

## AIR POLLUTION AND CONSERVATION: A NATIONAL ACTION PLAN

Christian Laine,  
Head of Dept.,  
Nat. Sw. Board of Antiquities

1985 saw the signing of the Council of Europe's Convention for the Conservation of the Architectural Heritage, the "Granada Convention". The undertakings covered by this Convention include special measures to combat the disintegration of our cultural heritage caused by air pollution:

"With a view to limiting the risks of the physical deterioration of the architectural heritage, each Party undertakes:

1. to support scientific research for identifying and analysing the harmful effects of pollution and for defining ways and means to reduce or eradicate these effects;
2. to take into consideration the special problems of conservation of the architectural heritage in antipollution policies" (Article 8).

In Sweden, environmental measures to combat air pollution and acidification have so far started mainly from the threat, and the damage, to our natural environment. Only in recent years has attention begun to be paid to the importance of pollution in the deterioration of our architectural heritage. It is already clear, however, that both local and long-range emissions of, above all, sulphur dioxides and nitrogen oxides, radically accelerate the corruption of monuments of various stone materials, metals etc.

This year, the National Board of Antiquities, at the request of the Swedish Government, has submitted a proposal for a three-year action plan, in accordance with the intentions of Article 8 in the Granada Convention.

One of the Board's main objectives has been to integrate also the cultural heritage in a coherent programme of environmental policy to restrict emissions, to mitigate the effects of pollution, and to develop a more environment-positive technology. The Board's investigative work has therefore been coordinated with the Environment Protection Board's simultaneous presentation of the action plan previously in force in the fight against air pollutants and acidification. Its report to the Government has also taken the form of a coherent action plan, containing a proposal that all measures, including the special inputs proposed in respect of the cultural heritage, be financed via the environment budget.

In this context, no account is given of the more general proposals designed to restrict emissions etc., but only of those specific to the cultural heritage. These include the following part-programmes: inventories and documentation, protection, and conservation; research and development; training; and systems for information and cooperation.

These part-programmes are based, in brief terms, on the following fundamental view.

- \* The process of degradation is caused by a large number of interacting chemical, biological and mechanical factors. The neglect of maintenance, unsuitable materials and methods in maintenance and repair work, inadequate storage and exhibition premises etc. greatly aggravate the effects of air pollution.

Any action programme to combat the injurious effects of air pollution on cultural monuments and objects should therefore be designed to clarify and improve the conditions for continued conservation in a broad and coherent perspective. Work in the future will be guided by the concept of "integrated conservation".

- \* Our knowledge of the causes, course and effects of the corrosive process is still inadequate, particularly as regards the synergic effects of interacting factors in the overall process of destruction. Our basis of knowledge is also inadequate as regards the materials and methods that can be used to prevent or slow down corrosion. A major factor contributing to this lack of knowledge is the poorly developed interplay between different professions and fields of competency, between the scientific disciplines, and between the public institutions responsible, both in the national and the international perspective.

The action programme should therefore be given a strongly inter-disciplinary thrust, involving all the areas proposed. The utmost priority should be given to the building up and continued operation of an efficient system for the national and international exchange of know-how and experience. To achieve an effective coordination of work, the Board of Antiquities should be given an overall responsibility for the planning, initiation, follow-up and evaluation of inputs.

- \* The damage, both direct and indirect, caused to cultural monuments and objects by air pollutants is lasting. Measures to reduce emissions of pollutants will take full effect only in a longer time perspective. In the meanwhile, the process of degradation that has started will continue. The damage caused to our cultural monuments and objects has reached such a stage that immediate measures must be deployed to rescue the monuments most at risk.

#### Inventories and documentation

Readily comprehensible compilations of the available material should be made, to provide a basis for coherent assessments of

the scale of the damage, the need for protection and conservation, etc., and for the setting of priorities between different measures of this kind.

More penetrating selective inventories should be made to chart in more detail the causes, course and effects of the corrosive process. In the case of particularly exposed categories, maximum priority should be given to inventories of this kind in the next few years. This applies primarily to buildings, details of buildings, sculptures, and other cultural monuments in various stone materials. These more detailed inventories are essentially in the nature of research and development projects, with a pronouncedly interdisciplinary thrust.

Material inventories should be systematically coordinated with relevant inventories of the external conditions for the corrosive process, i.e. measurements and analyses of deposits and contents of various pollutants, climatic conditions etc. Our present system for monitoring the quality of our environment therefore requires reinforcement by special inputs to chart the direct and indirect effect of pollutants on cultural monuments and objects. This applies particularly to the quality of the air in built-up areas, with the emphasis on the pollutant and corrosive effects of road traffic.

The description of status, documentation, and diagnosis covered by the inventory stage also constitute a necessary scientific basis for the measures of conservation and restoration to be undertaken during the subsequent stage. These measures, in their turn, have to be documented, to provide a basis both for evaluations of the materials and methods chosen, and for decisions on action in the coming cycle of conservation and maintenance.

Systematic documentation from the inventory to the action stage is also a necessary condition for research and development in the corrosion-conservation-maintenance field. It will also be decisive for the development of an effective international exchange of knowledge and experience.

### Protection and conservation

The corrosive effects of air pollution are influenced by and interact in a series of additional factors. The cumulative course of the corrosive process has its ground in, among other things, shortcomings in the day-to-day care provided, and the use of unsuitable measures of maintenance, restoration and conservation.

To counter the injurious effects of air pollution, increased efforts should therefore be made to achieve scrupulous and

continuous care. Particular attention should be devoted to the "materials ecology" of earlier building techniques.

Parallel with increased investments in research and development in this field, the information and counselling provided on materials and methods for the care of historical monuments should be reinforced. It is, also, essential that the approach, and the competency, reflected in the concept of "materials ecology" be incorporated in the basic and continued training of those occupational categories working in the care of historic monuments.

Parallel, however, with generally acting measures of this type, forceful selective measures are needed to hinder the destruction of particularly exposed monuments, and types of monument of high cultural value.

Given our present overall knowledge of the scale of the damage, priority can be accorded to the following types of monument: mediaeval facade sculptures etc. of sandstone and limestone (largely on the island of Gotland, but also in southern and central Sweden); and facade sculptures etc. in sandstone and limestone from, above all, the Renaissance and Baroque eras (mainly in the older, central parts of towns in southern and central Sweden, but also outside the built-up areas). On the basis of more detailed inventories and analyses of the nature and scale of the damage, measures should also be designed for the protection and conservation of facade and free-standing sculptures of bronze and other metals, constructions in smithied and cast iron, and rock carvings, painted stones, and runestones.

#### Research and development

R & D in the area of pollution, conservation and maintenance should be seen as a necessary and integral part of our individual action programmes. It is thus essential that the "clinical" operation, from diagnosis to treatment, be combined with purpose-oriented research and development inputs.

At the same time, any deeper-going and coordinated build-up of knowledge in the "corrosion/conservation/maintenance" field presupposes intensified basic research in a range of disciplines.

Urgent fields of research include:

- \* Swedish stone materials and their reactions to different types of pollutant;
- \* the importance of the macro- and microclimate in the corrosive process;
- \* synergistic and catalytical effects in the corrosive process;

- \* biodegradative processes and their relationship to pollutants;
- \* the development of diagnostic methods;
- \* research in materials ecology, with an emphasis on traditional materials and methods, and questions of durability and reparability; and
- \* the development of methods for the conservation of different categories of materials.

### Training

Communications between specialists with different fields of competency are poorly developed and make difficult any effective build-up of know-how and expertise.

There is thus a great need of continued training, and both a broader and more in-depth basic training, for the various occupational categories involved in the care of monuments, conservation, and restoration. A closer relationship should also be established between field work, research, and training.

As part of the measures required during the next three-year period, a special enquiry should therefore be devoted to training.

### Interaction and information

The central thrust of the action plan drawn up has been to build up, as soon as possible, an efficient national system for interaction and information between the practitioners and researchers in different fields of competency.

In the same way, however, as the battle against air pollution has to be waged in an international context, so too our national work to limit the damage it causes to our cultural heritage must be based on collaboration and information across the national frontiers. One of the main objectives of Sweden's action plan is therefore, naturally, to reinforce Swedish inputs in such collaboration.

It has also been considered important to get information across to a broad general public, to create involvement and influence public opinion. As an initial step in such a campaign, the Nat. Sw. Board of Antiquities and Sweden's historical museums have recently opened a major exhibition on our decaying cultural heritage: "Air Attack!".

### Implementation

The Government is scheduled to take its decision on the action programme early in 1988. The costs of implementing this programme have been estimated at SEK 30 million. These include funds for inventories and documentation, state grants for protection and conservation, the build-up of the information system, and the planning and follow-up of research and development. It has been assumed that the research and development projects as such will be financed mainly via the research budget, and no funds for this purpose are therefore included in the budget for the action programme.



Sub-theme 3: Monuments in relation to their natural and built environments and their historical contexts

Title : Air Pollution and Conservation: a National Action Plan

Author : Mr. Christian Laine, Sweden

The National Swedish Board of Antiquities has presented this year a three-year national action plan to combat the injurious effects of air pollution on historical monuments and objects.

In Sweden, the measures of environment policy deployed against air pollution and acidification have so far taken, as their main starting-point, the threat to, and damage caused to, the national environment. One of the Board of Antiquities' main objectives has been to integrate also the cultural heritage in a coherent environmental program to restrict emissions, mitigate the effects of pollution, and develop a more environment-positive technology. Work on the programme has therefore been closely coordinated with the parallel work of the Environment Protection Board on an overbridging action programme against air pollution and acidification in the coming three-year period. The Board of Antiquities and the Environment Protection Board are also suggesting to the Swedish Government that the special inputs proposed regarding the cultural heritage should be included in the environment policy budget for the overall Swedish programme.

Reinforced measures, with special emphasis on the cultural heritage, are proposed within the following part-programmes: inventories and documentation, protection and care; research and development; training; and systems for follow-up, coordination and information.

The Board of Antiquities is requesting that a total of SEK 30 million be voted for the programme, within the environment project, and, also, that research and development projects in this field be assigned high priority in the allocation of funds for building research etc. during the period.

Guiding principles for the programme will be:

- \* to chart and improve, also in this context, the conditions for preserving the cultural heritage, starting from the concept of "integrated conservation";
- \* to attack the issues of corrosion, conservation and care of buildings in a coherent perspective, and with special consideration to the synergistic effects of interacting mechanical, chemical, and biological factors;
- \* to reinforce the interdisciplinary collaboration and exchange of information, within all these part-programmes; and
- \* to reinforce the international collaboration and exchange of information.

Sous-thème 3 : Les monuments en relation avec leur environnement naturel et construit et avec leur contexte historique  
Titre : Pollution atmosphérique et conservation; programme d'action suédois  
Auteur : M. Christian Laine, Suède

La Direction nationale suédoise du patrimoine a présenté cette année un programme d'action national de trois ans en vue de mesures contre les effets dommageables de la pollution atmosphérique sur les monuments et objets culturels.

En Suède, les mesures de politique de l'environnement contre la pollution atmosphérique et l'acidification ont jusqu'à présent été axées pour l'essentiel sur les menaces et les dommages concernant l'environnement naturel. L'un des objectifs majeurs de la Direction nationale du patrimoine a été d'inclure également le patrimoine culturel dans un programme d'ensemble de politique de l'environnement visant à limiter les rejets, à maîtriser les effets de la pollution et à mettre au point des technologies plus propres. C'est pourquoi la préparation du programme a été étroitement coordonnée avec les travaux engagés simultanés par l'Administration nationale de la protection de l'environnement en vue d'un programme d'action global contre la pollution atmosphérique et l'acidification pour les trois années à venir. La Direction nationale du patrimoine et l'Administration nationale de la protection de l'environnement suggèrent par ailleurs au gouvernement d'inscrire les mesures spécifiques proposées en faveur du patrimoine culturel au budget de politique de l'environnement au titre du programme global.

Des mesures renforcées axées spécifiquement sur le patrimoine culturel sont proposées dans les sous-programmes suivants: inventaire et documentation; protection et sauvegarde; recherche et développement; formation; systèmes de suivi, de coopération et d'information.

La Direction nationale du patrimoine demande qu'un total de 30 millions de couronnes suédoises soient affectées au programme dans le budget de l'environnement, et qu'en outre les projets de recherche et développement dans ce secteur bénéficient au cours de la période d'une large priorité lors de la répartition des crédits pour la recherche sur la construction entre autres.

Les principes directeurs du programme doivent être notamment:

- o préciser et améliorer dans ce contexte également les conditions de la préservation du patrimoine culturel, sur la base de la notion de conservation intégrée
- o s'attaquer aux problèmes de la dégradation, de la conservation et de la sauvegarde dans une perspective globale et en tenant compte particulièrement des effets synergiques des facteurs mécaniques, chimiques et biologiques en présence
- o renforcer la coopération interdisciplinaire et les échanges d'informations au sein de tous les sous-programmes
- o renforcer la coopération et les échanges d'information au plan international.