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STEERING COMMITTEE FOR THE CONSERVATION AND MANAGEMENT
OF THE ENVIRONMENT AND NATURAL HABITATS
(CDPE)

Committee of Experts on Protected Areas

Kuscenneti National Park
(Turkey)

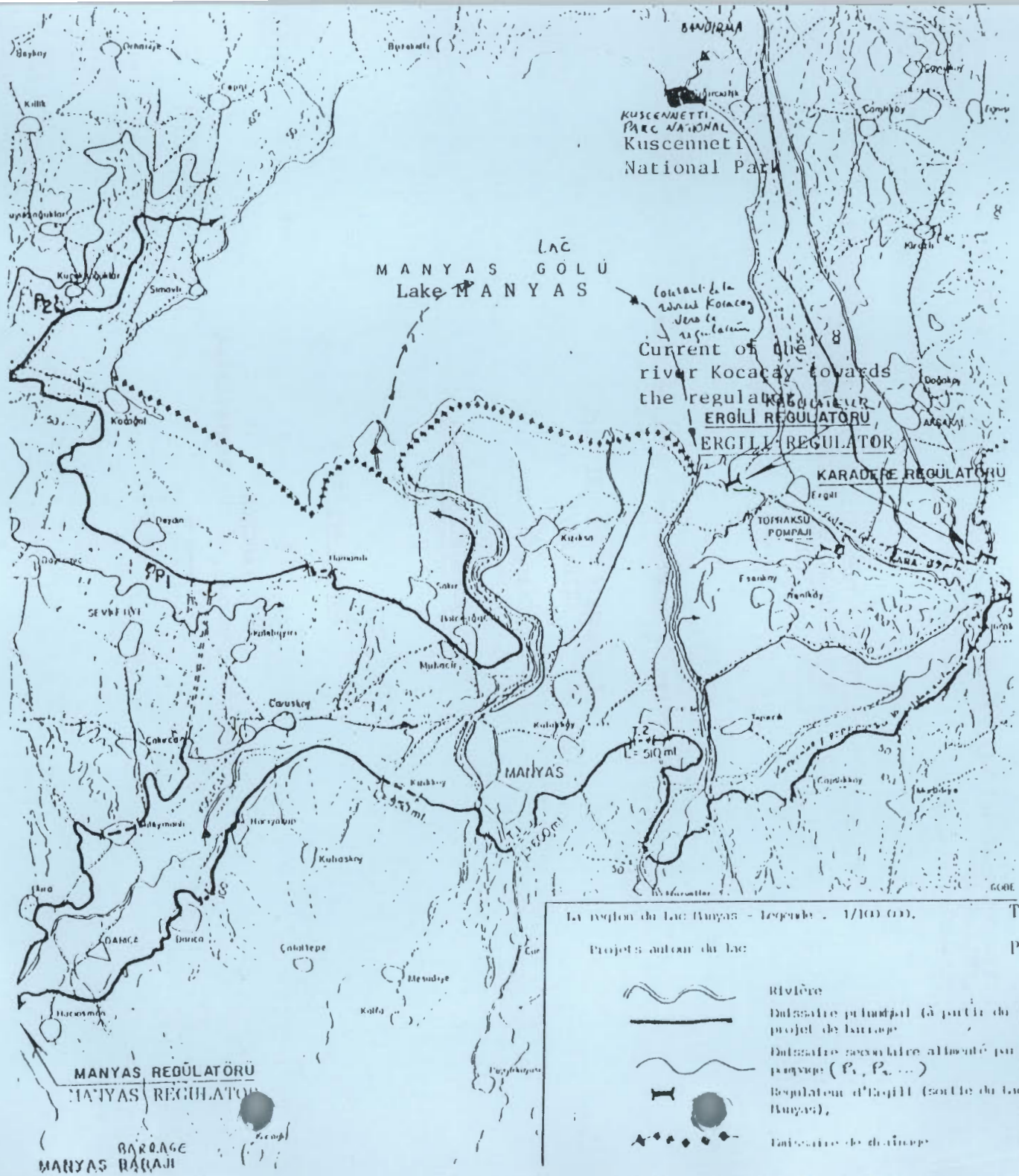
Category A

On-the-spot appraisal

Expert report

by

Mr J FAUCHON,
with the comments of the Secretariat



The Lake Manyas area -Leger

Projects around the Lake

River

Main drainage channel (fr
the dam project

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pump-fed

Ergili Regulator (Lake
Manyas outflow)

Drainage channel

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1. Introduction

1.1 The Council of Europe's European Diploma was awarded to the Kuscenneti National Park (Turkey) in 1976 for a period of five years. The Diploma was renewed in 1981 and again in 1986. The purpose of this visit was to verify on the spot whether the conditions justifying the successive renewals of the diploma still obtained or whether they had improved or, on the contrary, deteriorated, with a view to a further renewal of the diploma for a five-year period.

1.2 The on-the-spot appraisal was carried out between 24 and 27 May 1990 by the author of this report and Ms L'Hyver, Administrative Officer at the Secretariat of the Council of Europe.

1.3 The expert's terms of reference had been laid down in:

- Resolution (86) 11 of the Committee of Ministers, as supplemented by the Committee of Experts on Protected Areas (PE-ZP (90) 39). They are set out in detail below:

"The Committee of Ministers ...

I. Attaches to the renewal the following conditions, failure to observe which will result in steps being taken to withdraw the Diploma:

1. General conditions

1.1 To ensure that the human activities and facilities in close proximity to the area concerned by the Diploma in no way impair the biological integrity of the national park;

2. Specific conditions

2.1 All necessary measures must be taken to ensure that the construction of the Kocaçay dam has no negative repercussions on the biological balance of Lake Manyas or on the ecosystems of the national park;

2.2 the natural seasonal fluctuations in the water level of the lake must be maintained;

II. Invites the authorities responsible for the management of the site to implement the following recommendations:

1. Institute an ecological monitoring programme for Lake Manyas;

2. Avoid introducing exotic species into the lake;

3. Take any necessary measures to reduce the infestation of willow trees by insects, after having had an analysis carried out by a qualified entomologist."

- Report PE-ZP (90) 39, in the following terms:

"The Committee instructed the expert who would be visiting the Park in 1990 .... to consider the following problems in detail:

- Pollution of Lake Kus and its effects on vegetation, as well as the measures which the authorities intended to take to control it;

- The Kocaçay dam project, on which an impact study would be carried out."

1.4 A thorough visit of the Park was made. This included:

- a visit by boat to the shores of the Park and the mouth of the river;

- a tour of the lake, partly by boat and by car, providing an opportunity to examine the regulator (currently being rebuilt), which is the key installation for regulation of the water level, the embankment and the drainage ditches, the villages around the Park and the northern shores of the Park, which still seem to be unaffected by agricultural activities;

- a thorough inspection of the buildings of the Kuscenneti Centre and the observation tower, where several discussions took place with the national and local officials responsible for the project.

1.5 Finally, the fact-finding team was received by the Mayor of Bandirma and the presidents and members of the Rotary Club and the Lions Club, which provide important moral support and financial assistance to the National Park.

The fact-finding team was accompanied throughout its stay in Turkey by:

- Mr Tansu Gürpinar, Director of the Research Programming and Co-ordination Department at the Ministry of the Environment,
- Mr Nizam Savas, Director of the National Parks Department,
- Mr Ergin Karakurum, Co-ordinator of National Resources,
- Mr Kamil Seyhan, Director of the Kuscenneti National Park.

Other distinguished persons joined the fact-finding team where necessary, notably representatives of the National Forestry Department, the City of Istanbul Forestry Department and the Water Resources Department.

During its visit to Turkey the fact-finding team was received very hospitably by the Turkish authorities, which gave it all the explanations and information needed for a fair assessment of the work carried out at Kuscenneti. They address their sincere thanks in particular to the distinguished persons who joined them for their patience, their indulgence, their generous hospitality and the very cordial atmosphere constantly present among members of the group, which contributed considerably to the successful completion of its work.

2. Conclusions and recommendations

2.1 At the time of the on-the-spot appraisal the Kuscenneti National Park seemed to be maintaining a satisfactory equilibrium.

The number of bird species there and the total bird population seem to be as high as they were in 1985, and the variations concerning a few species may be due to episodic causes independent of the situation in the park, particularly in the case of migratory birds.

2.2 The infestation of the willows by insects seems to have cleared up, though it has not been possible to discover the causes of either the infestation or its disappearance.

2.3 Construction of the dam on the River Kocaçay seems to have been postponed indefinitely. On the other hand, construction of a new flow regulator has begun. Its role will be just as important as any the dam itself might have played since, dam or no dam, this regulator will be the means of controlling the water level in Lake Manyas. Consequently, it is essential that the existing agreement between the departments concerned (environment and water) be revised to include the functioning of the regulator, if this has not already been done.

2.4 Nevertheless, the possible consequences for Lake Manyas of the construction of the dam are being studied under their three main aspects: fluctuations of the lake's water level, pollution and sedimentation. If the government decides to build the dam, a general impact study covering all the consequences for the Lake Manyas ecosystem of the three factors mentioned above should be carried out.

2.5 The development of irrigation threatens to cause radical disturbance of this ecosystem:

- by draining off a substantial proportion of the water in the River Kocaçay before it reaches the lake,
- by increasing water loss through evaporation and evapotranspiration from crops,
- by disturbing the pattern of water level fluctuations through the construction of dykes, ditches and pumping stations,
- by increasing pollution of the lake through run-off water containing surplus chemical products flowing out of the irrigation channels,
- by the need to choose between the requirements of irrigation and those relating to maintenance of the Kuscenneti Park.

2.6 The problem of pollution in the lake thus has a twofold aspect:

a. pollution from agricultural chemicals, which it is possible to prevent to a great extent by diverting run-off water downstream from the regulator towards the Sea of Marmara,

b. industrial pollution from establishments in the Bandirma region, which has until now flowed directly into the lake via the river running through the Park. However, we were assured that the polluted water is treated upstream from the Park or collected and diverted towards the Sea of Marmara by a drainage channel running into the River Simav.

The problems relating to industrial pollution of the lake must be resolved, but it is suggested that the government submit a report in 1991 or 1992 on the effectiveness of the measures taken to prevent pollution of the lake.

Finally, mention must be made of the possibility that air pollution (smoke) from the fertiliser factory that has been established between Bandirma and Erdek might drive migratory birds away from Kuscenneti. This is a new problem which will have to be studied at some stage.

2.7 The number of visitors to the Kuscenneti Park is very satisfactory. Efforts should be made to make it easier for visitors to see more birds. Some suggestions along these lines have been made, but it is a difficult problem because the birds must not be disturbed.

2.8 Establishment of a limnological station at Lake Manyas

The "Kuscenneti National Park" ecosystem forms part of the "Lake Manyas" ecosystem. Anything which affects the latter will have repercussions on the former. Close monitoring of Lake Manyas is justified not only because of the Kuscenneti Park but also because this lake occupies an important place in the life of the region as a whole. This means that decisions concerning the water level to be established by means of the regulator must be based on precise scientific data, without which, for example, it would be impossible to carry out a satisfactory impact study for the Kocaçay dam.

Consequently, we propose the establishment of a permanent limnological station at Lake Manyas with a permanent staff of three scientists: a hydrogeologist, a chemist and a biologist, working in collaboration with one or more universities (covering economic and sociological questions in particular) and in close co-operation with the staff of the Kuscenneti Park.

Suggestions for a scientific programme both for the lake and the Park are put forward below.

2.9 These remarks and suggestions notwithstanding, the Kuscenneti National Park clearly satisfies all the conditions for the European Diploma awarded to it in 1976 and then renewed in 1981 and 1986 to be extended for a five-year period, beginning in 1991, subject to close monitoring of the various problems mentioned above.

3. Lake Manyas and the Kuscenneti National Park

The presence of the birds, which is the main raison d'être of the Kuscenneti Park, depends entirely on the situation of Lake Manyas, whether healthy or unhealthy, the problems it encounters as an

ecosystem subject to the vagaries of the climate, other physical phenomena and the direct or indirect influence of human beings. The Park itself forms an "open" ecosystem since, if the birds there find the conditions no longer to their liking, they can go elsewhere or, in the case of migratory birds, settle along the shores of a nearby lake. They sometimes tend to establish themselves permanently, in favourable circumstances; this applies, for example, to the large platforms provided for pelicans.

Consequently, the situation of Lake Manyas and then that of the Kuscenneti Park, and the main problems facing both these areas, must always be studied in close conjunction.

Lake Manyas and the Kuscenneti National Park

The Park occupies a small area of the shores of Lake Manyas, not far from the Sea of Marmara, about 20 kilometres away from the town of Bandirma.

3.1 Main features of Lake Manyas

Total surface area of the lake	162 km²
Annual rainfall	: 640 mm
Average annual temperature	: 14.3°
Minimum temperature	: -14.0°
Maximum temperature	: 38.7
Average water level	: 12.85 metres above sea level
Variations in water level	: between 14.5 and 18.5 m

Variations in the water level of Lake Manyas

In an average year (average height above sea level: 12.80 m)
in metres

	January	April	August	December
Maximum level	15.5	17.25	15.0	15.5
Minimum level	15.0	16.0	14.25	14.75

The lake is therefore shallow, its depth varying from 3 to 5 metres; one of the results of this is a high water temperature in summer, which ensures an abundant supply of plankton and thus creates favourable conditions for large populations of aquatic fauna.

3.1.1 The lake's hydrology

a. Apart from rainwater, the lake is fed mainly by the River Kocaçay, which flows into its southern side.

Its total flow is 580 million m^3 per year, while the rate of flow varies from 20 to 230 m^3 per second.

A few other small rivers flow into the lake, particularly the Sigirci, which passes close to Bandirma and flows into the lake through the Kuscenneti National Park, bringing with it, unless steps are taken to prevent this, all the industrial and other kinds of waste from the town of Bandirma and its region.

b. The overflow from the lake runs into a tributary of the Simav, a small river which also carries the outflow from Lake Apolyont to the Sea of Marmara. This tributary is blocked at the outflow from Lake Manyas by a regulator which is used to adjust the level of Lake Manyas according to requirements and is at present being rebuilt. Its role is essential for the maintenance of the Kuscenneti National Park.

c. The other causes of water loss from Lake Manyas are:

- natural evaporation (approximately 2 m per year);
- the irrigation requirements of the farmers around the lake; these requirements are considerable, but difficult to assess, as are requirements for various other agricultural purposes;
- evapotranspiration from the plants deriving their water supply from the lake; this is also difficult to evaluate;
- phreatic infiltration.

The net result is seasonal variation in the water level which, if the regulator did not exist, would normally lead to high water in winter and spring (low evaporation, tributaries swollen by rainwater or even snow, and rain falling on the lake) and low water at the end of summer.

At the same time the reduction in depth in the summer leads to a partial drying out of the lake, whose shores in 1985, for example, receded by between one and two km, with a corresponding fall in water volume and a proportionate rise in the concentration of mineral salts and sediment.

3.1.2 Other important information on the lake water

The studies carried out by Professor Sekendiz show that:

- the lake water carries large quantities of sediment brought down by the River Kocaçay, but the bottom of the lake is rich in oxygen, which reduces the effects of eutrophication;
- the pH is normal (8, 3-9, 1) as is the salt concentration;
- sudden variations in the water level (of up to two metres) have sometimes killed trees by causing their roots to dry out;
- soil texture plays an important role in terms of vulnerability to damage by buprestid beetles, which tend to attack trees growing on clay soils. It seems in particular that the lake is becoming shallower as a result of the accumulation of clay and other types of sediment and that the best way to prevent tree loss, particularly among the willows, would be to avoid sudden large falls in the water level at times of severe drought and halt the accumulation of clay sediment by allowing the clay-laden water from the river Kocaçay to flow directly out of the lake.

3.1.3 Is it possible to draw up a hydrological balance sheet giving figures for water entering and leaving the lake?

a. At present, ie before the dam is built, if it is built, and without taking account of future extraction of water for irrigation, the figures can be broken down as follows:

Water from the River Kocaçay	+ 580 million m^3
Evaporation from the lake: 2 m per year over 160 km^2, ie	- 320 million m^3
Rain falling on the lake: 0.64 m over 160 km^2	+ 102 million m^3
Evapotranspiration from plants, losses through infiltration, extraction for various purposes and water from small rivers	token entry
Irrigation: estimated requirements for 36,000 hectares of land	- 180 million m^3
Total:	182 million m^3

b. If the dam on the Kocaçay is built, this will lead to additional evaporation of 60 million m^3 (from a reservoir 30 km^2 in area). Even if the water taken from above the dam is passed on downstream without any extractions, 10-20% of it will be lost (particularly through infiltration). Moreover, demand for water for irrigation will increase as a result of the possibilities opened up by the height of the reservoir.

Consequently, it is probable that most of the remaining 182 million m^3 will be absorbed in this way and that in the end a very small quantity will flow out through the regulator. All these figures must be examined cautiously, since they concern the overall quantities for a 12-month period, whereas it is the variations in level between February and March which are important for the Park.

3.2 Vegetation in the Kuscenneti National Park

The Kuscenneti National Park occupies a very small area of the north-east shore of Lake Manyas, at the mouth of a small river called the Sigirci, and has a wooded aspect. Fringing the shore of the lake itself are clumps of willows and reed beds, while further away there are trees standing in meadowland which is flooded at high water time and then gradually dries out.

A comparison between the tables in section 3.1 (variations in the water level of Lake Manyas) and section 5.1 (population of the main bird species at Kuscenneti, particularly the "nesting" column) shows a correlation between the nesting period and the high water period, at least with regard to the larger wading birds, pelicans and cormorants, whose presence constitutes one of the lake's characteristic features (and attractions). This correlation is of vital importance, since at that time the nests are protected from a large number of terrestrial predators: foxes, beech martens, rats, etc.

Approximately a quarter of the park is covered by trees and shrubs. Apart from the reedbeds fringing much of the lake shore, the main types are:

Willows, which can reach 10 m in height, and have been devestated in recent years by the caterpillars of a Lepidoptera species (Typonodeuma padellus), the larvae of a Hemiptera species (no doubt Aphrophora spumaria, or Cuckoo Spit) and a wood-eating beetle (Agrilus ater). Measures to protect the willows against these insects had been recommended in previous years, but the fact-finding team did not find any traces of damage caused by them; nature has no doubt found a way to deal with the situation. However, the large number of dead trees (in which nests have been built) other than willows no doubt calls for a more detailed study of the damage caused by wood-eating beetles.

Moreover, it is possible that these caterpillars and larvae form part of the food supply of insect-eating birds.

That being the case, it does not seem necessary or advisable to undertake any action involving the use of chemical insecticides or even biological methods of control, since this would entail the risk of destroying the equilibrium of the present ecosystem.

Trees such as oaks, birches and maples, in whose branches the birds build their nests, some of which are very old. In addition, one can see trees which seem to be dead along the line where the water of the lake meets the small forest surrounding Kuscenneti, but from the observation tower the latter seems to be healthy.

3.3 Problems raised by the possible construction of the dam on the River Kocaçay

Very full information on the dam was given in Secretariat memorandum SN-ZP (85) 34, written after the on-the-spot appraisal of the Kuscenneti National Park in 1985.

It is unnecessary to repeat the information given in that memorandum, but some figures have been revised since then and the scale of the dam project, according to the figures given to the fact-finding team by the Water Resources Department, has been revised upwards in relation to the forecasts given in 1985, as shown below.

3.3.1 The planned dam on the Kocaçay: basic information

Location: approximately 35 km upstream from where the River Kocaçay flows into the lake
Objectives: electricity production/irrigation/flood control
Construction: gravity earth dam
Height and length: 73 m and 508 m respectively
Capacity: 394 million m^3
Electrical power: 20 megawatts
Electricity production: 870 million kWh
Upstream water flow (particularly from the River Kocaçay): 580 million m^3 per year
Irrigation requirements for 36,000 hectares of land: 180 million m^3 per year (*)
Downstream water flow: approximately 400 million m^3 (**)
Reservoir area: approximately 30 km^2.

NB:

(*) This figure is much lower than the one given in the 1985 report (560 million m^3). It takes no account of evaporation from the reservoir above the dam (approximately 60 million m^3, ie average evaporation of 2 m per year over an area of 30 km^2).

(**) It is probable that the flow of the River Kocaçay where it enters Lake Manyas will be lower than this figure. If evaporation accounts for 320 million m^3 (the lake's surface area being 160 km^2), the average annual flow at the regulator will be 80 million m^3.

The conclusions given in section 3.1.2 of the 1985 report are still valid, and indeed are even more so now than then, since the upward revision of the dam's target figures will draw off even more water than originally planned. At its present rate of flow (500-600 million m^3) the River Kocaçay cannot provide this water.

Contradictory information has been given about this dam, which is still under study. At present its construction seems to have been postponed indefinitely. However, there is apparently an agreement between the Environment Department and the Water Resources Department to guarantee minimum and maximum seasonal variations in the lake's water level established according to observations made in previous years.

3.3.2 Possible consequences of the dam's construction based on the information given above

a. A general impact study must be carried out to identify the possible consequences for the natural and human environment of building the dam and bringing it into service. Part of this study must be devoted to the situation of the Kuscenneti National Park.

This study will be simple because the dam seems to be of a fairly traditional type without any particular problems, at least according to the information we were given, but it will be complicated by the fact that the dam will have three functions - electricity production, flood control and irrigation - which will raise problems relating to technical adjustments and optimum water use, not forgetting the problems of the Kuscenneti Park. Nevertheless, it will be an impact study of a classic type, already carried out for many dams to a tried and tested pattern. Simple matrices which already exist can be used for this dam too.

b. The consequences of the dam's construction will be on several levels:

- Creation of a 30 km^2 lake above the dam. This does not directly concern the situation of Lake Manyas, downstream, but silt will accumulate behind the dam, no longer reaching the lake. This will lead to a change in the composition of the lake water with consequences for the fish population which are as yet difficult to forecast. Moreover, the silting up of the lake should slow down.

- Modification of the flow of the River Kocaçay. It is to be expected that the dam will regulate the release of any flood water to the lower channel of the river.

The water used by the hydro-electric station will be released downstream from the dam but upstream from the river's present confluence with the lake, the total annual volume released being 10-20% lower than the original volume above the dam, but varying according to seasonal fluctuations in electrical power requirements.

A large quantity of water (apparently about 180 million m^3 per year) will be used for irrigation of the land around the lake, demand for water being particularly high in spring and summer.

This all amounts to a combination of complex functions which can be analysed with any degree of accuracy only through detailed studies taking account simultaneously of the volume of water received in the catchment areas (collected mainly in winter), the water used during the irrigation season (spring, summer and autumn), floods, if any, and periods of severe drought.

- Lastly, evaporation from the two lakes: evaporation from the lake above the dam (30 km^2, ie total evaporation of about 60 million m^3) plus evaporation from Lake Manyas (about 320 million m^3) make a total of approximately 400 million m^2 (taking the rate of evaporation as 2 metres per year). This must be compared with the flow of the River Kocaçay (580 million m^3) minus the volume of water for irrigation (180 million m^3), which gives ... 400 million m^3. Not much water will be passing through the Ergili Regulator. To this figure must be added evapotranspiration from vegetation, underground losses etc.

It seems that at one time there was a proposal to halt the flow of the River Kocaçay completely at the dam and use the water to irrigate the two alluvial plains on each side of the dam. This would mean that Lake Manyas would receive hardly any water and would be doomed to disappear or turn into marshland. This would obviously be the end of the Kuscenneti National Park.

c. The role of the regulator

In the meantime the regulator described in section 3.1 of Mr de Klemm's 1985 report as being no longer in use is being rebuilt and will be brought into service in a few months. This is of vital importance, since, whatever the volume of water reaching the lake, it is the regulator which will maintain the water level at a specific height, provided that it can cope with the volume of water in question or losses through evaporation. The old regulator, formed of beams which were raised and lowered between two vertical slides, could not have been easy to operate. That is no doubt the reason why it was abandoned. The new regulator will apparently be machine-operated, making it easy to adjust the lake's water level according to requirements.

However, whatever mechanism is used for the regulator, it must be able to control the water level according to requirements. To that end, a co-ordinating body must be able to reach the necessary compromises. The requirements of the Kuscenneti Park are simple but imperative: during the nesting season (March until May/June) the roots of the trees must be under water to protect the nests against predators.

This will certainly create problems for the irrigation authority, since crops will need water from the end of spring onwards.

Finally, whether the dam is built or not, it will in the last analysis be the regulator which plays the main role in controlling the water level, as fixed by agreement between the different members of the co-ordinating committee mentioned above. Consequently, operation of the regulator must be covered in the agreement under discussion or governed by a provisional agreement until the latter can be replaced by a new document taking account of the dam's existence.

4. The impact of pollution on the biology of the Park

4.1 The biology of the lake can be disturbed by various forms of pollution, and the life of the birds in the Park may as a result be affected directly or indirectly. For example:

a. Accidental natural pollution may lead to an overconcentration of colloidal clay, making the lake water turbid.

b. Pollution from industrial waste can occur; such waste can reach the lake via the rivers flowing into it, whether the Kocaçay, which is the main river, or the River Sigirci, which drains the Bandirma region, collects a quantity of waste from the region's industry and finally flows into Lake Manyas after passing through the Kuscenneti Park. This river must be closely monitored, since any waste it contains will not yet have settled to the bottom before it reaches the lake and, furthermore, it is into this river that most of the industrial waste is likely to make its way.

All industrial activity, in fact, is concentrated in this region. About 30 industrial establishments are clustered in the area north of the lake (around Bandirma in particular). These include several flour mills, foodstuffs producers, industrial poultry farms (a major source of pollution), a few metal-working and carpet workshops and dairies. On the southern shore of the lake are a lead foundry and a company specialising in the extraction of various metals (eg lead and antimony) which is a major source of pollution. Lastly, on the coast (near Erzdek) there is a large fertiliser factory, which emits large quantities of smoke and gases.

4.2 The main products likely to pollute the lake water include:

- fuel leaked from factories and other liquid or soluble waste;

- oil from foodstuffs factories (eg sunflower oil);

- acids used for the production of fertilisers or the processing of heavy metals;

- slurry and other forms of animal manure used as fertilisers, which can cause high concentrations of nitrates, the latter being themselves potential eutrophication agents.

4.3 The development of irrigation and the use of industrially produced fertilisers leads to a concentration of surplus fertilisers, herbicides and insecticides in run-off water. If this reaches the lake and is not drawn towards the regulator by a sufficiently strong current, there will be a concentration of toxic products in the lake which may affect the situation of fish populations and the birds which feed off them.

Attention must also be drawn to:

- the harmful action of herbicides and insecticides which become concentrated, directly or indirectly (ie via the plants or animals eaten), in the liver and reproductive system of certain birds, affecting their reproduction (eg the strength of eggshells);

- atmospheric pollution due to smoke, which may influence the route taken by some species of migratory birds.

All of this should be studied in depth by the limnological station proposed above. The same applies to questions relating to:

- plankton, the first element in food chains,

- the phenomenon of eutrophication, linked to high concentrations of nitrates and phosphates, particularly in run-off water,

- water currents within the lake, mainly between the mouth of the Kocaçay and the regulator, and the transportation of products and mineral salts through the lake.

4.4 Lastly, it will be necessary to observe the situation of aquatic fauna in the lake, which forms the basic food supply of many bird species, particularly fish and crustaceans, since in the final analysis it is largely through their food that birds absorb pollutants. The same applies to the lakeside vegetation, which must be the main source of food for herbivorous or omnivorous birds such as most ducks, geese and other Anseriformes.

4.5 However, these complex studies, which necessitate frequent periodic analyses, will lose their importance if the central waste evacuation programme being studied by the University of Istanbul with financial help from a German organisation is launched, since the waste will be destroyed or evacuated from Bandirma towards the sea. Nevertheless, the problem of run-off water flowing into the southern side of the lake remains and can be resolved only if this polluted water is diverted away from the lake and into the River Kara downstream from the regulator under construction.

4.6 Plant and animal disease

As stated in Section 3.2.2, infestation of the willows seems to have disappeared permanently or temporarily. On the other hand, infestation of trees by wood-eating insects is apparently continuing, but it would no doubt be preferable to allow nature to defend itself, since the treatment of such diseases is either impossible or very difficult. Certain types of treatment could alter the balances governing the functioning of the Park's ecosystem.

According to the Park staff, neither the birds nor the fish in the lake suffer from any serious disease. One symptom of the lake's healthy condition is the gradual return of the crayfish once decimated by a disease which also destroyed most crayfish in other European countries.

5. **Birds and the Kuscenneti Park**

Why has a large and apparently flourishing population of birds maintained itself through the centuries in a tiny corner of Asia Minor? Why do these birds come back every year to the same spot? There is still not enough known about the reasons for migration or for the choices made by birds, which remain stable through the centuries.
5.0.1 It is certain that birds find in Kuscenneti the conditions necessary for their reproduction and multiplication: water, food, protection during the nesting season, nest-building materials and sites, and no doubt other unknown factors which induce migratory birds to return to Kuscenneti over a period of centuries and from generation to generation to build their nests there. There has thus been a satisfactory equilibrium between the natural environment and the fauna of the lake ever since antiquity.

5.0.2. Human activities have modified this equilibrium in several ways.

The natural, periodic variations of the water level in the lake have been (more or less) regularised and will be even more so in future.

Pollution of all kinds has altered the ecological balance of the food chains on which the birds rely: production of plankton and water weed/herbivorous (and in some cases carnivorous) fish/fish-eating birds, or aquatic plants/herbivorous birds etc.

These remarks concern all the birds of the lake, particularly the resident bird species.

5.0.3 Migratory birds experience many other types of hazard on their prodigious journeys. Some of these are physical hazards (natural or accidental losses, for example). Others are linked to changes in the migration route, variations in atmospheric conditions, the discovery of more attractive temporary quarters than those they know already, dissatisfaction with the latter due for example to atmospheric or other forms of pollution or a new source of insecurity etc.

5.1 The Park's present bird population

It is difficult to present a picture of the Park's bird population otherwise than through the information provided in the very comprehensive annual reports. 1985 was a difficult year with a very cold winter followed by a period of drought so severe that half the lake was nothing more than a quagmire. On the other hand, 1989 was a normal year and, as far as one can tell from a short visit, this will also be the case in 1990.

The following table shows variations in the numbers of some particularly remarkable and spectacular species. Since 1975 the egret, spoonbill, cormorant and pelican populations have either remained stable or risen. On the other hand, there are wide fluctuations in the glossy ibis population for reasons which remain unclear but are probably unconnected with the Park itself. The bald ibis is locally extinct but some authors (Heinzel, Cuisin) describe it as threatened by extinction and surviving only along the upper Euphrates and in Morocco.

Appendix II of the 1987 report, which contained a very comprehensive census of the birds living in the Park at different seasons of the year, shows very clearly how some species like the lesser white-fronted goose (Anser erythropus) overwinter in the Park (2000 pairs in winter, 10 in spring) while others come to nest in the spring and then leave the Park, eg cormorants (Phalacrocorax carbo) (800 pairs observed in spring, 60 in autumn).

Lastly, this appendix highlights the rich profusion of birds at Kuscenneti not only in spring (the nesting season) but also in winter, when the abundance of ducks, geese and other Anatidae must form an impressive spectacle.

Just as important, no doubt, is the number of bird populations resident in the Park more or less permanently, eg passerine or limicoline species and birds of prey, which make do with very short migrations between the lake and the nearby Sea of Marmara.

In conclusion, it seems that in 1990 there is a satisfactory equilibrium of birdlife at the lake, thanks to the Park's double function - as a resting place and overwintering site, on the one hand, and as a stopoff point in spring for migratory birds from the North making their way to Eastern or Southern Africa.

Population of the main bird species at Kuscenneti (number of pairs recorded)

	1975	1979	1984	1987	1989	Nesting Period	Winter	Food
Plegadis falcinellus (Glossy ibis)	100	379	68	20	80	March-April	Nile, North Africa	Fish
Pelecanus crispus (Dalmatian pelican)	60	51	30	33	150	May-June	Europe	Fish
Phalacrocorax pygmaeus (Pygmy cormorant)	70	135	131	200	250	April-May	Equatorial Africa	Fish
Platelea leucorodia (Spoonbill)	+400	304	540	500	300	March-May	Europe (resident)	Fish
Phalacrocorax carbo (Cormorant)				800	2000	March-April	Resident	Batrachians, Molluscs, Reptiles
Ardea cinerea (Grey heron)			300	286	250	April-July	Central Africa	Insects, Frogs Fish
Ardeola ralloides (Squacco heron)				200	200	March-May	Africa	- idem -
Egretta garzetta (Little egret)			50	500	200	April-June	Equatorial Africa	Fish, Batrachians, Insects
Nycticorax nycticorax (Night heron)				600		April-May	Resident	Omnivorous
Corvus monedula (Jackdaw)			146	20(?)		April-May	East Africa	Insects, Batrachians
ESTIMATED ANATIDAE POPULATION IN WINTER:	TOTAL 44,000,	including 12,000 European teal (Anas crecca) and 5,000 Greylag geese (Anser anser)						

5.2 Birds, fish and fishing at Lake Manyas

The undoubted reason for the remarkable profusion of birds at Kuscenneti is the abundance of fish in Lake Manyas. Twenty-two species of fish have been recorded in the lake, together with crayfish, mussels, frogs and other batrachians which form, with innumerable aquatic insects, the main diet of many bird species. The droppings of these birds fall into the lake, provide fertiliser for the water weed and food for bacteria and plankton; thus the ecological cycle begins again.

Nine hundred fishermen, each belonging to one of nine co-operatives, fish for the following species, the only ones authorised: carp, pike, silurids (catfish), chub, the "Manyas herring" and crayfish. The rest is for the birds. There seems to be no competition between the fishermen and the birds because of the abundance of fish. Nevertheless, it should be remembered that an adult pelican can consume up to three kilos of fish per day and swallow fish weighing up to one and a half kilos.

The presence of the fish is undoubtedly the reason for that of the birds, especially the larger birds such as pelicans, cormorants and herons; it is also certain that a decline in the population of certain species would lead to the departure of those birds which prefer them. It is therefore important to monitor fish stocks closely, from the point of view of both quality and quantity; this depends largely on the quality of the water, its acidity, the sediment brought down by the rivers flowing into the lake, the temperature and lastly the water level. Thus it would be necessary to include in the small team working at the limnological station proposed above a hydrobiologist to deal with all these problems.

NB: Precise studies should be carried out to look into the consequences of water pollution for fish stocks. Not enough is known about some aspects of this problem. For example, the turbidity of the lake water at present allows aquatic fauna to flourish, but what would happen to these creatures if part of the sediment was held back by the dam and the water in the lake became clearer?

5.3 Suggestions for an ornithological work programme

In view of the ornithological importance of the Kuscenneti Park, it should step up the programme it has already undertaken in this field, in close collaboration with the limnological station, since many of the latter's functions would have a direct bearing on the conservation of birds in the Park, particularly with regard to fluctuations in the water level, water quality (turbidity, various types of pollution) and the food supplies provided by the lake for birds (insects, fish, aquatic plants, etc). If the limnological station is not directly attached to the Park, machinery for the co-ordination of research will need to be established (see section 6.3).

The scope of a specific ornithological programme will depend on the Park's future policy: however, I suggest:

5.3.1 Continuation of the censuses of nesting and overwintering birds, collecting information on the largest possible number of species.

5.3.2 The establishment of close relations with other centres for the study of migration. since Kuscenneti lies on the route of birds travelling from Scandinavia to equatorial and southern Africa or to the Nile valley. These contacts could help to shed light on the fluctuations from year to year observed in the numbers of individual species.

5.3.3 A study of the diet of the various species of birds and any disruptions of trophic chains by chemical pollution of industrial or agricultural origin.

5.3.4 Lastly, it would be useful to compile specific lists of the amphibians and reptiles in the Park and its surroundings.

5.4 Organisation of research and dissemination of results

Research into an ecosystem - in this case that of Lake Manyas - must satisfy two contradictory requirements.

The first requirement is the need to study each of the aspects in detail and draw the relevant practical conclusions, and therefore to call on the services of qualified, specialist scientists.

However, it is necessary at the same time to bring together all the knowledge acquired in a synthesis reflecting the situation of the lake Manyas ecosystem at short intervals (at least twice a year, at the time of the lowest and highest water levels) thus enabling the Park management to take the necessary measures (eg adjusting the regulator).

The mechanism (already partly established through contacts between the Park and the Aegean University) could take the following form:

- appeal to various universities which will propose scientists specialising in each of the essential sectors mentioned above and students preparing theses;

- establishment of a scientific council, composed of all these specialists and led by an eminent figure recognised by all, to make whatever recommendations are necessary to the appropriate Ministers.

Finally, dissemination of the results of studies is important for the future. This would be based on reports presented by the scientists concerned and distributed in Turkey and abroad, on contacts with comparable organisations and on close relations in particular with ornithological stations studying the migration of certain species.

NB: Many of the suggestions made here have already been put forward or even put into practice (contacts with certain universities, for example). The above list simply sets them out in one place.

6. Suggestions for a limnological station at Lake Manyas

6.1 Systematic study of the Lake Manyas ecosystem has become essential for the following reasons:

- human use of the land around the lake is increasing, particularly through irrigation schemes which take water out of the lake or the rivers flowing into it. The discharge of run-off water and other agricultural activities are increasing pollution in the lake. The villages are growing and their animal and human waste is causing a rise in pollution. Lastly, construction of the dam on the Kocaçay, if it is built, and that of the regulator at Ergili will modify the volume and quality of the lake water;

- the physical conditions around the lake are changing rapidly. The lake is becoming shallower, large quantities of sediment which the regulator will hold back are entering the lake and it is likely that more water will be absorbed through evaporation than enters the lake, which will continue to dry out, becoming smaller each year;

- all of this alters the biology of the lake by disrupting the ecological chains of which both plants and higher animals form links, from phytoplankton to birds and also to men, or at least those who live near the lake and live by fishing from it. Until now, no doubt over a period of centuries, the lake's ecosystem has evolved peacefully, the process being disrupted probably only by natural accidents, but the rapid increase in human activity is causing considerable disturbance of this fragile equilibrium.

6.2 With regard to the Kuscenneti Park in particular, any change in the level of the water, its chemical composition or that of the atmosphere (see the body of the report itself) would constitute a serious threat, since the advent of any conditions which disrupt nesting or the birds' food supply would lead to the disappearance of certain species, or an unbalanced rise in the number of some species at the expense of others.

Consequently, conservation of the Kuscenneti Park in its present form and with its present structure is dependent on conservation of the lake and the conditions in which the lake's ecosystem can function harmoniously. This requires detailed, scientific knowledge of these conditions, pursuit of which would be the main aim of a limnological station approaching the ongoing study of the situation of the park as part of a study of the whole Lake Manyas ecosystem.

6.3 The station's work programme

6.3.1. This programme should include

- a fundamental study of the lake in all its aspects, involving in particular the systematic, periodic collection of all relevant data about the functioning of the lake, including air temperature, water temperature, analysis of the water in the lake and its tributaries, turbidity of the water and chemical composition of sediment, fluctuations in the water level, depth of the lake at different seasons and measurements of evaporation;

- a study of the flora and fauna living in and around the lake (plankton and phytoplankton, various plants, submerged or otherwise, living in the lake, reeds, willows and other trees growing around the shores of the lake, insects, batrachians and fish living in the lake - birds being studied in a separate part of the programme);

- a study of the use of the lake shores or the lake itself for human activities, eg villages, farming, irrigation schemes, water channels (water extraction and discharge of run-off water), roads, tracks and various forms of communication, occupations linked to the lake (fishing) etc.

6.3.2 If it is decided to build the dam on the Kocaçay, studies should immediately be undertaken in the context of the general impact study which should begin as soon as the decision is taken.

Certain specific problems should be studied, including currents within the lake (and the course of the river Kocaçay through the lake); eutrophication; fish stocks; control of insects attacking the willows etc.

6.3.3 The note on the visit to the research centre at Thonon (Haute Savoie, France) suggests the appointment of three main scientific research workers, ie

- a hydrogeologist/soil scientist dealing mainly with variations in the water level and sedimentation,

- a chemist, monitoring water pollution from all sources, whether agricultural or industrial,

- a biologist, looking into the biology of the lake in all its forms (plankton, flora and fauna).

Close collaboration would be established with the staff of the Kuscenneti Park. One or more universities should launch special programmes on specific aspects of the Park's development, particularly the human aspects (population, cultivation of non-agricultural land, irrigation, new villages etc).

If the dam construction scheme is implemented, this essential impact study will require a much larger research team, and further suggestions could be made at that time.

7. Tourism and education at Kuscenneti

7.1 In 1989 the Kuscenneti Park was visited by 65,165 people, including about 4,000 foreigners. Perusal of the annual reports shows that the number of visitors has been rising each year, while the fame of the park is spreading both within Turkey and abroad. During the visit of the fact-finding team there were many people there, particularly classes of school children.

The numerous visitors are apparently not deterred by the cost of admission (only 1,000 TL). Moreover, there are reductions for particular categories of visitors such as children, pensioners, classes of schoolchildren, groups etc.

What will a visitor to the Park see?

After buying his ticket he will go to the Visitor Centre, an elegant building where a large room serves as a museum with dioramas showing the main species of birds living in the Park, together with a number of reptiles. batrachians and other animals found there. A laboratory has just been completed and will be used in future by research workers. Lastly, the building has other rooms used as offices for the Director, bedrooms for occasional visitors, a kitchen, food stores etc.

Architecturally the buildings are of pleasant aspect, and they are very well maintained. Park staff are available to answer visitors' questions.

Visitors then go to the observation tower a few hundred metres away, from the top of which they have a general view of the lake and the small forest around the Park. They can also see from a distance a number of nests of the larger bird species and can use the powerful binoculars provided. Nevertheless, visibility is limited by the distance and the foliage which partly hides the birds' activities. The Park management is aware of this problem and a television system might be used to provide a clearer view of the birds' activities.

These are the facilities provided for visitors. The fact-finding team itself visited the portion of the lake within the Park boundary, moving in sufficiently close to the banks, willows and reed beds to obtain a close view of the birds and their nests, particularly the platforms on which the pelicans nest. A trip along the river running through the park also provides incomparable views of countless nests and a valuable insight into the birds' habits. However, all this is accessible only to a small number of privileged people, not to "ordinary" visitors, since the Park's management rightly considers that over-frequent visits would disturb the birds.

7.2 Consequently, visitors to the Park at present have a limited programme: they visit the centre and the small museum (excellent) and then go to the observation tower, from which they can observe some of the birds. However, their view is restricted, especially when some of the nests are hidden by foliage, but also because the nests are in any case quite a long way off.

It seems that this could be improved so as to enable visitors to study more birds from closer range, naturally without disturbing them. Television observation (as planned) is an excellent idea.

8. **Administration of the Park**

In May 1990 the Park's administrative staff was as follows:

One director, two forestry engineers, one biologist, four wardens, one secretary and seven manual workers.

At present, on the basis of agreements with three universities, there are research programmes on pollution, certain insects and the production of documentary films. An excellent but rather long video film was seen by the fact-finding team.

Symposia are organised every year with the assistance of clubs in Bandirma. One of these, organised in 1986, produced a very interesting report. The subjects studied include various scientific, human and other aspects of the life of the Park and Lake Manyas. Well produced and well illustrated printed material in several languages is available to visitors.

The Park does not seem to have a budget of its own. In 1989 the Park's management and employees were national government officers or civil servants, total admission receipts were 24 million TL and the Park apparently received a subsidy of 36 million TL, though we cannot vouch for the accuracy of these figures.

In 1989 there were only two breaches of the regulations on hunting, which is forbidden throughout the Park, while fishing is authorised only outside its boundary (see section 5.2).

9. Comments of the Secretariat

Several other circumstances with important consequences for the future of the Kuscenneti Park need to be taken into consideration.

9.1 The Park's natural evolution is leading to a gradual invasion by reeds, followed by extension of the wooded area at the mouth of the Sigirci. Over the last ten years the Park's land area has grown from 52 to 64 hectares. This land won from the lake provides ideal nesting sites for birds. Consequently, this evolution must be seen in a favourable light, up to a certain point at least. On the other hand, the area of Lake Manyas is steadily shrinking as a result of a gradual fall in the water level. It is not known whether this is caused by a succession of drier than average years or by an increase in the quantities of water drawn off to irrigate nearby land. In any case, this evolution should be carefully monitored and, if possible, quantified.

9.2 Secondly, an embankment approximately 30 km long has been built by the Turkish government at the request of local farmers to protect agricultural land south-west of the lake. This earth embankment 2 to 3 metres high has caused the disappearance of an important feeding area for birds and a breeding site for several limicoline species which are particularly drawn to this type of grassland subject to flooding. In our opinion, therefore, this construction is regrettable and in future the establishment of new embankments around the lake should be strictly limited, since they would affect the way the lake's entire ecosystem functions, including the Park.

9.3 If the plan to extend the Park by including the land subject to flooding around the lake comes to fruition, this would help to improve protection of the land in question. It already belongs to the state, but its use and protection would then come under the control of the Park authorities. Consequently, this plan meets with our approval and should be speedily implemented, if possible.

9.4 The most serious problem the Park will have to cope with over the years to come is the anticipated intensification of agriculture on the land around Lake Manyas. The number of farming families has apparently remained more or less stable until now, but we saw large quantities of new agricultural equipment (mainly tractors and irrigation pipes taking water directly from the lake) bought through loans which can be paid off and justified economically only by intensifying agriculture. The local products are cereals to the east and north and market gardening crops to the south, which consume large quantities of water, together with a few areas of pasture and a few intensive poultry farms. At present the quantities of fertilisers and plant protection products used are apparently limited because of their high cost, but they will surely increase to keep pace with the "modernisation" of local agriculture. In the medium or long term, therefore, the lake water will firstly be increasingly diverted for irrigation purposes (with heavy demand in spring, a critical period for the birds in the Park) and secondly stand in danger of being enriched by excess fertiliser or polluted by plant protection products residues. All of this is likely to cause serious disturbance to the ecological equilibrium of Lake Manyas and the Kuscenneti Park. These dangers must be recognised now so that from the outset a rational development policy for the region which does not damage either the Park or fishing on the lake can be adopted. The problem of wetlands is sufficiently well understood for it to be possible to call on the skills of scientists and experts in this field so as to guarantee lasting use of this fragile ecosystem. In order to explain exactly what is at stake in this situation it would be desirable to begin immediately an information campaign to explain the issues to local decision-makers, local developers and the local population in general.

9.5 We were informed of two serious accidents involving chemical pollution of urban or industrial origin in 1972-73 and 1987-88. Boric acid accidentally spilt into the Sigirci seriously affected the whole area. Fortunately, these accidents have left no visible traces and they prompted the introduction of a programme for the monitoring and treatment of water upstream from the Park. However, it will be necessary to check that this programme is working effective and ensure that the quality of the water in the Sigirci and Lake Manyas is subject to frequent, regular monitoring. The monitoring programme concerned with the water's physical and chemical properties could be one of the responsibilities of the limnological station proposed above. This station should also carry out a study of the plankton in the lake (this is very rich but there is still too little known about it) as a biological indicator of the health of the ecosystem.

9.6 More generally, it seems important to develop research into the lake and the Park. In any case, the Visitor Centre should have a complete collection of all the research work concerning the ecosystem. This information will be extremely valuable for the long-term supervision and management of the Park. Following our on-the-spot appraisal proposals for research in the Park were forwarded directly to the Park authorities.

9.7 The Park could enhance its educational role by mounting a small exhibition in the museum of the Visitor Centre explaining the ecological interactions between the Park, its bird population, Lake Manyas and the surrounding land. A presentation of the water cycle, nutrients (particularly bird droppings) and trophic chains might help the public and the local population to better understand the richness and fragility of the area.

9.8 One last source of serious concern is the question of year-to-year fluctuations in the numbers of glossy ibis, which cannot apparently be explained by reference to any conditions in the Park itself. The conditions would appear to be exactly right to attract this species, which is threatened in Europe. It would be useful to bring together scientists and managers of wetland areas with knowledge about the movements and population trends of this species. Establishment of an information and co-operation network would make it possible to monitor and manage these population trends better. This question could be given special attention by the Standing Committee of the Bern Convention and/or be made the subject of a forthcoming symposium in the annual series at Kuscenneti.

9.9 In conclusion, the Kuscenneti Park remains a site of exceptional value for the migration and reproduction of numerous bird species. Like all wetland areas, it is a fragile biotope, especially because the Park covers only a small area of a vast ecosystem used in different ways by man. The Park authorities are doing very valuable work but they should step up their vigilance even further in future in order to maintain the delicate harmony between man and nature.

9.10 Our on-the-spot appraisal has therefore enabled us to propose renewal of the European Diploma, subject to the conditions and recommendations set out in the draft resolution given in Appendix II.

APPENDIX I

The Thonon lacustrine hydrobiology station (Haute-Savoie, France)

This station is the largest in France. It has a staff of 12 specialist researchers, 7 engineers and about 20 laboratory and administrative staff. It has numerous laboratories, a library, a fish hatchery, boats etc.

Its activities extend not only to Lake Geneva but also to the other lakes in the region. There is no question of establishing such a large station in the Lake Manyas area, but some of its 18 programmes might concern Lake Manyas (and no doubt other lakes in the same region). These programmes include:

Applied limnology

Transfer of solids and associated pollutants in the catchment areas (NB very important programme concerning all forms of lacustrine pollution), measurements of chemical agents

Sedimentation

Phytoplankton

Zooplankton, nutrition and migration of filter-feeding plankton

Crayfish.

The station has a large-scale fish-breeding programme, but this concerns only salmonidae (rare if not completely absent in Lake Manyas). It has no programme on birds, which is a pity since Lake Geneva provides shelter for many migratory birds.

I have discussed with several of the station's researchers and engineers what the main activities of a small limnological station at Lake Manyas (and perhaps the neighbouring lakes) might be. These suggestions are set out in the preceding report. It is suggested that the station's staff might comprise:

- a hydrogeologist with a good knowledge of pedology and sedimentation (dealing mainly with variations in the water level)
- a chemist to monitor water and air pollution
- a biologist dealing with all aspects of the biology of the lake.

All these researchers should co-operate with the ornithologists attached to the National Park and should be permanent staff. More specific programmes could be prepared with interested universities.

The station receives many foreign researchers and would be prepared to help train Turkish researchers under conditions which remain to be defined.

APPENDIX II

Draft Resolution (91) ...
on the renewal of the European Diploma
awarded to the Kuscenneti National Park (Turkey)

The Committee of Ministers, under the terms of Article 15.a of the Statute of the Council of Europe,

Having regard to Resolution (65) 6 instituting the European Diploma;

Having regard to Resolution (76) 15 awarding the European Diploma to the Kuscenneti National Park;

Having regard to the proposals of the Steering Committee for the Conservation and Management of the Environment and Natural Habitats (CDPE),

Renews the European Diploma awarded to the Kuscenneti National Park in Category A until ... 1996;

I. Attaches to the renewal the following conditions, failure to observe which may lead to steps being taken to withdraw the Diploma:

1. General condition

1.1 Human activities and facilities in the area around the site concerned by the Diploma must not impair the biological integrity of the Park;

2. Specific conditions

2.1 All necessary measures must be taken to ensure that the eventual construction of the Kocaçay dam would have no negative repercussions on the ecological equilibrium of Lake Manyas or the ecosystems of the national park, including the completion of a thorough impact study before the start of any project which would entail modification of the lake's hydrological regime;

2.2 Natural, seasonal fluctuations in the water level of the lake must be maintained, as must the land subject to flooding around the lake;

II. Invites the authorities responsible for management of the site to implement the following recommendations:

1. Institute a programme of regular monitoring of the quality and quantity of water in Lake Manyas and the River Sigirci, if possible by establishing a small permanent limnological research station on the site;

2. Add to the national park, if possible, the land subject to flooding around Lake Manyas in order to guarantee the continuation of its traditional use for extensive agriculture;

3. Step up the educational role of the Park museum, particularly by producing display cases explaining the ecological interactions between the Park and the surrounding area, water cycles, the main nutrients, food chains and the main bird migration routes;

4. Improve scientific knowledge about the site by compiling exhaustive inventories of plant and animal species and population breakdowns by species, by promoting field research into the site and by continuing to encourage scientists and the Park management to pool information and knowledge, particularly through annual symposia;

5. Study the possibilities of giving visitors a better view of the Park's wildlife without disturbing it or unsettling the birds.