

# COMMISSION OF THE EUROPEAN COMMUNITIES

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P R O P O S A L

FOR A

C O U N C I L D E C I S I O N

ADOPTING A EUROPEAN ECONOMIC COMMUNITY

C O N C E R T E D A C T I O N

IN THE FIELD OF

PHYSICO-CHEMICAL BEHAVIOUR OF ATMOSPHERIC POLLUTANTS

(Presented by the Commission to the Council)

COM(78) 14 final.

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SHORT SUMMARY

The proposal for a Concerted Action in the field of Physico-Chemical Behaviour of Atmospheric Pollutants aims at supplying knowledge necessary for the implementation of the Action Programme of the European Communities for the Environment. It is complementary to the Communities' Environmental Research Programme (Indirect Action). With regard to the research content, the programme is a follow-up and extension of COST Project 61 a.

It is proposed to execute research in the following fields:

- 1) Studies of the conversion and transport of atmospheric pollutants
  - a) laboratory studies
  - b) field studies
  - c) modelling
- 2) Studies on deposition and absorption of atmospheric pollutants

The programme is implemented for a 4 year-period starting in 1978, (date of publication of the decision).

The maximum financial contribution of the Community is evaluated at 500.000 EUA.

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## 1) Introduction

The scope of the present proposal for a concerted action on "Physico-chemical behaviour of atmospheric pollutants" is to co-ordinate the relevant research going on or planned in this field, in the spirit of the Council resolution of 14 January 1974 on an initial outline programme of the European Communities in the field of science and technology. The association of interested European Non-Member States is envisaged. The Commission intends to introduce in the concerted action the relevant research executed in the Joint Research Centre.

The programme, which will be implemented as a concerted action, is a further development and extension of research carried out within COST Project 61a "Physico-Chemical Behaviour of SO<sub>2</sub> in the Atmosphere", 1972-1976. It is closely linked to the 2nd Environmental Research Programme adopted by the Council in its decision of 15 March 1976.

The results of the research will provide a scientific basis for a better understanding of the impact of human activities on the atmosphere and their consequences for the aquatic and terrestrial environment.

The proposed research is in direct relationship to the Community's Action Programme on the Environment, laid down in the Council resolution of 17 May 1977, in particular to Title II, Chapter 3 "Atmospheric Pollution", to a certain extent also to many of the other chapters (e.g. protection of flora and fauna). The expected results will contribute to the basic information necessary for the evaluation of effects of air pollution on human health and the environment. They will also shed light on some aspects of long range transport of air pollutants and acidity of rain, issues of major public concern.

Since a substantial fraction of the air pollutants concerned originate from energy production, strong links with the Community activities on energy are evident.

This programme was prepared with the concurrence of the Management Committee of COST Project 61a, which recommended strongly the implementation and co-ordination of the proposed research.

The proposal was comprehensively discussed by the Advisory Committee on Programme Management for Environmental Research, whose opinion is given in Annex I.

## 2) Definition of the Problem

As a consequence of energy generation, industrial activity, (e.g. ore processing), domestic heating and road traffic, large amounts of sulphur (mainly in the form of sulphur dioxide) and nitrogen oxides are released into the atmosphere. Worldwide, these amounts range in the order of magnitude of 100 million tons per year.

These gases interact in the atmosphere with each other, with oxygen, and with other air pollutants, namely with ozone and photochemical oxidants (oxidation products of hydrocarbons and other organic compounds). Particulate matter acts as a catalyst in many of the conversion processes and as an absorbant. Many of the processes occur in aqueous phase (rain droplets, fog, clouds), often catalysed by dissolved substances (metal compounds) or suspended matter.

Alkaline compounds, in particular ammonia, react with the acid pollutants and their acid conversion products in the presence of water, forming inorganic salts.

For many of these processes, the reaction partners need to be activated by sunlight, and radicals (active chemical entities with a short lifetime) are often the real acting agents.

A number of basic mechanisms are responsible for the elimination of the pollutants and their reaction products from the atmosphere:

- dry deposition of gases on soil, particulate matter, and snow
- absorption by water surfaces
- wash-out by rain and rain-out (the latter being defined as incorporation of pollutants into liquid water during the process of condensation)
- removal by living organisms, in particular plants, involving physical as well as active physiological processes.

The scope of the proposed research programme is essentially to unravel the multitude of parallel and consecutive chemical and physical processes involved in this complex conversion of air pollutants.

As a result, one can expect:

- the establishment of the chemical equations describing the individual processes, and the characterization of physical processes (interaction between gases and condensed matter) involved.

- the determination of the reaction rates of the chemical and physical processes involved
- the possibility to compare the relative importance of the processes, and to establish an overall balance of the turnover of the important air pollutants.

### 3) State of the Knowledge and Results of COST Project 61a

COST Project 61a "Physico-chemical Behaviour of SO<sub>2</sub> in the Atmosphere" was executed from November 1972 until the end of 1976. The Project was based on an agreement concluded between the governments of Denmark, the Federal Republic of Germany, Spain, France, Greece, Italy, the Netherlands, Yugoslavia, Austria, United Kingdom and Belgium. 26 national research projects, including research executed in the Joint Research Centre of the European Communities, were coordinated.

The essential results are presented in the final report of the Management Committee (Doc. EUCO/SO<sub>2</sub>/69/77). A comprehensive scientific publication on the project is in preparation.

The project was limited by the definition given in the agreement to the atmospheric conversion of sulphur dioxide, at this time deemed to be the major problem. It was recognised soon that sulphur dioxide is only one facet of the overall problem (e.g. in some instances, up to 50% of the acidity of rain may be due to acids derived from nitrogen oxides) and in implementing the project due consideration was given to tackle atmospheric sulphur chemistry within a more general context. As progress evolved, the importance of other pollutants became more and more evident.

For practical reasons, the project was subdivided in three main research areas:

- chemical conversion studies
- particularities of the conversion in plumes and areas close to important sources
- removal from the atmosphere

COST Project 61a may be considered as successful and to have contributed significantly to the present state of knowledge. A critical evaluation of the results may be summarized as follows:

- a) Within the studies on chemical conversion of sulphur dioxide, the broad outline of the chemistry of many important reactions of sulphur dioxide in homogeneous phase has been elucidated, their rate constants have been established, and a number of catalytical phenomena have been explained. This permits a comparative evaluation of the relative importance of the conversion pathways likely to occur in the atmosphere. Field measurements are in general in good agreement with these findings, but need, however, further confirmation, extensions and refinement.

Substantial results with regard to the conversion of  $\text{SO}_2$  on the surface of particulate matter have been reported. This extremely complex and diversified field of inquiry needs, however, further investigation.

- b) With regard to research on the behaviour of sulphur dioxide in the special conditions prevailing in plumes and areas near the emission sources, the project was hampered by the fact that several series of planned experiments could not be executed as foreseen for external reasons (public objections against the release of radioactive tracers, use of low-sulphur fuel in power stations). Several other relevant national projects are not yet definitely completed. The results obtained so far, although not yet conclusive, form a solid ground for further research.
- c) Studies on removal of  $\text{SO}_2$  from the atmosphere were perhaps of an undercritical dimension in COST Project 61a, since several topics were not covered by national projects. Valid data have been produced by measurements of concentration gradients near the ground, and substantial progress has been achieved regarding the absorption by vegetation and different types of soil and other inorganic material.

#### 4) Content of the Programme

Taking into account the state of knowledge outlined above and the suitability of certain types of research projects for inclusion in a concerted action, the following programme has been established:

The aim of the Project is to conduct research into the physico-chemical behaviour of pollutants in the atmosphere, in particular into

- elucidating the chemistry of reaction between atmospheric pollutants and of their reactions with normal atmospheric constituents,
- describing the physical processes (interaction between gases and condensed matter) which are important in this context,
- investigating the rate constants of these reactions and processes, including catalytic aspects,
- investigating the mechanisms and the quantitative aspects of the processes responsible for the elimination of pollutants and their conversion products from the atmosphere,
- identifying sources and sinks of pollutants which are not yet known.

A broad range of pollutants will be studied; without the intention to set priorities, the following will be included initially:

- (a) Sulphur dioxide, its oxidation products and atmospheric precursors.
- (b) Nitrogen oxides i.e. nitrous oxide, nitric oxide, nitrogen dioxide, and products formed from these in the atmosphere such as nitrous acid, nitric acid, nitrates, pernitric acid and peroxyacetyl nitrate (PAN),
- (c) Ammonia,
- (d) Hydrocarbons, both natural and man-made,
- (e) Carbon monoxide,
- (f) Other organic compounds important in the atmospheric photo-chemical cycle, e.g. formaldehyde and higher aldehydes,
- (g) Ozone.

This list is not intended to be exhaustive and further primary or secondary pollutants may be added later, provided they meet the criteria for inclusion. Broadly, they should be involved in some chemical conversion process in the atmosphere or in the removal of the above mentioned pollutants from the atmosphere. Priority will be given to those pollutants having, or thought to have, measurable environmental effects, and due consideration will be given to radicals, i.e. short-lived intermediates.



Because of the number of pollutants included and therefore the danger of producing a very broad project with little cohesion, a number of restrictions will have to be placed on the nature of the investigations. These are:

- Exclusion of substances which normally undergo only physical processes, such as dispersion and sedimentation (dust, grit, persistent gaseous pollutants),
- Limitation to processes occurring in the lower atmosphere,
- Exclusion of investigations where the main purpose is monitoring of pollutants, that is extended time series of observations whose purpose is to demonstrate the spatial and time-dependent variability of concentration and the mathematical modelling of the long range transport of pollutants,
- Exclusion of research into the subsequent behaviour of pollutants after removal and any general study on the effects of pollutants (corrosion, physiological effects).

There are a number of peripheral subjects, for example, dispersion theory and cloud physics, which need to be considered in relation to the physico-chemical behaviour of pollutants but such peripheral subjects shall not form the major part of any investigation.

With regard to the methods of investigation all suitable experimental or theoretical approaches will be considered, in particular

- laboratory experiments simulating atmospheric conditions in order to investigate the chemistry and kinetics of reactions,
- field experiments, stationary or using mobile stations like aeroplanes, including limited series of atmospheric measurements whose purpose is to investigate a particular physico-chemical process or group of processes occurring in the atmosphere and investigations intended to demonstrate the existence of particular sources or sinks,
- computer modelling studies (within the limitations mentioned above).

The work may involve the development of new methods and techniques as far as they are suitable to the achievement of the objectives of the programme.

The Member Countries will introduce in the concerted action all relevant research on hand or planned, and that they will endeavour to explore the possibilities of launching new projects in order to fill gaps likely to be identified. The Commission will introduce the relevant research executed by its Joint Research Centre.

In Annex A to Annex II (Decision of the Council) a table indicating the initial participation of the different countries in the different research topics is given. It is anticipated that further projects will be included as progressive co-ordination in this field evolves.

A number of European Non-Member States have already shown a strong interest to be associated to the Community Concerted Action within the framework of an agreement between the Community and these states.

5) Duration

A duration of 4 years is proposed for this concerted action.

6) Implementation of the programme

The project is implemented as a "concerted action". It is closely linked to the Environmental Research Programme of the European Communities (Indirect Action).

A Concerted Action Committee will be established, in which the Member States and associated Non-Member States and the Commission are represented by a delegate, who may be assisted by experts. The terms of reference of this Committee are given in Annex B to Annex II.

With the agreement of the Concerted Action Committee, the Commission will appoint a project leader who will assist the Commission in the co-ordination.

The competence of the Advisory Committee on Programme Management for Environmental Research covers also the implementation of this programme; this Committee is, in particular, duly qualified for giving this research its proper place within the overall environmental research programme of the European Communities.

7) Dissemination of Knowledge

Emphasis will be given to a speedy and efficient dissemination of knowledge by organising workshops, symposia, etc., and publishing regular reports, stressing in particular the applicability of the results.

8) Financial Volume and Staff

The financial volume of the national research in the Member States to be introduced in the concerted action is estimated at eight million EUA (1) for a 4-year period.

The cost of co-ordination, charged to the Community budget, is estimated at 500.000 EUA(1) for the 4-year period. These costs include salaries for scientific and secretarial staff (2) involved in the co-ordination, expenses for experts, for organising meetings and symposia and for publications.

- (1) Amounts expressed in European Units of Account, which are applicable as of 1978 and the value of which is different from that of the "old" unit of account.
- (2) The allocation of 1A and 1C to this concerted action is requested. It is intended to pool this staff with such allocated to other concerted actions in the field on environmental research approved or proposed, in view of an optimum efficiency of the overall co-ordination of European research.

**Annex I**

**Opinion of the Advisory Committee on Programme Management  
for Environmental Research on the Commission Proposal  
for a Concerted Action in the field of  
Physico-chemical Behaviour of Atmospheric Pollutants**

The Advisory Committee for Programme Management in Environmental Research examined comprehensively during its meeting of 28th June 1977 the Commission's proposal for a concerted action in the field of Physico-chemical Behaviour of Atmospheric Pollutants and its relation to the programme of direct and indirect action.

The Committee agreed unanimously that the proposal meets the research needs in the Community, and that the scientific and technical content is sound.

The Committee recommended that in implementing this programme emphasis be given to a speedy dissemination of knowledge and to a careful evaluation of the results with regard to their application.

The Committee agreed that the concerted action fits well into the overall European research effort of direct and indirect action. It would contribute to the broader co-ordination of environmental research with which the ACPM is concerned. The successful collaboration with European non-member states during COST-Project 61a should continue, and great importance should therefore be given to their association to the concerted action.

The Committee stressed that adequate financial means and staff be allocated to this programme in order to ensure an efficient co-ordination to which it was hoped that JRC would contribute.

Annex II

## DRAFT COUNCIL DECISION

adopting a European Economic Community  
Concerted Action in the field of

Physico-Chemical Behaviour of Atmospheric Pollutants

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof,

Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Parliament,

Whereas by virtue of Article 2 of the Treaty the Community has been assigned the task of promoting throughout the Community a harmonious development of economic activities, a continuous and balanced expansion and an accelerated raising of the standard of living;

Whereas in the declaration of 22 November 1973 (1) the Council approved the principles and objectives of a Community environmental policy and the general description of the actions to be undertaken at Community level; whereas in the Resolution of 17 May 1977 (2) the Council approved the continuation and implementation of a Community policy and an action programme on the environment;

Whereas in its Decision 76/311/EEC (3) the Council adopted an environmental research programme;

Whereas in its Decision 77/488/EEC/EURATOM (4) the Council adopted a research programme for the Joint Research Centre;

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- (1) OJ N° C 112, 20.12.1973, p. 1  
(2) OJ N° C 139, 13. 6.1977, p. 1  
(3) OJ N° L 74, 20. 3.1976, p.36  
(4) OJ N° L 200, 8. 8.1977, p. 4

Whereas in its Resolution of 14 January 1974 on an initial outline programme of the European Communities in the field of science and technology (1), the Council stressed that an appropriate approach should be adopted towards the whole range of available ways and means, including concerted actions, and that whenever it proves desirable that third countries, particularly European ones, should be associated in these projects, steps should be taken to make this possible;

Whereas in its Resolution of 14 January 1974 on in particular the co-ordination of national policies in the field on science and technology (2), the Council entrusted the Community Institutions with the task of gradually ensuring such co-ordination, aided by the Scientific and Technical Research Committee (CREST);

Whereas a research project on the physico-chemical behaviour of SO<sub>2</sub> in the atmosphere carried out under an Agreement signed on 23 November 1971 in the framework of European Co-operation in the field of Scientific and Technical Research (COST) (COST Project 61a), produced very encouraging results;

Whereas a concerted Community research project in the field of Physico-chemical behaviour of atmospheric pollutants, continuing and extending COST Project 61a, will contribute effectively to the achievement of the above-mentioned aims, in particular with regard to the reduction of environmental pollution;

Whereas the Member States intend, as part of the rules and procedures applicable to their national programmes, to carry out the research described in Annex A, and are prepared to integrate such research into a process of co-ordination at Community level over a period of four years;

Whereas the execution of such research as described in Annex A will require financial contributions of about eight million European units of account from the Member States and from the Community;

Whereas the Treaty does not provide the specific powers necessary for this purpose;

Whereas the Scientific and Technical Research Committee (CREST) has given its opinion on the Commission proposal,

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(1) OJ N° C 7, 29. 1. 1974, p. 6

(2) OJ N° C 7, 29. 1. 1974, p. 2

HAS DECIDED AS FOLLOWS:

Article 1

The Community shall carry out over a period of four years a concerted action in the field of Physico-chemical behaviour of Atmospheric pollutants (hereinafter referred to as "the action")

The action shall consist in the co-ordination at Community level of the research described in Annex A and forming part of the national research programmes of the Member States and of the research programme of the Community.

Article 2

The Commission shall be responsible for the co-ordination.

Article 3

The financial contribution by the Community to such co-ordination is evaluated at 500.000 European Units of Account, the European Unit of Account being defined in accordance with the financial regulations in force.

A staff of two shall be assigned to the co-ordination of the action.

Article 4

To assist in carrying out the action, a Concerted Action Committee on the Physico-chemical Behaviour of Atmospheric Pollutants, hereinafter referred to as "the Committee", is hereby established.

A project leader shall be appointed by the Commission in agreement with the Committee. The Project leader shall, in particular, assist the Commission in its co-ordination.

The terms of reference and the composition of the Committee are laid down in Annex B.

The Committee shall draw up its rules of procedure. Its secretariat shall be provided by the Commission.

#### Article 5

- (a) In accordance with a procedure to be adopted by the Commission in agreement with the Committee, the Member States participating in the action and the Community shall exchange regularly all useful information concerning the carrying out of the research covered by the action. The participating Member States shall provide the Commission with all information relevant for co-ordination purposes. They shall also endeavour to provide the Commission with information on similar research planned or carried out by bodies for which they are not responsible. Any information shall be treated as confidential if so requested by the Member State which provides it.
- (b) The Commission shall prepare yearly progress reports on the basis of the information supplied, and shall forward them to the Member States and the European Parliament.
- (c) At the end of the co-ordination period, the Commission, in agreement with the Committee, shall forward to the Member States and the European Parliament a general report on the carrying out and the results of the co-ordination action. The Commission shall publish this report six months after it has been forwarded to the Member States, unless a Member State objects. In this case the report shall be distributed, at their request, solely to the institutions and undertakings whose research or production activities justify access to the knowledge resulting from the performance of the research covered by the project. The Commission may make arrangements to ensure that the report remains confidential and is not passed on to third parties.

#### Article 6

- (1) In accordance with Article 228 of the Treaty, the Community may conclude agreements with other States involved in European Co-operation in the field of Scientific and Technical Research (COST) with a view to extending the co-ordination which is the subject of this Decision to research undertaken in those States.



- (2) The Commission is hereby authorised to negotiate the agreements referred to in paragraph 1 .

Article 7

This Decision shall be published in the Official Journal of the European Communities. It shall take effect on the day of its publication.

Done at Brussels,  
For the Council,  
The President

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Annex A to Annex IIAnnex A to the Draft Council Decision  
on a Concerted Action in the field ofPHYSICO-CHEMICAL BEHAVIOUR OF ATMOSPHERIC POLLUTANTS

Contributions of the Member States and of the JRC to the concerted action by research topics.

<u>RESEARCH TOPICS</u>	DIVISION OF RESEARCH WORK								
	B	D	DK	F	I	IRL	NL	UK	JRC
1) Studies on the conversion and transport of atmospheric pollutants									
a) laboratory studies		X		X	X	X	X	X	X
b) field studies	X	X	X	X	X		X	X	X
c) modelling		X			X		X		X
2) Studies on deposition and absorption of atmospheric pollutants	X			X	X			X	

Annex B to Annex IITERMS OF REFERENCE AND COMPOSITION OF THE CONCERTED ACTION COMMITTEE  
PHYSICO-CHEMICAL BEHAVIOUR OF ATMOSPHERIC POLLUTANTS.

1. The Committee shall:
    - 1.1. contribute to the optimum execution of the programme by giving its opinion on all of its aspects;
    - 1.2. evaluate the results and draw conclusions as to their application;
    - 1.3. be responsible for the exchange of information referred to in Article 5(a);
    - 1.4. keep abreast of national research being done in the fields covered by the project, and more especially of scientific and technical developments likely to affect the execution of the concerted action;
    - 1.5. suggest guidelines to the project leader.
  2. The Committee's reports and opinions shall be forwarded to the Commission and the Member States participating in the project. The Commission shall forward these opinions to CREST.
  3. The Committee shall be composed of the persons responsible for co-ordinating the national contributions to the programme and one delegate from the Commission responsible for its contribution, and the project leader. Each member may be accompanied by experts.
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PROPOSAL FOR A COUNCIL DECISION  
ADOPTING A EUROPEAN ECONOMIC COMMUNITY CONCERTED ACTION  
IN THE FIELD OF  
PHYSICO-CHEMICAL BEHAVIOUR OF ATMOSPHERIC POLLUTANTS

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FINANCIAL STATEMENT

**FINANCIAL DATA**

1. **BUDGET CHAPTER :** 3371
  
2. **HEADING OF THE BUDGET TITLE :**  
Implementation of concerted action projects on the physico-chemical behaviour of atmospheric pollutants.
  
3. **JURIDICAL BASIS :** Art. 235

4. **DESCRIPTION, OBJECTIVES AND JUSTIFICATION OF ACTION**

4.1. **Description :**

Coordination of the most important research work in progress or planned in the Member States on the physico-chemical behaviour of atmospheric pollutants. The association of European non-member States is also likely

4.2. **Objectives :**

Development and extension of research work performed under COST Project 61a (1972-76). A better understanding of the impact of human activities on the atmosphere and their repercussions on the environment.

4.3. **Justification :**

The proposed research work is in line with the Second Environmental Research Programme (Council Decision of 15 March 76). It has a direct bearing on the Council Resolution of 14 January 1974 and on the Communities' Action Programme on the environment, especially Chapter 3 of Title II of the Council Resolution of 17 May 1977.

5. TOTAL FINANCIAL INCIDENCE OF ACTION DURING THE TERM ENVISAGED  
(in EUA)

5.0. Funded :

- on Community budget	500.000
- by national administrations	} 8.000.000
- by other sectors at national level	

TOTAL

8.500.000 EUA

5.0.0. Multiannual term

COMMITMENT

in EUA

	1978	1979	1980	1981
Staff	86.000	93.000	100.000	107.000
Manag.	14.000	30.000	35.000	35.000
Contracts				
<b>TOTAL</b>	<b>100.000</b>	<b>123.000</b>	<b>135.000</b>	<b>142.000</b>

PAYMENT

	1978	1979	1980	1981
Staff	86.000	93.000	100.000	107.000
Manag.	14.000	30.000	35.000	35.000
Contracts				
<b>TOTAL</b>	<b>100.000</b>	<b>123.000</b>	<b>135.000</b>	<b>142.000</b>

5.0.1. Evaluation method

a) Staff expenditure

The staff needs for this programme are estimated at:

- 1 category A staff
- ~~category B staff~~
- 1 category C staff

In addition to staff number estimates, the evaluation take account of the data of the Council Decision of 21.12.1976, on the adaptation of salary of European Community staff and applicable correction coefficients adding to it - on a hypothetical basis - possible needs originating from the general evolution of prices in the Community.

The rates adopted are those used for the calculation of the three-year forecast 1978/1980. The evaluation of expenditure increases up to 1981 has been made on the basis of the following indices : 108: 1979 , 116: 1980 , 124: 1981.

b) Contracts expenditures

Incidence on the funds :

- Community income tax on staff
- Functionaries contribution for retirement fund

6. FUNDING ACTION

6.0.

6.1.

6.2.

6.3. Funds to be included in future(s) budget(s)