibliography and an accurate index.

BIOLOGISCHE SCHÄDLINGSBEKÄMPFUNG
by Professor J.M. FRANZ and Dr. A. KRIEG
Verlag Paul Parey - Berlin and Hamburg 1972
208 pages - price 24 DM
(Text in German)

COUNCIL OF EUROPE PUBLICATIONS

NATURE CONSERVATION AND LOCAL AUTHORITIES

This handbook for local authorities contains a great deal of practical advice on action to be taken by regional authorities responsible for the welfare of those coming under their administration, and this for their environment. M. de Vilmorin first considers specific problems facing urban and rural authorities, and then looks at the different kinds of pollution menacing present day society. Various control methods and techniques are described, which will certainly be of practical value in the day-to-day application of anti-pollution measures.

NATURE CONSERVATION
Handbook for local authorities
by J.B. de Vilmorin - 72 pages - Price 10 F.
Council of Europe 1971
Nature & Environment series No. 4
LE ROLE DES POUVOIR LOCAUX
en matière de sauvegarde de la nature
par J. B. de Vilmorin - 80 pages - Prix 10 F.
Conseil de l'Europe 1971
Collection Sauvegarde de la nature No. 4

PESTICIDES AND WILDLIFE

Although pesticides have a definite effect on the parasites they are intended to combat, they present a possible risk for other organisms, and the need for the threat to such organisms

ZUSAMMENFASSUNGEN

to be reduced as far as possible must be acknowledged.

In other words, allowance must be made for the dangers to wildlife whenever new chemical products are being controlled, offered for sale or used; the author sets out in the first section the criteria to be observed by manufacturers and authorities concerned.

The second section of the study contains, in addition, three lists of pesticides with an indication of their effects on wildlife.

PESTICIDES AND WILDLIFE by Dr. N. Moore
Council of Europe 1971 - 23 pages - Price 4 F.
PESTICIDES ET VIE SAUVAGE par Dr. N. Moore
Conseil de l'Europe 1971 - 25 pages - Prix 4 F.

FACETS OF SOIL CONSERVATION IN THE DIFFERENT CLIMATIC AND PEDOLOGICAL REGIONS OF EUROPE

Surprisingly enough, soil erosion is once more becoming a current phenomenon in temperate climates. This is certainly the result of factors stemming from the population explosion, industrialisation and the continuing drive for maximum production.

Dr. Fournier's book is to be commended because it sets out data concerning soil conservation problems and provides governments and technicians with practical information. It may provide the foundation for concerted action throughout Europe to protect soil.

The author gives an indication of the dangers threatening the maintenance of soil properties, of the extent to which soil is being destroyed in the different climatic regions of Europe, going on to suggest measures whereby Europe's soil may be protected.

By way of conclusion, he points to the importance that should be attributed to soil in the context of regional planning. Soil, after all, provides the essential platform for human beings' earthly activities.

SOIL CONSERVATION by Dr. F. Fournier
Council of Europe 1972 - 194 pages - Price 16 FF.
Nature & Environment series No. 5
CONSERVATION DE SOLS par Dr. F. Fournier
Conseil de l'Europe 1972 - 206 pages - 16 FF.
Collection Sauvegarde de la nature No. 5

LUFTVERSCHMUTZUNG HEUTE S 2

Dr. P. C. BLOKKER
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Die Hecke
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Es werden folgende Gründe für die Luftverschmutzung aufgeführt: Populationsexplosion; Anstieg des Energieverbrauchs per capita; ökonomisches Wachstum und industrielle Expansion. Fortgeschrittenes technisches Wissen könnte dazu führen, die sich abzeichnende Bedrohung zu lösen, da theoretisch viele Schmutzstoffe in harmlose oder sogar nützliche Produkte umgewandelt werden können. Hierzu ist die Unterstützung von Toxikologen und Ökologen, supranationale Zusammenarbeit und internationale Abkommen von ausschlaggebender Bedeutung. Sind die akuten Auswirkungen der Luftverschmutzung hinreichend bekannt, so besteht noch keine ausreichende Klarheit über die Langzeitwirkungen. Sollten die Verschmutzungskonzentrationen über ein gewisses, natürliches Mass ansteigen, so stellt sich die Frage, welche Kriterien dieses Mass bestimmen sollen? Ausserdem werden die Probleme spezifischer, sich weit ausbreitender, luftverschmutzender Substanzen diskutiert. Hierzu gehören: Kohlenrauch, — massgebende luftverschmutzende Substanz mehrerer Jahrhunderte —; Schwefeldioxyd — als gefährlichste luftverschmutzende Substanz —; Stickstoffoxyde; Ozon usw.; Blei; Kohlenmonoxyd; Kohlendioxyd; Kleinstpartikel und städtische Verunreinigungen.

AUSWIRKUNGEN DER LUFTVERSCHMUTZUNG AUF PFLANZEN, TIERE UND BODEN — S 6

Dr. E. BOVAY, Direktor,
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für Landwirtschaft und Chemie
Bern, Schweiz

Einige luftverschmutzende Substanzen führen im Pflanzen- und Tierreich zu ernsthaften Schäden. Für Pflanzen sind u.a. Schwefeldioxyd, Fluor- und Chlorverbindungen, industrielle Staubpartikel und im besonderen Schwermetalle giftige Substanzen. Pflanzen reagieren häufig empfindlicher auf bestimmte Substanzen (Schwefeldioxyd, Fluor) als Tier und Mensch. Bei Tieren ist die Vergiftungsgefahr auf den Konsum von verseuchtem Futter zurückzuführen; z. B. Fluorverbindungen, Bleilagerungen — hervorgerufen durch Auspuffgase —, oder Partikel toxischer Metalle in der Nahrung. Durch ständige Anhäufung im Boden bilden einige luftverschmutzende Substanzen eine permanente Vergiftungsgefahr für das Pflanzenreich, und infolgedessen auch für die Tiere, denen diese Pflanzen als Nahrung dienen.

AUSWIRKUNGEN DER LUFTVERSCHMUTZUNG AUF DIE MENSCHLICHE GESUNDHEIT — S 9

Dr. Marc Lob
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Die Auswirkungen der Verschmutzung auf die menschliche Gesundheit sind erörtert worden. Ausser bestimmten Unglücksfällen, vergleichbar akuten Vergiftungen, verursacht bei ähnlichen Gelegenheiten, ist die am besten begründete Tat-

sache der Zusammenhang zwischen den Bronchialbeschwerden einerseits und andererseits einem Anwachsen der Verschmutzung, hervorgerufen durch mannigfache entzündend wirkende Substanzen, wie Rauch, Schwefeldioxyd, Stickstoffoxyde, bestimmte Peroxyde, Salzsäure, usw. Eine direkte Beziehung zum Krebs konnte bis jetzt jedoch noch nicht nachgewiesen werden; auch scheint zum gegenwärtigen Zeitpunkt das Kohlenmonoxyd keine nennenswerte Rolle zu spielen. Das Blei der Auspuffgase stellt hingegen eine potentielle Gefahr dar. Die Auswirkungen der Asbeste werden vielleicht durch weiterführende epidemiologische Studien aufgeklärt werden. Ebenfalls sollten die psychologischen Auswirkungen nicht vernachlässigt werden. Wie dem auch sei, eine energische Aktion auf internationaler Ebene ist unerlässlich, um die Zukunft zu sichern, solange es noch Zeit ist.

SCHLUSSFOLGERUNG — S 11

Dr. Aurelio Pececi

Die Probleme der Umweltverschmutzung scheinen gegenwärtig das Interesse des grössten Teils der Bevölkerung zu finden, aber gelenkte Aktionen zum Schutze unserer Umwelt sind leider noch nicht sehr häufig.

Obgleich die Industrie mit ihren dazugehörigen Anlagen die grössten Umweltverschmutzer der Atmosphäre sind, darf man nicht vergessen, dass die Industrie ein Produkt unserer Gesellschaft ist, deren Belangen sie dient. Das bedeutet jedoch leider auch, dass die Industrie ihre Vormachtstellung häufig über Gebühren ausnutzt, um einer Kontrolle ihrer Abfallprodukte zu entgehen, obgleich es möglich sein sollte eine wirkungsvollere Kontrolle durch härtere Gesetze zu ermöglichen. Um die Bedrohung der Umweltverschmutzung allgemein besser zu verstehen, muss die Situation in einem engen Zusammenhang mit den Rohstoffquellen, der Bevölkerungsexplosion und den übergrossen Forderungen der Bevölkerung auf unserem Planeten gesehen werden. Unsere Aufgabe ist es, jetzt mit wissenschaftlichen Mitteln zu klären, ob wir in einigen Fällen nicht die Grenzen des wirtschaftlichen Wachstums erreicht oder gar schon überschritten haben, sei es weltweit oder in einzelnen Kontinenten, wie Europa.

DIE FRANZÖSISCHE UMWELTPOLITIK — S 12

Robert Poujade
Ministre Délégué auprès du Premier Ministre
Chargé de la Protection de la Nature
et de l'Environnement
Frankreich

Für den französischen Umweltminister sind wirtschaftliche Ausdehnung und Naturschutz keine traditionellen Feinde. Die Produktivitätseinnahmen ermöglichen es im Gegenteil technische Verfahren zu verbessern, um Schadstoffe zu eliminieren bzw. aufzubereiten. Das heisst, dass die Natur und die Umwelt von der Wirtschaft geschützt werden, die selbst den schädlichen Charakter ihrer Ausdehnung begrenzt.

Auf der anderen Seite muss der Akzent der französischen Politik zum Schutze des natürlichen Raumes auf eine wahre Leistung gelegt werden, was die Wasserverschmutzung anbetrifft. Das bedeutet: die Bildung von Verbänden, die «Agences de bassin» genannt werden. Diese Verbände zeichnen sich durch eine doppelte Funktion aus: Gebührenerhebung auf Wasserverschmutzung bzw. Subventionen zur Verwirklichung von speziellen Techniken gegen die Pollution und Errichtung von Anlagen, die eine quantitative Verbesserung des Wasserreservoirs ermöglichen.

DIE GEGENWÄRTIGEN UND ZUKÜNFTIGEN PROBLEME DER ABFALLBESEITIGUNG IN EUROPA — S 17

Prof. Dr. O. Jaag
Zürich, Schweiz

Die Behandlung von festen Abfallstoffen muss an die sich ändernden Anforderungen und die gegebenen Umstände angeglichen werden. Die Menge an häuslichen Abfällen hat sich allein in den letzten 15 Jahren mindestens verdoppelt. Das Problem der Abfallbeseitigung ist komplex, da nicht nur die Aufbewahrung, sondern auch die Behandlung, die Wiederverwendung und schliesslich die entgeltliche Ablagerung unbrauchbaren Materials berücksichtigt werden muss. Die geläufigsten Ablagerungssysteme für angefallene Abfälle sind: offene Schutthalde, kontrollierte Berghalden (oder sanitäre Anlagen), Kompostierung und Einäscherung. Die Hauptfaktoren der Abfallbeseitigung im Hinblick auf zukünftige Bedürfnisse sind: Industriel- und Populationswachstum und Landplanung. Vorkursoren werden gewöhnlich auf regionaler und interregionaler Ebene entwickelt. Die angemessene Methode wird von dem Anstieg städtischen, industriellen und landwirtschaftlichen Mülls abhängen, der in einer bestimmten Zeit im Laufe der verschiedenen Jahreszeiten anfällt.

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