

AIR POLLUTION IN CORK

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Environmental awareness has increased in recent years within Ireland. One of the most contentious issues involved in this growing concern is that of urban air quality. This topic will be considered in relation to Dublin and Cork city, particularly the latter which has received very little publicity in relation to this problem. An assessment of the situation in Cork will be attempted within a discussion and the factors contributing to its urban air quality. The similarities and differences between the two cities will be examined to discover if Cork can avoid the air pollution levels which presently exist in Dublin.

In the late 1970s, environmental deterioration emerged as a political issue more or less simultaneously in several industrialised countries. Consequently many countries introduced environmental protection agencies and policies. International organisations concerned with the problem of environmental pollution such as the World Health organisation undertook valuable independent assessments of diverse research studies. Many of the short and long term goals published by these organisations are readily adopted as national goals by many countries. In Ireland, we are governed by the European Community's directives on pollution control.

Most relevant to Ireland, and in particular Dublin at the present time, is the European Community air-quality standards. During the 1970s, the EC became convinced that there was sufficient medical evidence to justify proposing health protection air-quality standards or "limit values" for various pollutants. In July 1980, the EC issued a Directive (80/779/EEC setting out the maximum concentration of smoke and sulphur dioxide permitted in urban areas. Member states were given until 1983 to comply with air quality standards with the tactics for implementing the standards being left to the individual states. The EC requires Member States to set up an adequate network of air pollution monitoring stations, to supply information and to ensure compliance with the air quality standards. In Ireland, it is on the basis of these monitoring stations that the air quality in our urban areas is assessed. The data collected clearly indicates that while our cities are not severely polluted, we continue to breach the EC regulations.

There are many different views as to what constitutes pollution of the atmosphere. One such opinion considers air pollution in terms of the increase or even decrease of any atmospheric constituent from the value that would have existed without human activity. However, natural processes such

as volcanic eruptions and forest fires must be included, therefore a useful definition of air pollution is "the presence of substances in the ambient atmosphere, resulting from the activity of man or from natural processes causing adverse effects to man and the environment" (Weber 1982). Until well into this century, air pollution was for most people synonymous with suspended particulate matter and sulphur dioxide. These are waste products produced mainly by domestic heating equipment, a wide range of industrial plants and power plants. As the 20th century has progressed, concern over the pollution of the atmosphere has ranged across a large number of pollutants such as carbon monoxide, hydrocarbon and lead. In Ireland, the problems caused by smoke and sulphur dioxide in our urban areas have gained precedence over other pollutants such as acid rain, lead, toxic chemicals and ionising radiation. Smoke in urban areas is generally caused by the incomplete combustion of hydrocarbon fuels in domestic heating.

In Ireland there is a heavy dependence on solid fuel as a method of domestic heating, heightened by the traditional equation of a warm home with a real coal fire. In 1983, Warren Spring Laboratories undertook a consultancy study for Dublin Corporation which included air pollution modelling. It states that smoky fuels in domestic fires was the main source of air pollution. The consultants also predicted that more than half of the monitoring sites in the city would break the EEC Directive smoke limit values by 1990/91. In the EC air quality directive the daily limit value is 250 micrograms per cubic metre of air. Levels above this can impair the health of individuals. This value must not be exceeded for more than three consecutive days.

While this prediction proved accurate enough, the emphasis of this report differed from Michael Bailey's explanation of the problem being that "the present pattern of air quality in Dublin is dependent primarily on meteorological conditions rather than emission trends" (Bailey, 1985). This argument is illustrated by a Dublin pollution episode during January of 1982; very high smoke levels (in excess of $1000 \mu\text{g}/\text{m}^3$) were observed at several sites between the 11th and the 15th of January. The daily average smoke level for the whole network from January 11th to 14th, was in excess of $300 \text{g}/\text{m}^3$. The reasons for this concentration of smoke were, according to him, caused by an intense ground-based inversion and low temperatures (minimum daily average -3.2°C). The term 'smog' is often used to describe such a situation. It refers to a synthesis of smoke and fog during certain periods when meteorological conditions fail to disperse the pollutant. A polluted fog 'is less readily evaporated by solar radiation than a 'clean fog', so the duration of the smog/pollution episode may be prolonged.

The fact that Dublin now has an air quality problem is well documented but to what extent does Cork City compare? National media attention has focused largely on Dublin with Cork only making local headlines. Cork Corporation has six monitoring stations situated throughout the city. In an article published by the 'Evening Echo' in 1989, the Assistant City Manager, Matt O'Connor stated that "the stations have never once recorded a breach of EC standards since those standards were given legal status by the Government in the 1987 Air Pollution Act". Earlier in the same year in the 'Evening Echo' of January 31st, Mr. Brian Bermingham stated that "Air pollution levels in Blackpool had exceeded EC limits in the past and it would be an ideal location for a pilot 'smoke free zone' project. He warned that parts of Dublin were recently declared 'smoke free' because of lack of foresight and that Cork Corporation should not follow that same road. Contrary to this claim, in the same article, the Acting Assistant City Manager, Michael Moloney, stated that "given the results of air pollution monitoring for the November/December period, the declaration of Blackpool as a 'Smoke Free Zone' was not warranted and would result in unnecessary expenditure for city residents. These contradictory opinions make quite clear the misleading nature of media reports. The Cork Corporation monitoring stations have in fact breached the EC directive on daily limit values for smoke as recently as January 1989. At that time four of the six stations exceeded the EC limit of $250 \mu\text{g}/\text{m}^3$ for smoke, three of the four on the same day. On January 18th, $263 \mu\text{g}/\text{m}^3$ of smoke was recorded at Blackpool Fire Station, $363 \mu\text{g}/\text{m}^3$ at Spangle Hill and $260 \text{mg}/\text{m}^3$ at Mahon House. On January 17th, Princes Street Market recorded $290 \mu\text{g}/\text{m}^3$ of smoke. The previous month's data also indicates a breach of EC limits at five of the six monitors. On none of these occasions did the pollution episode last for three consecutive days; but in November 1988, the EC limit was breached for three days at Blackpool Fire Station with $270 \mu\text{g}/\text{m}^3$, $430 \mu\text{g}/\text{m}^3$ and $310 \mu\text{g}/\text{m}^3$ being recorded on the 22nd, 23rd and 24th of the month respectively. Thus, the situation can be seen to be far worse than the Local Authorities claim it to be. Of more concern is the fact that the Corporation's monitoring results are averaged figures over 24 hours and do not measure or represent the really chronic situation pertaining between 5.p.m. and 10 p.m. when virtually all the coal fires are lighting.

Blackpool is an area of social concern both because of the nature of its housing, its residents and its topographical situation. It is an area of high density housing, some of which is over 100 years old. The residents are predominantly working class and there is a higher proportion of well established families and middle-aged than would be found in the newer, more

spacious suburbs. These facts mean that peoples resistance to pollution is lowered because of age, degree of exposure as well as an unwillingness or inability to switch to smokeless fuels. The pollution episodes in the Blackpool area are intensified by the fact that it is in a valley with steep sides, both of which have even more high density housing. When temperature inversion of winter anticyclones forming a 'lid' over the valley occur, large quantities of pollutants are emitted. Country breezes are strengthened by the Ratabatic winds from the surrounding hills containing cold air to flow downhill bringing cleaner air to the outskirts of the city and trapping the pollutants in the valley. This adds to the 'heat island' effect where the centre of the city is often a few degrees warmer than the outskirts. An analysis of temperatures between Cork City northside suburb of Farranree and the centre of Blackpool on the 2nd, 8th, 19th and 23rd of November, 1989 clearly illustrates this. Temperatures on these occasions experienced an increase of up to 1°C on three of the four occasions. The samples were taken between 8.p.m. and 9 p.m., a time when most heating appliances are in operation. The degree of intensity of change in temperature is influenced by the wind speed, cloud cover and altitude. The 8th of November was a particularly calm night with virtually no cloud cover. The heat island reached its peak at 8°C in Thomas Davis Street in the heart of Blackpool while temperatures dropped to 4°C in the northside on Upper Fair Hill. The Cork Corporation air pollution data for this night shows the smoke levels at the nearby Spangle Hill site to be the second highest for that month, reaching 109 µg/m³.

While Dublin City has been the subject of much research on the environmental front. Given the above figures, it seems clear that Cork is suffering from an air quality problem. The causes of smoke and sulphur dioxide pollution are well known but the adverse effects on city dwellers depends on a wide range of factors. The health effects of pollutants cover a wide spectrum of biological response. In both epidemiological and toxicological studies, the health responses of the sampled population depend upon the sensitivity of the individuals forming that population such as age, sex, general state of health and nutrition, concurrent exposure, pre-existing diseases, temperature and humidity and the level of activity at the time of exposure. It should also be remembered that urban populations spend proportionately more of their time inside buildings and vehicles than out of doors. Even in their homes, people are subject to a wide variety of pollutants such as carbon monoxide, oxides of nitrogen and suspended particulates released from cigarettes and maladjusted heating and cooking appliances and formaldehyde released from foam and plastics.

The presence of smoke and SO₂ in the urban atmosphere have differing effects on individuals at varying levels of concentration. An annual daily average of 80mg/m³ has no ill-effect on the body, while an annual daily average of 100 µg/m³ causes annoyance and slight ailments. A 250 µg/m³ daily average causes respiratory symptoms and hospital admissions, while a 500 + µg/m³ daily average causes excess mortality. Given that the annual average in Cork City's Blackpool and Spangle Hill sites was only 30 µg/m³ and 25 µg/m³ respectively in 1987, while in 1988 the same stations recorded annual averages of 43 µg/m³ each. However, there have been incidences of very high pollution above the limit of 250 µg/m³ daily average which may have resulted in hospital admissions such as the 430 µg/m³ recorded in both stations on the 24th November, 1988. Despite this, there have been no major incidences where high pollution levels have caused excess mortality. In Dublin where emissions are considerably higher than the rest of the country, the Medical-Social Research Board in 1968, found death rates were even higher there than those in the rural areas of the Republic. This was particularly true of respiratory disease and of heart attacks. It must be remembered that studies of the health effects of pollutants are faced with enormous problems in attempting to overcome variables such as housing conditions, social class and indoor pollution exposure. Another problem is to ensure that monitored pollution levels are representative of an individual's or a communities exposure levels. For example, the problem still remains in deciding what pollution sampling period one should employ in the analyses.

An article in the 'Irish Times', published in November 1985, identified areas in Dublin which suffered effects of poverty and deprivation, when smoke emission zones were mapped, these two largely corresponded to each other. The inadequate dispersion of smoke from low domestic chimneys also ensures that such areas are particularly subject to their own pollution. The obvious assumption here is that working class areas tend to use more coal since their housing is likely to be uninsulated and they probably are unable to afford conversion to smokeless fuels. Cork City is often referred to as having a north-south division, not just the physical division made by the river Lee. Do power areas of the city correspond to the parts most affected by air pollution? Taking two contrasting sites in the southside, Mahon, which is a newly built, high density, working class area and St. Finbarr's Cemetery monitor which is located in a relatively well established middle class area and comparing with the older northside suburb of Farranree [Spangle Hill monitor] we can see a number of differences in emission trends. Taking the 1986 pollution data figures, there is no stark contrast

between the monthly means of smoke emissions recorded at Mahon and St. Finbarr's Cemetery, but the monthly means are considerably lower than the northside suburbs of Farranree [Spangle Hill]. Taken in order of St. Finbarr's and Spangle Hill, the monthly mean for smoke in December 1986 was $63 \mu\text{g}/\text{m}^3$, $64 \mu\text{g}/\text{m}^3$ and $122 \mu\text{g}/\text{m}^3$. For March, it was $29 \mu\text{g}/\text{m}^3$, $27 \mu\text{g}/\text{m}^3$ and $74 \mu\text{g}/\text{m}^3$, while in April it was $29 \mu\text{g}/\text{m}^3$, $27 \mu\text{g}/\text{m}^3$ and $59 \mu\text{g}/\text{m}^3$ and in May emissions were $14 \mu\text{g}/\text{m}^3$, $10 \mu\text{g}/\text{m}^3$ and $43 \mu\text{g}/\text{m}^3$ respectively. This considerable difference in smoke emissions between the northside and southside of Cork City, while being justified by many in terms of income groupings, other factors such as housing, type, insulation and topography are also important. Mahon in the southside and Spangle Hill in the northside are similar in terms of income groups but the Mahon houses are newer, better insulated, while the influence of a strong sea breeze dispersing pollution concentrations is also a factor to be considered.

Whatever the nature of the pollutant, a sound understanding of both the causes of atmospheric pollution problems and the nature and effects of atmospheric pollutants is needed before appropriate and effective pollution control can be introduced. Straightforward pollution solutions in urban areas such as fuel conversion and house insulation must take into consideration a range of socio-economic factors as well as the attitudes of the individuals involved.

This essay has attempted to assess both the degree of the problem in Cork City as well as the present problem in Dublin, together with the wide range of variables that come to the fore when dealing with and drawing conclusions about atmospheric pollution.

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