

Air Pollution Reviews – Vol. 2

Editor

Peter Brimblecombe

The Effects of Air Pollution on the Built Environment



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The Effects of Air Pollution on the Built Environment

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PREFACE

Air Pollution and Our Cultural Heritage

The effects of air pollution on building materials became linked to a wider debate about the protection of cultural heritage. We find ourselves in an age where the links between environment, its pollution and culture seem more obvious than ever. Pollution has become a feature of artistic expression broadening the public interest. The century, just complete, began with the paintings of Monet that rendered impressions of the smoke pollution of London and the novels of Arthur Conan Doyle, had his hero Sherlock Holmes pacing the fog-bound streets of London. In the United States, fictional detectives, such as Raymond Chandler's Philip Marlowe, were driving around Los Angeles in the 1940s when photochemical smog was born. Hardly surprising that Hollywood's detective *film-noir*, ultimately encapsulated a vision of smog, perhaps most intensely seen in the futuristic *Blade Runner* (1982). Here it is always as dark as night, because the orange sun can only cut through the pollution at the tops of buildings. As the century ended, the Ken Saro-Wiwa's literary visions of the environment impelled him to an activism, that became a justification for Nigerian government to order his execution.

The destructive effect of air pollution on our built heritage has long been apparent. Recent interest seems particularly driven by the concerns over the widening effects of acid rain in the 1970s and 1980s. The damage from deposition of sulphur dioxide, often accumulated over centuries, at last found voice. The Convention on Long Range

Transboundary Air Pollution fostered a number of international cooperative programmes in the late 1970s. Among these the international cooperative programme for the effects of air pollution on materials gave rise to a long series of studies at the behest of the United Nations Economic Commission for Europe.

Across the Atlantic, 1980 saw the US Congress authorise the National Acid Precipitation Assessment Program (NAPAP), an inter-agency task force under the auspices of the Council on Environmental Quality. By the early 1990s, NAPAP had produced a series of reports: *Acidic Deposition: State of Science and Technology*. The program was re-authorised through the 1990 Clean Air Act Amendments and examined trends in emissions, deposition and effects, to evaluate the expected benefits of the 1990 legislation. It looked at important construction materials such as metals, paint systems and concrete, and the culturally important materials such as marble, limestone and bronze.

Within Europe, the European Commission promoted studies of the effects of air pollution on cultural heritage, most particularly under the European Union's STEP and Framework programmes from the 1980s. This policy-driven research developed through a period of increasing interest in the concept of sustainability. Sustainability was set to be a central consideration of policy development in the 21st century. Cultural heritage was not explicitly recognised, as a strategic imperative, within seminal documents such as the *Brundtland Report*. Nevertheless, it appeared in official European publications relating to our cultural heritage. The Council of Europe prepared a document about *Sustained Care of Cultural Heritage* and the European Commission's Framework 5 Programme sought tools for the sustainable management of cultural heritage. The move to link sustainability and heritage was motivated by an admirable desire to preserve so much of what we value, although sustainability was not well defined within the heritage context.

Research often focused on dose-response function research and concerns about the mechanisms of damage under laboratory and field conditions. There was much interest in investing decay of well-characterised ambient exposures for standard size samples, as well as for individual structures. The STEP and Framework Programmes in Europe initially focussed on stone, but as with the NAPAP research

widened to take an interest in many other materials, e.g. wood, glass and metals. More recently, European research paid greater attention to indoor materials, such as paper, leather and silver.

This research area gave value that went well beyond the field of materials research. There were important spin-offs into other fields, which characterise the research as innovative and show it had escaped the bound imposed by traditional disciplines. One example of this is the use of research on the behaviour of salts on monuments to gain an understanding the moisture requirements of the house-dust mite, implicated in childhood asthma.

The work that contributes to this volume comes from a period when research on damage to cultural heritage was especially active. Times have changed and the future directions of such research is not necessarily clear. The shifting focus of European research under Framework Programme VI seems likely to foster very different projects. In the U.S., similar changes are felt perhaps with less interest in the outdoor dose-response function and increasing attention on the indoor environment.

Nevertheless, buildings remain a most permanent feature of our culture. Whatever the direction of future research, it is clear that an understanding of the way air pollutants affect materials are of practical concern to many involved in the regulation and control of air pollutants. It is hoped that this volume will be of use to the increasing number of scientists, students, conservators and practitioners whose concerns lie at the interface between research and its application.