Conservation in problems and

Sweden, with its small population and its wealth, is in an ideal position to practise sound conservation. Indeed, it was the first European country to enact legislation making provision for national parks. But, as is true of anywhere else in the world, there have been, and still are, conflicts between conservationists and those who exploit natural resources without thought for the future. Professor Kai Curry-Lindahl, an ffPS Vice-President, has been involved with conservation in Sweden for many years as well as being extremely active at an international level. In July 1983, the British Museum (Natural History) invited him to give a public lecture on the progress of conservation in his country and its attendant problems. Here we publish a shortened version of his talk.

From the conservation point of view Sweden, of all countries in Europe, should be a land of great possibilities. A nation of considerable size with no population pressure, it is wealthy and has one of the highest standards of living in the world. In such an ideal situation Sweden could have planned to use its environment in an ecologically far-sighted way and its renewable resources on a sustained yield basis.

Sweden's mountains are the eastern part of the Scandinavian mountain range, the oldest of Europe's mountain formations, stretching from the Arctic Ocean to southern Norway. Below it an immense coniferous forest begins, the westernmost part of the great taiga that runs across Eurasia eastwards to the Pacific Ocean and also covers large tracts of Alaska and Canada. In southern Sweden conifers predominate in the mixed forest of pine, spruce and deciduous trees, while in the extreme south deciduous forests prevail, with beech as the major species. Finally, among deciduous forests in Sweden, there is a subarctic or subalpine birch forest in the mountain zone forming the timber-line. Much of these forests have been altered, or in certain regions entirely eliminated, by man, chiefly for agricultural purposes, but below the mountains two-thirds of the country is still forested.

Lakes, marshes and rivers are abundant all over Sweden—8·5 per cent of the land surface is water. The country's coastline, measured as the shortest distance between the borders with Norway and Finland is about 2500 km, but if all the fjords, islands and archipelagos are included the coastline is more than 7600 km. Marine life and resources around Sweden vary considerably. In the west, Skagerack and Kattegatt, being salt-water offshoots of the North Sea, have a high salinity whereas the Baltic Sea is brackish. Although there is an influx of saltwater through the Sound and the Belts into the Baltic and the Gulf of Bothnia, they receive enormous volumes of freshwater through numerous large rivers borne beneath the snow masses and glaciers of the mountain chain.

Though Sweden is a fairly large country, covering 487,000 sq km, the largest in Europe after the USSR, France and Spain, it has only 8·3 million inhabitants, 17 people per sq km. By contrast Britain has 229 per sq km. The low population

Sweden—progress

Kai Curry-Lindahl

density puts the country in an extraordinarily advantageous situation for conservation planning and management in comparison with most other countries. As the population slowly increased during the twentieth century there was a pronounced shift of people from rural areas to urban communities. About 90 years ago approximately one million more people lived in the countryside

A living replica of the luxuriant deciduous forest that was predominant in southern Sweden during the warm Bronze Age. This is still the climax vegetation along parts of the western coast *(Kai Curry-Lindahl)*.

https://doi.org/10.1017/S0030605300019232 Published online by Cambridge University Press

A montane threshold and tamed waterfalls are all that remain of the heartland in one of the most spectacular national park areas of Europe. A giant artificial reservoir, 60 km long, flooded the richest and most productive valley of the Stora Sjofallet (= Great Waterfall) National Park, eliminating five large lakes and 48 smaller ones. A unique subarctic 'inland archipelago' with important populations of rare mammals, birds and fish was entirely destroyed, governmental vandalism of a natural heritage *(Kai Curry-Lindahl)*.

than today and now the majority lives in cities. This is another factor which should have been favourable for conservation planning and activities.

The history of the conservation movement in Sweden began about 60 years ago. From the first groping ways of thinking—for example, about the necessity to protect single objects like boulders and strangely growing trees as well as rare species of plants and animals without regard for their interrelationships with their habitats—conservation philosophy has evolved to the more biologically and ecologically based approach of today. During this period of evolution certain periods were dominated by battles about activities which conservationists found disastrous for Swedish wildlife. These periods of conservation battle were often long and some of them are still going on. They were, and are, significant for the increasing public awareness of the importance of the environment that we have witnessed in Sweden during the last decades.

Two main subject areas that caused controversies for a long time are now more or less ended. The first was the policy of government subsidies for wetland drainage, which arose from the commonly held view that wetlands are useless wastelands. At the end of the nineteenth century and during the first 60 years of the present century enormous areas of shallow lakes, marshes, bogs and mires were drained for agriculture. Some of these drainage schemes were successful, but most destroyed valuable aquatic resources and were economic failures. Instead of providing the productive arable land anticipated they have resulted only in a few pastures and in large areas that are virtually useless. Tragically, a high percentage of the drainage failures have included the most productive wetlands. The worst economic consequence has been the lowering of the water table, adversely affecting extensive surrounding, previously fertile areas and promoting soil erosion. Agriculturalists, water engineers and politicians are thus guilty of ruining productive wetlands, largely at public expense. This is the form of farm subsidy that has no regard for national prosperity. Conversion to agriculture is

seldom the wisest or the most economic way of utilising a wetland resource.

A few individual conservationists, united within the Swedish Society for Conservation of Nature, fought the drainage mania for decades while the Government took no interest at all in conservation and continued to finance the drainage schemes. It has only been during the last 15 years that the Government has realised that the drainage of remaining wetlands must be discouraged, and that many lakes and marshes already drained ought to be restored to regain their former productivity.

The second conservation battle fought and won concerned hunting legislation. During the 1940s and 1950s conservationists and ornithologists were involved in continuous conflict with the Government, the Forest Service and the hunters, organised within the Swedish Association of Sportsmen. The latter had been given full power to suggest, or in reality determine, which mammals and birds could be hunted throughout the year or seasonally and which species should be protected. The hunters had traditionally dictated their wishes and the conservation side was not even allowed to make suggestions. As a result, biological and ecological considerations were ignored and the traditional biased attitude against predators dominated the legislation. During 15 years of intense conflict the conservation point of view gradually became respected and won the Government's confidence. This conservation victory, however, does not mean that all matters of controversy have been eliminated.

The present conservation battles are concerned chiefly with six subject areas: hydroelectric schemes causing biological destruction of lakes, rivers and surrounding lands including national parks and nature reserves; the use of biocides; the general pollution of the natural environment; the ecological effects of acid deposition; and, finally, problems dealing with energy and forests. Several of these subject areas overlap.

Before going into these problems I would like to explain briefly the present legislative and administrative background to conservation in Sweden. The first Swedish conservation act was passed in 1909. It deals with the protection of natural monuments, like single boulders and individual trees, and also contains a clause making provision for national parks. In this respect Sweden was a pioneer, being the first European country to enact legislation on national parks, of which it established several in the same year. It is worth noting that the definition of a national park in Britain differs greatly from that adopted by almost all other countries, as well as by the United Nations and other international organisations. Internationally, the term 'national park' designates areas 'where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment'. Until 1963 there was no government authority dealing with conservation. The national parks were administered by the Forest Service and it was mandatory that all matters dealing with aspects of nature conservation, such as exploitation schemes involving natural resources, had to be advised upon by the Committee for Conservation of the Royal Academy of Sciences of Sweden and by the Executive Board of the Swedish Society for Conservation of Nature. As a member of both these voluntary bodies I can assure you that it was a Herculean task. Obviously, the conservation work required funds and a fully-fledged organisation of its own. Therefore, for 10 years we urged the establishment of a Ministry of the Environment or at least a government Nature Conservancy of the type Britain had instigated just after World War II.

In 1963 the National Swedish Environment Protection Board finally came into being. In the 1970s there was a strong expansion of the conservation administration at government and county levels in Sweden. The government conservation impact is now very ambitious and has proportions that we, in the 1950s and 1960s, could not even dream about. Conservation legislation has advanced, particularly within the field of pollution. Does this fact signify that the protection and utilisation of renewable natural resources are adequate? The answer is both yes and no.

Before the Government assumed official responsibility for nature conservation, the main

battle in protecting national parks, lakes, rivers and forests from exploitation was against the Government itself. It was and still is the State that is the main exploiter of these areas. Therefore, a politically run administration like the National Swedish Environment Protection Board did not, unfortunately, become a strong opponent to government exploitation and violation of national parks. On the contrary, there are too many examples of how this Board paved the way for government exploitation by facilitating the destruction of national parks and nature reserves.

It is chiefly the hydroelectric schemes that involve national parks and nature reserves. So far all major Swedish river systems except four have been destroyed by a series of dams and hydroelectric plants. The fight goes on to save these four remaining rivers. National parks and nature reserves are also damaged by road building, mining exploration and deforestation. So far four of the seven national parks in Swedish Lapland—the largest and most valuable in Sweden—as well as several internationally significant nature reserves, some of them listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (The Ramsar Convention) of which Sweden is a Contracting Party, have been seriously destroyed by unnecessary government exploitation. As a Swede, I regret to say that Sweden has, through government projects, destroyed more national parks and equivalent reserves than any other country, without even economic pressure to justify it. The destruction is still proceeding despite protests from responsible national and international conservation organisations.

The example from Sweden shows that in some cases of flagrant environmental misuse and violation of national parks, it is imperative to exercise international pressure on a government. Man-made major modifications in national parks must be banned in the interest of humanity and it is time, after 110 years of national park activities in the world, that all nations declare their acceptance of the integrity of national parks as a universal act of solidarity. Such a decision would be a step forward for our civilisation.

The use of biocides and pesticides in agriculture and forestry has been a conservation issue since the 1940s. The detrimental effects of toxic chemicals on wildlife soon became evident to conservationists, particularly ornithologists. As the producers of biocides and their allies represented powerful economic interests, and were supported by the Government, it was not easy for poor conservation organisations to campaign against the widespread use of these toxic chemicals. Despite repeated warnings by conservationists about the danger of using increasing quantities of toxic chemicals no action was taken. In 1950 the World Conference of the International Council for Bird Preservation, held in Uppsala, Sweden, adopted a resolution that urgently warned governments about the use of toxic chemicals. Not one government took action at the time or showed any concern. In 1965 a voluntary agreement was reached to ban particular uses of toxic chemicals such as aldrin, dieldrin and heptachlor in Great Britain, out of recognition that they were too damaging for the environment, and particularly harmful to vertebrates. This was a fine achievement, but when the British market was closed the same manufacturers tried to export their toxic chemicals. Some years later, when comparable Swedish products were banned in their home country the Swedish manufacturers did the same, with government approval.

After more than 20 years of intense campaigning by conservationists against seed-dressing with mercury the Swedish Government finally banned it in 1966. In 1970 a preliminary ban on the use of DDT was introduced. However, many serious problems remain: still today fishes from many Swedish lakes are black-listed because they are too contaminated by mercury, cadmium and other heavy metals to be eaten. This is probably the reason why the otter, a fish-eater, has virtually disappeared from the southern half of Sweden.

On the marine side, the Baltic has been a victim of various pollutants. Like the Mediterranean, it is one of the most polluted seas of the world. Through the input of PCB, DDT and its allies of chlorinated hydrocarbons, mercury compounds and other toxic chemicals originating from industrial dumping, as well as through oil pollution and eutrophication processes, the Baltic has become a death trap for many organisms. Among the vertebrates are two species of seals, the white-tailed eagle and the salmon. The DDT compounds seem to be declining but PCB per-

sists and, despite intense monitoring, its source is a mystery. The eutrophication of the Baltic is due to the increased influx of nitrogen and phosphates in the run-off of fertilisers from agricultural lands, municipal waste discharges and the burning of fossil fuels. Phosphates and nitrogen compounds have increased tenfold in the Baltic during the last 80 years. This is a threat to aquatic life and to the fisheries. This is, of course, an international problem. There is a ratified Convention amongst Baltic shore states about the pollution problems and there have been certain improvements.

The acidification of the environment is an international conservation problem with disastrous consequences in Sweden as well as in many other countries, particularly Norway. This acidification comes not only from acid rain but also from dry deposition. The main acidifying atmospheric pollutants arising from man's activities are sulphur dioxide and nitrogen oxides. Over most of the globe's surface natural and man-made emissions of sulphur dioxide are of comparable magnitude, but over industrialised regions the man-made emissions exceed the natural emissions by a factor of 5–20. The consequences for water acidification have been very serious in lakes of southern Sweden and Norway. In southern and central Sweden, fisheries damage has been observed in 2500 lakes and is assumed to have occurred in a further 6500 lakes with some observed symptoms of acidification. On the basis of lake chemistry the fisheries of an estimated 18,000 lakes are now affected. High egg and fry mortality in acid water is regarded as the main reason for fish decline but massive kills of adult

For more than 40 years the Sjaunja Bird Sanctuary—largest bog complex in Europe, with 27 species of mammals and 157 species of birds—has repeatedly been proposed as a national park or a strictly protected area by Swedish and international conservation organisations. Yet the Swedish Government has persistently used false arguments in an attempt to downgrade the sanctuary and exclude it from international lists in order to pave the way for destructive hydroelectric and other kinds of exploitation *(Kai Curry-Lindahl)*.

fish during acid-release episodes are well documented and are caused by physiological stress from toxic combinations of water acidity and aluminium.

Vegetation acts as an efficient filter of the chemical components in air and precipitation but cannot prevent soil acidification, though it is a slower process than in water. The damage by acid air pollutants to forest vegetation is both direct and indirect. The first affects leaves and stems, the second alters the root environment. Emission patterns in Europe show that a large proportion of the sulphur deposition in Sweden and Norway comes from areas of the European continent and the British Isles. The quantities are large: some 64 million tonnes of sulphur dioxide are emitted annually in Europe. Lakes in Scotland and in the Lake District of northern England are also hit by acid rain, particularly when winds from the south and south-east prevail. A number of Scottish lakes have lost their fish populations. I am sure this matter will become an issue also in Britain. Chancellor Helmut Kohl recently announced that the Federal Republic of Germany has decided on vigorous action to rescue its dying forests and reduce the air and lake pollution it exports to other countries. It will spend up to $5 billion over the next 10 years to fight the acid rain pollution problems at source. The West German measures are particularly significant because the country has been one of the main producers of this kind of pollution.

As a result of rising international concern, in 1979 34 states signed a Convention on Long-range Transboundary Air Pollution that will provide a framework within which corrective measures may be taken at international level. In March 1983 the Convention, having been ratified by 24 countries, came into force. It remains to be seen what it can do. The first step is a suggestion that each nation should decrease its sulphur emission by 30 per cent within 10 years. Sweden has so far reduced its sulphur emission to the level prevailing in the early 1950s and will reduce it still further in the future, but cannot alone prevent acidification of its environment. Therefore, Sweden has worked hard for the adoption of the Convention and its implementation.

Artificial liming of acidified lakes is, in my opinion, no solution to an environmental problem of such magnitude. Yet, Sweden allocated 54 million Swedish crowns (approximately £4·7 million) in 1983 for this remedy. Liming only changes the symptoms of acidification, not its causes.

The energy problem is another much debated environmental issue, which I can only touch on here by mentioning some of the questions being asked. Shall Sweden sacrifice its last free-flowing rivers for hydroelectric power? Shall it turn to nuclear power despite the fact that there is no safe solution to the problem of nuclear waste disposal? Shall it base its energy production on imported and air-polluting coal or oil? Will technology eventually find the means to harness solar energy even in a northern country with long, dark winters?

The conservation, management and utilisation of forest resources is a much debated issue which would require some time to review. But there is one fundamental conflict, between the forest industries and the Government on one side and conservationists on the other, that needs resolving. The Government and the Forest Services adopt a purely commercial approach which leads to ecological and biological impoverishment. Here again, the National Swedish Environment Protection Board has not taken a stand against the simplistic view that forests consist of nothing but timber.

The status of the fauna in a country is indicative of the effectiveness of conservation. Sweden is large and sparsely populated and could easily have remained the home of animals that lived there for thousands of years. The wolf is a case in point, a tragic symbol of how Sweden treats its animal treasures. About 100 years ago the wolf was dispersed throughout the country. In 1945 only 25 wolves remained and in the 1950s their range was limited to Swedish Lapland, where, it was hoped, they could at least find a safe retreat in the large national parks and reserves. At that time wolves were hunted throughout the year despite the fact that conservationists had suggested their protection for 20 years. In 1964 the last free-living Swedish wolf cubs were born. In 1965 only five or six wolves were still in existence in Sweden. That year the Government authorised that they could be shot from helicopters. The following year, when it was doubtful that any wolves were left in Sweden, the Government proclaimed total

protection of the species! Hunters have also caused other exterminations of mammals in Sweden, but not in recent times. Reduction of biological diversity and species' loss are mainly caused indirectly, through the destruction of habitats. Two years ago Sweden lost the middle spotted woodpecker, the latest of the extinctions in the country.

Despite many conservation problems, Sweden is still a country where there are great possibilities to walk freely in what one can call wilderness areas, where nature lovers can watch wild flowers, beavers or elk (moose), white-tailed eagles or a dozen species of owls, where anglers can fish trout or graylings, or where people can collect mushrooms and berries without asking the landowner for permission. This prerogative of 'all men's rights', as it is called in Sweden, is an old tradition. Sweden has made significant conservation progress in the expansion of nature reserves. In addition to the 18 national parks there are 1100 nature reserves covering about 900,000 ha.

Finally, I would like to consider the effects of Sweden's conservation policy on the developing world. It could have played a useful role by exporting ecologically based principles embedded in its technical assistance to developing countries, for it is one of the major contributors of aid, both bilaterally and multilaterally through the United Nations Development Programme (UNDP). Yet Swedish technical and economic assistance has, despite numerous warnings, unfortunately failed to apply conservation principles in its aid. Sweden is by no means the only country that has failed in this respect. An analysis of the ways in which technical assistance is deployed by bilateral and multilateral aid organisations leads inevitably to the tragic conclusion that for decades the aid to developing countries has, and is still, destroying renewable natural resources.

Today about 30 billion dollars go annually to technical assistance through UNDP and bilaterally through individual donor countries. Unfortunately, these funds are largely spent on projects giving short-term economic returns; thus they actually contribute to the long-term environmental degradation and loss of natural resources. This disastrous situation emphasises the necessity of, and justification for, a radically new, ecologically based approach to aid and development in tropical and subtropical countries. It is indeed remarkable that in 20 years of aid the organisations responsible have ignored ecological realities, despite being continuously reminded about them by conservation organisations. It is even more remarkable that technical assistance organisations, whose representatives in developing countries have long been witnessing the destruction of the environment, have not taken any initiatives to stop it, although they have been frequently asked to do so by non-governmental organisations. Is this passivity due to the fact that the technical assistance organisations do not like to admit that they themselves are to a large extent the cause of environmental destruction? This question leads to another: 'Is technical assistance to developing countries still environmentally destructive?'. In my opinion, the answer is yes. Too often exploitation and development plans are nothing but a plundering of resources leading to the ruin of the area concerned.

Conservation organisations have tried for two decades to draw the attention of UNDP, the Food and Agriculture Organisation (FAO), the World Bank and countries providing bilateral assistance to the dangers of neglecting ecological realities, yet hardly a month passes without news about environmentally destructive projects. Non-governmental organisations try to stop or modify these projects but the decisions have usually already been taken. The effects of technical assistance projects cannot be measured in terms of economic growth without being balanced by the enormous losses of environmental capital in the form of ecosystem productivity. Hitherto, development projects in developing countries have ignored the facts that such productivity exists and that water, soil, vegetation and wildlife resources are interrelated. They have not been concerned with functions and processes of ecosystems or about conservation in general. Future governments in tropical and subtropical countries will regret that many projects promoted by technical assistance organisations have had disastrous environmental effects in their countries.

Professor Kai Curry-Lindahl, Ministry for Foreign Affairs, Box 16121, S-103 23 Stockholm 16, Sweden.