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REPORT

on behalf of the Committee on the Environment, Public Health and Consumer Protection

on the combating of photochemical pollution

Rapporteur: Mr H.J. MUNTINGH

English Edition

PE 71.018/fin.

On 14 January 1980 the President of the European Parliament referred Petition No 17/79 to the Committee on the Environment, Public Health and Consumer Protection for an opinion.

On 25 January 1980 the Committee on the Environment, Public Health and Consumer Protection appointed Mr Muntingh draftsman.

It considered the draft opinion at its meeting of 12 May 1981 and adopted it by 14 votes to 2.

Present: Mr Collins, chairman; Mr Alber, vice-chairman; Mr Muntingh, draftsman; Mr Adam (deputizing for Mr O'Connell), Mr Ceravolo (deputizing for Mr Segre, Mr Del Duca (deputizing for Mrs Lentz-Cornette), Mr Ghergo, Mrs Krouwel-Vlam, Mrs Maij-Weggen, Mr Mertens, Mrs Schleicher, Mrs Seibel-Emmerling, Mr Sherlock, Mrs Squarcialupi, Mr Verroken and Mr Visas.

It instructed its chairman, however, to request the Bureau for authorization to submit this opinion in the form of a report. The Bureau granted the request on 22 September 1981. On 1 October 1981 the committee decided unanimously that the report should have the same text as the opinion which it had already drawn up.

Present: Mr Collins, chairman; Mr Muntingh, rapporteur; Mr Adam (deputizing for Mr Bombard), Mr Combe, Mr Del Duca (deputizing for Mr Ghergo), Miss Hooper, Mrs Lentz-Cornett, Mrs Maij-Weggen, Mrs Schleicher, Mrs Scrivener, Mrs Seibel-Emmerling, Mr Sherlock, Mrs Squarcialupi and Mr Verroken.

<u>C o n t e n t s</u>

A

The Committee on the Environment, Public Health and Consumer Protection hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

MOTION FOR A RESOLUTION

On the combating of photochemical pollution

The European Parliament,

- having regard to Petition No 17/79,
- having regard to the EEC Treaty, and in particular Articles 2 and 235 thereof,
- having regard to the declaration of the Council and the representatives of the Governments of the Member States meeting in the Council on 22 November 1973 on the programme of action in the European Communities on the environment,
- having regard to the Council resolution of 17 May 1977 on the continuation and implementation of a European Community policy and action programme on the environment,
- whereas, in accordance with the declaration of the United Nations conference on the human environment adopted at Stockholm in 1972, one of the principles of the Community's environmental policy is to ensure that activities carried out in one state do not cause any degradation of the environment in another,
- having regard to the estimated annual increase by 6-7% in emissions of nitrogen oxides ($NO_x$),
- having regard to the estimated annual increase by 5-6% in emissions of hydrocarbons (CH),
- whereas these emissions are caused largely by motor traffic,
- whereas nitrogen oxides and hydrocarbons, which are themselves air pollutants, react under certain weather conditions and in sunlight giving rise to the formation of toxic oxidants such as ozone, PAN, PPN, $PB_2N$, etc.,
- whereas these oxidants:

(a) have very harmful effects on man and animals ranging from irritation of the eyes and mucus membranes to permanent loss of pulmonary function and lower resistance to infectious diseases,
(b) diminish growth and yield and cause leaf injury in plants,
(c) cause paints to fade, fibres to lose their elasticity and rubber to crack,

- whereas these photochemical reactions occur more or less simultaneously throughout Europe,

- whereas the US operates at present a standard for ozone concentrations of 80 ppb, the WHO one of 60 and Japan one of 20 ppb, and whereas in European cities hourly ozone concentrations of 150-200 ppb have been measured,
- having regard to the report by the Committee on the Environment, Public Health and Consumer Protection (Doc. 1-636/81),

1. Concludes that photochemical air pollution has serious and transfrontier effects on the environment which must be actively combated, in particular at European level;

2. Requests the Commission to set limit levels for $NO_x$, CH and oxidants and to embody these in a Community directive and, should this not be possible in the near future, to continue with its research and to keep the European Parliament regularly informed of progress made;

3. Requests the Commission to draw up an order of priority for the most effective methods of combating photochemical air pollution and to instruct the Member States to take account of local circumstances and the different reactions of the various compounds involved;

4. Requests the Commission, in the light of the most recent information on air pollution, to strengthen the relevant directives on air pollution, in particular the directive on measures against air pollution by exhaust fumes from certain motor vehicles;

5. Instructs its President to forward this resolution and the relevant report to the Council and the Commission.

B

EXPLANATORY STATEMENT

I. INTRODUCTION

1. A petition has been submitted on behalf of the ecological movement 'Anders Denken! Anders Doen!' in which attention is drawn to the need to combat photochemical air pollution (Petition No. 17/79).

2. The petition looks in detail at this particular type of trans-frontier pollution, which can have serious consequences for the population and the quality of the environment, even beyond the areas where the pollution is actually produced.

3. It also draws attention to the need for an EC directive and points out that, because trans-frontier pollution is concerned, the individual Member States are not in a position to take adequate measures individually, since unilateral action would have little effect. Similarly unilateral initiatives are not be expected because they would inevitably lead, in a common market, to distortion of competition.

4. The movement bases its petition on one of the principal objectives of the Treaty of Rome, namely the constant improvement of living conditions. It calls firstly for the implementation of the EC directive relating to vehicle exhaust fumes and secondly for the drawing up of a harmonization directive on the release of hydrocarbons and nitrogen oxides into the atmosphere by industry.

5. Before dealing with these two issues, however, we shall first say something about the alarming increase in this type of air pollution. We shall go on to discuss the processes of natural and non-natural ozone formation, the latter requiring the presence of nitrogen oxides ($NO_x$) and hydrocarbons (CH). We conclude the discussion of the chemical aspects with a look at these two compounds and their origins. We shall then draw attention to the seriousness of the present situation in Europe and provide supporting data. The effects of photochemical air pollution on man in particular, but also on animal life, vegetation and materials are examined. The final section considers a number of policy measures and deals with the two specific requests by the ecological movement 'Anders Denken! Anders Doen!'.

## II. PHOTOCHEMICAL AIR POLLUTION

6. Air pollution is not a new problem. For most European countries in the years 1950-1965 sulphur dioxide ($SO_2$), soot and suspended particles posed the main pollution problems. Under certain conditions, $SO_2$ can be rapidly converted into sulphuric acid and sulphates. This type of pollution still produces serious transfrontier effects, such as the acidification of surface waters in the Scandinavian countries, for instance. Attempts are being made - through government legislation, the use of cleaner fuels and the application of cleaner abatement techniques - to limit the scale of this problem. One such measure within the EEC is the directive on air quality standards for sulphur dioxides and suspended particles. Work is also in progress on the broader issues in the context of the convention on long-range transboundary air pollution, which the Community is expected to ratify in the near future.

7. The growing industrialization and the rapid increase in the number of cars has led to new emissions, consisting largely of toxic compounds such as nitrogen oxides ($NO_x$) and hydrocarbons (CH). These substances are known as primary air pollutants or precursors. Precursors may react under the influence of sunlight to form secondary air pollutants, which are responsible for photochemical air pollution.

8. Photochemical air pollution was first observed in 1944 in the area around Los Angeles in the United States, where it caused damage to vegetation and reduced visibility. In 1950 the same phenomena occurred in the San Francisco area and in 1952 around New York. This pollution caused eye and lung irritation, damage to lung tissue and discomfort for asthma sufferers in particular. Damage to materials was also observed, namely cracking of rubber and fading of paint. In 1965 photochemical air pollution badly affected the Netherlands horticultural industry and from 1971 onwards, vast numbers of complaints were received from the population living around the mouth of the Rhine. Similar reports have been received since 1970 from Japan, Australia, Germany the UK and Sweden. The Greek Government is currently calling on the Athens population not to use their cars or light fires, because of photochemical pollution which is causing eye irritation, sickness and nausea among the population.

9. Ozone ($O_3$), nitrogen oxides ($NO_x$) and hydrocarbons (CH) are the principal toxic constituents of photochemical air pollution or smog. There is good reason to fear that emissions of $NO_x$ and CH will continue to increase, leading in turn to increased smog formation. An indication of the seriousness of this development is that since 1970 $NO_x$ emissions have increased by 6-7% and CH emmissions by 5-6% annually. The outlook for the future is

even bleaker. The increase in the number of cars in the Netherlands alone over the next 10 years is likely to raise CH emissions by 70-90% and $NO_x$ emmissions by 170-220%. The large-scale burning of coal is another cause of smog formation.

10. It is not being over-pessimistic to conclude that photochemical air pollution is going to be an increasingly serious problem in the years to come, and one to which we shall have to devote a great deal of attention.

The most common method of evaluating the seriousness and scale of smog formation is to measure the ozone concentration. The natural process of ozone formation, however, only accounts for observed ozone concentration up to a certain level; concentrations above this level are invariably the result of human activity.

## III. NATURAL OZONE FORMATION

11. The threat which photochemical air pollution represents to man, animals, vegetation and materials lies in the combined presence of ozone ($O_3$), $NO_x$ and hydrocarbons. Because of their specific properties these compounds are also known as oxidants, and the most important toxic oxidant is ozone.

12. Ozone is formed naturally in the earth's atmosphere. The photochemistry of the different zones of the atmosphere varies significantly. In the uppermost zone, the stratosphere (from 11 to 47 km altitude), there is extensive high-energy radiation with short wavelengths (up to 200 nanometers (nm)). In the lower zone, the troposphere (up to 11 km altitude), low-energy radiation is found (with wavelengths greater than 290 nm).

13. The high-energy radiation in the stratosphere can dissociate oxygen ($O_2$) into two separate oxygen atoms (O). This oxygen atom (O) combines with oxygen ($O_2$) in a balanced reaction to form ozone ($O_3$). The stratosphere contains little $O_2$ for the reaction, while at lower altitudes high-energy radiation diminishes. There is a maximum ozone concentration between these two levels, at 23 km altitude. (The presence of the ozone layer prevents the hazardous ultraviolet radiation from the sun reaching the earth's surface.) These high ozone concentrations are diffused in all directions, including into the troposphere. This zone is characterized by strong vertical air currents and is a zone of well-mixed air with a natural ozone concentration of 20 - 30 ppb (parts per billion). Higher concentrations, therefore, are not of natural origin.

## IV. NON-NATURAL OZONE FORMATION

14. Ozone concentrations of 150-200 ppb and more are measured in Europe. These high concentrations can occur in the lower levels of the polluted atmosphere and are generally not of natural origin. Forest fires, fossil fuel deposits, biodegradation mechanisms and the like, which are responsible for naturally occurring ozone, ultimately account for a very marginal proportion of ozone compared with the concentrations which form atmospherically. Hence, man and man alone is responsible for these high concentrations, and it is man's activity that has resulted in a heavily polluted atmosphere.

15. Nitrogen oxide is the main radiation-absorbing compound in this polluted atmosphere. Lower-energy UV radiation (from 300 to 400 nm) splits nitrogen dioxide ($NO_2$) into nitric oxide (NO) and an atom of oxygen (O). The latter combines with oxygen ($O_2$) to form ozone ($O_3$). Thus, equilibrium is established by $NO_2 + O_2 \xrightleftharpoons{uv} NO+O_3$. However, this process accounts for only a limited increase in the natural background concentration of ozone.

16. In fact, this concentration is increased by the following factors:

(a) A complex reaction mechanism involving hydrocarbons. Hydrocarbons (CH) react with oxygen ($O_2$) to form peroxyl radicals CH-OO, which in turn combine with nitric oxide (NO) to form CH-O and $NO_2$. The formation of $NO_2$ displaces the balance from its original point towards a higher ozone concentration.

This effect is accentuated by CH-O combining with CH and $O_2$ to form CH-OO and CH-O. The new CH-OO combines in turn with NO to give CH-O and $NO_2$. This process continues until all the NO is used up. Then peroxyacetyl nitrate (PAN) is formed by the following process: $CH\text{-}OO + NO_2 \rightarrow CH\text{-}OO\text{-}NO_2$. In addition to this highly toxic and not naturally occurring compound, other similar hydrocarbons, such as peroxypropionylnitrate (PPN), peroxybutynylnitrate (PBN) and peroxybenzonylnitrate ($PB_2N$) are also formed.

(b) During the day, the lower layers of the atmosphere are heated and an exchange with the upper layers takes place; in the process this air mixes with the higher ozone concentrations in the upper atmosphere. This phenomenon can also be caused by high wind velocities.

(c) Light intensity: between March and October there is enough light intensity for about 30% of the day to fuel the photochemical process. The gradual build-up of ozone begins between 6 and 9 a.m. and reaches a peak between 2 and 6 p.m.

(d) The presence of carbon monoxide (CO) and sulphur dioxide ($SO_2$) causes a shift in the overall reaction mechanism and a resultant increase in ozone.

17. Ozone concentrations are therefore time-related (a function of light intensity). In view of the rapidity with which the effects caused by ozone and other oxidants occur, concentrations must be measured at frequent intervals. Hourly readings appear to give an accurate picture of the seriousness of the situation.

18. $NO_x$ and hydrocarbons appear as precursors in ozone formation. These two compounds warrant our attention not only for this reason, but also because they are sources of air pollution in themselves - another reason to recommend a reduction in the emission of these substances. We shall confine out comments for the moment, however, to their role as precursors.

## V. NITROGEN OXIDES ($NO_x$)

19. The natural background concentration of $NO_x$ is formed biologically in the soil, but this accounts only for concentrations up to 5 ppb. The non-natural emissions of $NO_x$ are as follows:

Total $NO_x$ emissions in the Netherlands in 1974:

| | | |
|---|---|---|
| Agriculture and horticulture | 9,000 tonnes/year | 2.6% |
| Households/commerce | 36,000 tonnes/year | 10.3% |
| Public utilities | 61,000 tonnes/year | 17.5% |
| Industry | 117,000 tonnes/year | 33.7% |
| Transport | 125,000 tonnes/year | 35.9% |

Expressed in this way the figures understate the damaging effects, firstly because these are annual averages for the country as a whole and secondly because interactions between individual substances which intensify the photochemical processes (synergism) are not included. Synergism is what produces the extremely toxic compounds, such as PAN.

20. The daily pattern of $NO_x$ concentration in towns is determined primarily by traffic density (which accounts for 36% of total emission). Generally speaking one should distinguish between three processes:

(a) In the morning the large amounts of sunlight trigger the process of photochemical smog formation. The peak-traffic period from 6 to 9 a.m. produces heavy NO emission, which is converted photochemically into $NO_2$. This $NO_2$ causes the balance to shift (see point 15) resulting in an increase of the ozone concentration.

(b) In the middle of the day there is a fall-off in photochemical activity. The peak traffic period from 5 to 8 p.m. again produces NO, which reacts with the $O_3$ formed in the meantime to produce a high $NO_2$ concentration.

(c) During the day CO and $SO_2$ concentrations also increase, indirectly raising the $O_3$ concentration.

VI. HYDROCARBONS (CH)

21. There is a fixed background concentration of hydrocarbons which are produced primarily by biodegradation. This concentration varies between 6 and 10 ppb. Traffic accounts for the major proportion of hydrocarbons produced by human activity.

Total CH emission in the Netherlands for 1974:

| | | |
|---|---|---|
| Traffic | 225,000 tonnes/year | 45% |
| Industry | 175,000 tonnes/year | 35% |
| Other sources | 100,000 tonnes/year | 20% |

Vehicle emissions are caused both by exhaust gases and evaporation, the latter occurring during the filling of petrol tanks and accounting for 15% or more of total emissions. Other important hydrocarbon sources are leaks in natural gas pipelines, petrochemical industries and incomplete combustion of fossil fuels. (A reduction of these emissions is also to be recommended from the point of view of the efficient use of energy).

22. Of themselves, hydrocarbons at present concentrations (with few exceptions) are not toxic and cause no physiological damage. Some, however, cause disagreeable odours which is a psychic irritant and, like noise, detrimental to the general welfare.

VII. EFFECTS OF PHOTOCHEMICAL AIR POLLUTION

23. The products of photochemical air pollution can have a detrimental and harmful effect on humans, animals, plants and materials. Ozone often takes the blame for these effects, but this is incorrect, because:

(a) most complaints are received between 10 a.m. and noon, whereas the maximum ozone concentration occurs between 3 and 5 p.m.;

(b) ozone concentrations in areas where many complaints are recorded are often lower than in the surrounding areas.

The damaging effects of photochemical air pollution are caused by a variety of compounds. While ozone is one of the most toxic of these compounds its main interest is that it serves as an indicator for a complex set of reactions. The pattern of ozone concentration provides a quantitative and qualitative picture of smog formation, although actual concentrations are not necessarily identical at any given time.

24. In order to give an idea of the seriousness of the situation, we list below the maximum concentrations of ozone (and in some cases of all oxidants) for a number of European cities:

| | | |
|---|---|---|
| <u>Netherlands</u> | | |
| Delft | 1971 | 180 ppb |
| Delft | 1969-1972 | 250 ppb |
| Delft | 1973 | 190 ppb |
| Delft | 1973-1974 | 170 ppb |
| Eindhoven | 1973-1974 | 220 ppb |
| Delft | 1974 | 150 ppb |
| Eindhoven | 1974 | 210 ppb |
| Delft | 1975 | 150 ppb |
| Eindhoven | 1975 | 160 ppb |
| Delft | 1976 | 200 ppb |
| <u>United Kingdom</u> | | |
| London | 1973 | 140 ppb |
| London | 1973-1974 | 180 ppb |
| Harwell | 1973-1974 | 140 ppb |
| London | 1974 | 147 ppb |
| London | 1975 | 150 ppb |
| <u>Germany</u> | | |
| Frankfurt | 1973-1974 | 170 ppb |
| Bonn | 1974 | 145 ppb |
| Frankfurt | 1975 | 130 ppb |
| Bonn | 1975 | 160 ppb |
| <u>Italy</u> | | |
| Rome | 1973 | 170 ppb |
| Rome | 1974 | 130 ppb |
| Rome | 1975 | 200 ppb |
| <u>France</u> | | |
| Nice | 1974 | 170 ppb |
| Nice | 1975 | 200 ppb |
| <u>Sweden</u> | | |
| Gothenburg | 1973 | 80 ppb |
| Gothenburg | 1974 | 80 ppb |
| Rörvin | 1975 | 140 ppb |

25. Ozone is highly toxic and its toxicity increases at higher temperatures and with increased physical exertion. Ozone has a greater effect on young people. Its effects are limited initially to irritation of the eyes and the mucous membranes of the respiratory passages.

26. The lungs in particular are extremely susceptible to attack by ozone, which makes them more vulnerable to respiratory infections. Changes also occur in the biochemical properties of the pulmonary membranes. The structural elements of lung tissue may lose their elasticity. The effects of ozone on the lung are not limited to the surface but may also initiate an irreversible process deeper in the lung tissue. This causes a change in the elastic structure of the lung, making it more rigid. There may also be a reduction in the respiratory surface (emphysema).

27. Many other, less well-documented effects in various organs and systems are caused by ozone, including the phenomenon of accelerated ageing. The presence of metabolites in the body can also be attributed to ozone and other oxidants. Metabolites generally occur as a warning reaction in cases of stress.

28. All these effects can be observed in healthy human beings; in less healthy and sick people the effects may be even more severe. Ozone does not appear to cause long-term medical conditions although there are indications that it may cause chronic bronchitis.

29. If we try to draw up a graduated scale of effects we obtain the following picture:

a. 50 - 100 ppb ozone: From the pattern of complaints there appears to be a lower threshhold value at which eye irritation and similar symptoms occur; this pattern becomes more pronounced above 100 ppb;

b. 80 ppb ozone: At this concentration the number of macrophages (cells which defend the body against bacterial infection) decrease both in number and in activity, which increases the risk of infection;

c. 100 ppb ozone: On days when the concentrations are of short duration the number of asthmatic attacks increases;

d. 100-200 ppb ozone: Functional disorders are observed in the performance of healthy cross-country runners, in the form of irritation of the mucous membranes and reduced permeability of the alveoli. The ability to inhale oxygen is also impaired;

e. 200-250 ppb ozone: After 30 to 60 minutes' exposure, ozone in the bloodstream appears to cause rapid ageing of the red blood corpuscles and structural changes in the heart muscle tissue;

f. 500 ppb ozone: Structural changes occur in the vital capacity after 10 weeks' exposure;

g. 600-800 ppb ozone: After 2 hours' exposure, chest pains, and irritation of the respiratory passages occur, the vital capacity of the lungs is reduced by between 12 and 44%, with an average reduction of 25%;

h. 1,000 ppb ozone: Exposure leads to chronic infections (bronchitis, bronchiolitis) and loss of respiratory tissue (emphysema, fibrosis); it also increases the incidence of lung tumours and speeds up the ageing process.

30. Similar effects are of course observed in animals. At 100-500 ppb of ozone, the fertility of mice is reduced by half, and at 300-1350 ppb of ozone their breathing frequency increases by 25 to 65% and the volume of air breathed is reduced by 30 to 40% - an effect akin to hyperventilation.

31. The influence of nitrogen oxides should not be underestimated. Their effects range from a loss of pulmonary function and an increase in the mortality rate (from 100 ppb $NO_x$) to a loss of structural elasticity in lung tissue (at 250 ppb $NO_x$), attacks on bacteriophages (500 ppb), lung infections (500 ppb) and the denaturing of lung lining and tissue (at 1,000 ppb $NO_x$).

32. In Delft (Netherlands) concentrations of 15 ppb of PAN, PPN and $PB_2N$ have been measured. As already stated, there are no known natural sources of PAN. Here again physical performance is impaired, probably as a result of increased difficulty in breathing.

33. Photochemical air pollution also affects living patterns. For instance, 18% of the population of California and 65% of the inhabitants of Los Angeles are affected by air pollution. One-third of the doctors there have considered moving to another area because of air pollution, and two-thirds have given this advice to their patients, who, in 25% of cases have followed it. One-fifth of all persons moving out of polluted areas gave air pollution as one of the reasons, and 4% as the only reason for the move.

34. Ozone and PAN are particularly harmful to vegetation. In Southern California, damage to 18 agricultural crops has been put at more than $18,000 million. In Europe, too, these effects have been observed in the form of diminished growth and crop yields, and also leaf injury. These effects are compounded by the presence of $NO_2$ and ethane (synergy). There is a direct correlation between the reaction of certain plants (e.g. potatoes, tomatoes, grass, tobacco, petunias, etc.) and this type of air pollution, so they may be used as indicators.

35. It will now have become clear that the economy is also affected by photochemical air pollution. Studies have shown that a minimum of 0.74-1.48% of GNP is lost every year in the form of damage caused by air pollution: some 10% of this loss is due to photochemical smog. Ozone in particular, which is a powerful oxidizing agent, attacks all types of organic materials, causing cracking in natural and synthetic rubber (car tyres); it attacks cotton and synthetic fibres and plastics, causing paint to fade and elastic materials to lose their elasticity. In addition to the human suffering and discomfort caused, the effect on the economy is a further reason to take effective action to combat photochemical smog formation.

## VIII. POLICY

36. The atmosphere is a mixture of substances, and it is the balance between these substances which makes life on earth possible. An increase in the concentration of any one substance puts life at risk. Any policy on the environment in general, and on air pollution in particular, should be based on the principle that no sources of pollution should be sited in relatively clean areas and that emissions in already polluted areas are reduced. This is of particular importance in combating photochemical air pollution. Since the sources of precursors are now relatively concentrated, it is possible for smog to form simultaneously over large areas, and therefore simply dispersing the sources offers no solution.

37. In 'favourable' circumstances smog can be formed over more than 1,000 kilometres in Western Europe and even extend into Eastern Europe. Precursors have a relatively long life-span (because degradation is slower over less polluted areas); they can travel 100 kilometres in a day and are characterized by continuous ozone plumes of 250 km in length.

38. It will have become clear that national frontiers are no barrier to this process. For instance, 90 tonnes of $NO_x$ per hour come into the Netherlands from the direction of Antwerp and 80-150 tonnes $NO_x$ per hour from the Ruhr. Polluted air can also be converted into smog over the sea and blown back inland by the wind.

39. The foregoing demonstrates the need for measures at local, regional and national level to counteract emissions with relatively high concentrations; but the only effective policy is one pursued at European level.

40. Because of the complex reactions between precursors, meteorological circumstances and oxidants, a reduction in the concentration of a particular precursor will not necessarily mean less smog. The decision on whether to reduce CH or $NO_x$ or both depends on the specific relationships between them. In areas with a high $CH/NO_x$ ratio (e.g. 9:1) a reduction in $NO_x$ would be worthwhile, whereas when the ratio is low (e.g. 6:1) a reduction in CH is preferable. Although reducing both does lower the absolute photochemical potential, this gain is relatively insignificant. Generally speaking, lowering $NO_x$ appears to be the most effective course of action for the European situation.

| Ozone concentration as % of the permissible standard e.g. 80/ppb ozone | % ozone reduction anticipated from a 50% reduction in CH emission | % ozone reduction from a 50% reduction in $NO_x$ emission | % ozone reduction from a 50% reduction in $CH+NO_x$ emission |
|---|---|---|---|
| 50% ozone | -22% | -44% | -44% |
| 90% ozone | -13% | -19% | -31% |

41. In attempting to lower hydrocarbon levels, attention should be focussed first of all on the most reactive compounds. An order of priority can be drawn up for the various groups of CH compounds in the context of a multi-annual programme.

42. The standard set by the WHO is 60 ppb ozone, which may be exceeded only once per year. The United States sets a limit of 80 ppb ozone with a maximum hourly average of 130 ppb. In Japan, the standard is extremely strict - only 20 ppb. <u>At the present moment, Europe has no standard in this area</u>, although some Member States have recommended levels. Germany, for instance, has general guidelines and the Netherlands has a recommended level with hourly, daily and yearly maxima. It is extremely important that an early start be made on establishing a European standard.

43. As stated in points 20 and 21, traffic is the biggest source of precursors. The average speed of vehicles, which appears to increase as a function of the distance to be travelled, determines the CH emission and acceleration determines the $NO_x$ emission, which can be lowered by 70-90% by travelling at constant speed. It is possible, through a properly conceived urban traffic policy, with improved traffic flows, to cut CH emissions by 48% and $NO_x$ emissions by 66%.

The effect of these measures is negated, however, if there is no consistent policy for the improvement of public transport by road, rail and water. Unless such a policy is adopted the next 10 years will see an increase (in the Netherlands) of 70-90% in CH emissions and 170-220% in $NO_x$ emissions, compared to the period 1970-1980.

44. This suggests a number of practical measures which can be taken to limit photochemical air pollution:

(a) setting limit levels for CH, $NO_x$ and ozone to be laid down in an EEC directive;

(b) drawing up an order of priority for the most effective methods of dealing with photochemical smog formation. This programme should be based on local and regional circumstances and take into account the different reactions of the various precursors;

(c) encouraging improved traffic flows in town centres and public transport in and between town centres.

45. Returning to the petition by the ecological movement 'Anders Denken! Anders Doen!' we can agree with the following points:

(a) The ecological movement rightly believes photochemical air pollution to be a serious transfrontier problem. Sharing their concern on this increasingly serious issue, we advocate the adoption of energetic measures as set out in point 44.

(b) The implementation of the 1977 EEC directive relating to the close connection between the exhaust fumes of motor vehicles and the formation of photochemical smog. Japan has set very low emission limits for new automobiles forthe domestic market. A similar measure is needed for the European market. In this context, account should be taken of the problem of gas emission when filling petrol tanks (see point 21).

(c) The drawing up of a harmonization directive on emissions of CH and $NO_x$ by industry is also desirable, but should not stop at limiting industrial emissions. An effective approach must give preference to the framing of a generally applicable directive, covering ozone, CH and $NO_x$ concentrations, coupled with a workable programme based on the priorities set out in point 44.

ANNEX

Petition No 17/79

submitted by Mr P.L.Th. A. MARECHAL

on behalf of the ecological movement 'Anders Denken! Anders Doen!

Subject: Combating photo-chemical pollution

'Nowhere is the vulnerability and interdependence of the entire biosphere more evident than in the atmosphere, which is being increasingly encroached upon by mankind's industrial activities' to quote BARBARA WARD and RENE DUBOS in ONLY ONE EARTH, written at the request of the Secretary-General of the United Nations Conference on the Human Environment (Stockholm 1972).

Having regard to the foregoing introduction and the facts set out below, i.e. that:

A. the World Health Organization (WHO) recommends a quality standard of 0.06 parts OZONE p.m. (per million);

B. United States law stipulates a maximum hourly average of 0.08 parts OZONE p.m.;

C. no harmonization directive exists on this matter in the EEC;

Considering that:

1. photochemical pollution is harmful to human health and to the quality of the environment;

2. the level recorded over Eindhoven (Netherlands) on 3 June 1979 was certainly 50% higher than the American limit and also exceeded this limit on at least 24 subsequent days (up until the date of this petition);

3. the photo-chemical smog over Eindhoven is caused partly by the industries of the Ruhr (FRG) and of the Antwerp port area (Belgium);

4. action taken by local and regional authorities to combat photochemical smog has therefore proved very ineffective and is consequently accorded low 'credibility' by the population;

Invoking one of the main objectives of the Treaty of Rome, i.e. the constant improvement of living conditions; the undersigned ecological movement 'Anders Denken! Anders Doen! calls for

1. the implementation at an early date of the 1977 EC directive relating to the close connection between the exhaust fumes of motor vehicles and the formation of this chemical fog;

2. a harmonization directive to be drawn up concerning the discharge into the atmosphere by industries of hydrocarbons and nitrogen oxide, likewise because of the close connection with chemical fog formation.

We believe these demands to be justified on the following grounds:

a. trans-frontier pollution is here concerned, which has serious consequences for the population and the quality of the environment beyond the areas where the smog particles are actually produced;

b. there is a clear need for an EC directive because, partly for the reasons set out above, individual measures by the Member States would have little effect and measures taken unilaterally in a common market would inevitably result in distortion of competition, for which reason Member States are not expected to take individual initiatives.

In anticipation of the decisions you may take, we remain,

Yours faithfully,

Strasbourg, 24 October 1979

On behalf of the ecological movement,
'Anders Denken! Anders Doen!'
P.L.Th.A. MARECHAL, Chairman
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