



Department of the  
**Environment**  
www.doeni.gov.uk

# Air Pollution in Northern Ireland

## 2007



A report to  
the Northern  
Ireland DoE



# 1 Introduction



This brochure is the sixth in a series of annual reports on air quality in Northern Ireland. Produced by AEA on behalf of the Department of Environment in Northern Ireland, it is intended to provide a summary of air quality monitoring carried out on behalf of Government and by District Councils during 2007.

Section 2 of this report reviews the continuing developments in air quality legislation and policy affecting Northern Ireland. Section 3 summarises the main national air quality monitoring programmes, together with locations of Northern Ireland's monitoring sites. In Section 4, we review long-term trends in air quality, followed by spatial patterns of pollution in Section 5. In Section 6, we take a closer look at levels of one particular group of pollutants: polycyclic aromatic hydrocarbons (PAHs). Finally, for readers wanting to find out more, additional web-based and published sources of information on Northern Ireland's air quality issues are summarised in Section 7.

Air quality in Northern Ireland has shown substantial improvement in recent years. In particular, levels of pollutants associated with coal and oil combustion have declined significantly over the past decade. However, some pollutants in some parts of Northern Ireland continue to exceed air quality objectives. The 2007 review of the Air Quality Strategy reports that current average levels of man-made particulate pollution in the UK are estimated to reduce life expectancy by up to eight months. Continued effort to reduce air pollution is therefore important, together with monitoring to assess progress and to provide sound, science-based input to policy development.

## 2 Legislation and policy



The management of air quality is based on a series of statutory measures and policy programmes originating from Europe, the UK and Northern Ireland. Together, these form the basis of a strong framework for managing air quality in Northern Ireland over the coming years.

### 2.1 The European Union Process

Much of the foundation for managing air quality in Northern Ireland can be traced back to the objectives and provisions contained within a series of Air Quality Directives adopted by all Member States of the European Union. June 2008 saw the adoption of a new European Air Quality Directive (Directive 2008/50/EC) on ambient air quality and cleaner air for Europe. This has:

- ▶ Combined and streamlined several pre-existing Directives and Decisions.
- ▶ Confirmed many of the existing Directives' obligations, but introduced some flexibility in meeting those obligations under some circumstances.
- ▶ Introduced provision for identifying and discounting the contribution to air pollution from natural sources – for example natural wind-blown dusts – when determining compliance with Limit Values.
- ▶ Clarified guidance on where to assess air quality, so that the focus is on areas where members of the public could be exposed.
- ▶ Introduced controls on fine particulate, measured as  $PM_{2.5}$ , in the light of clear scientific evidence that fine particles are hazardous to health.
- ▶ Introduced an "exposure reduction" approach, aimed at improving air quality in areas where the greatest numbers of people are exposed, not just in areas that exceed a Limit Value.

Member States must transpose the new Directive's requirements into their own legislation by June 2010; it comes into force the following year.

## 2.2 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, first published in 1997, establishes a strong framework for tackling air pollution. It was established on the basis of strong scientific evidence and a science-based understanding of the effects of air pollutants on health and the environment.

The Strategy sets objectives for a series of pollutants to be met within the UK. The scientific basis, the objectives set and provisions contained within the Strategy are closely associated with the corresponding standards set within European Air Quality Directives, as described above. However, provisions and corresponding objectives for some pollutants differ from those in the Air Quality Directives; these differences relate to scientific evidence and expert opinion that is specific to the UK situation.

A major revision of the Strategy was published in July 2007. This provides a detailed update of the effectiveness of current provisions and objectives, as well as proposing a series of new regulatory measures and objectives to be adopted. The key outcomes from the Strategy revision are that all current objectives for pollutants will be maintained. Additional objectives for PM<sub>2.5</sub> to protect human health, and for ozone to protect ecosystems, have been adopted. Both of these new objectives are in line with corresponding standards in European Air Quality Directives (Table 1). In addition, a series of policy measures have been considered for adoption following detailed cost-benefit analysis. The full revised Air Quality Strategy and associated technical annexes can be accessed at <http://www.defra.gov.uk/environment/airquality/strategy/index.htm>

The Department of the Environment in Northern Ireland has also now published its own Air Quality Standards Regulations (Northern Ireland) 2007, which came into operation on 28<sup>th</sup> May 2007. Other relevant legislation includes the Sulphur Content of Liquid Fuels Regulations (Northern Ireland) 2007, which came into force on the 31<sup>st</sup> May 2007. This legislation limits the permissible sulphur content of liquid fuel oils such as those used for domestic heating, and thereby helps to reduce emissions of sulphur dioxide.

**Table 1: Objectives to be adopted within the Air Quality Strategy for England, Scotland, Wales and Northern Ireland from 2007.**

Pollutant	Applies	Objective	Measure	Date to be achieved	European obligation	Date to be achieved
Particles (PM <sub>2.5</sub> )  Exposure Reduction	UK-except Scotland	25 µg m <sup>-3</sup>	Annual Mean	2020	Target value 25 µg m <sup>-3</sup>	2010
	UK urban areas	Target of 15% reduction in concentrations at urban background		Between 2010 and 2020	Target of 20% reduction in levels at urban background locations	Between 2010 and 2020
Ozone: vegetation and ecosystems	UK	Target value of 18,000 µg m <sup>-3</sup> based on AOT40 <sup>1</sup> to be calculated from hourly values from May to July	Average over 5 years	1 January 2010	Target value of 18,000 µg m <sup>-3</sup> based on AOT40 <sup>1</sup>	1 January 2010

<sup>1</sup>. AOT40, expressed in ppb.hours, is a measure of accumulated ozone dose exceeding a 40ppb – 80µg m<sup>-3</sup> threshold; it provides a useful measure of the exposure of crops and ecosystems to this pollutant.

## 2.3 Local Air Quality Management

Local Air Quality Management (LAQM) provides the framework within which air quality is managed by District Councils in Northern Ireland. LAQM requires District Councils to review and assess a range of air pollutants against the objectives set out within the Air Quality Strategy, using a range of monitoring, modelling, observations and corresponding analyses. For locations where objectives are not expected to be met by the relevant target date, District Councils are required to:

- ▶ Declare an Air Quality Management Area (AQMA), and
- ▶ Develop an Action Plan to address the problem.

At the time of writing, ten of Northern Ireland's 26 District Councils have Air Quality Management Areas in place. Of these, three declared AQMAs for PM<sub>10</sub> alone, two declared AQMAs for NO<sub>2</sub> and PM<sub>10</sub> together, four declared an AQMA for NO<sub>2</sub> only, and one for SO<sub>2</sub>.

Last year, it was reported that Carrickfergus and Newtownabbey were to revoke AQMAs for PM<sub>10</sub> originally declared after the first round of local air quality management review and assessment; this has now taken place, although Newtownabbey needed to declare three new AQMAs for NO<sub>2</sub> in different locations. Ards has also revoked a previous AQMA for PM<sub>10</sub>. Table 2 shows the locations of these AQMAs, and what pollutants they address.

**Table 2: Current Air Quality Managements Areas in Northern Ireland**

Council	Pollutant	Source	Date Declared	Number of AQMAs
Antrim	SO <sub>2</sub>	Domestic	31/10/04	1
Ballymena	PM <sub>10</sub>	Domestic	1/11/04	2
Ballymoney	PM <sub>10</sub>	Domestic	1/08/05	1
Belfast	NO <sub>2</sub> & PM <sub>10</sub>	Roads & Domestic	31/08/04	4
Derry	NO <sub>2</sub>	Roads	21/02/05	1
Dungannon	NO <sub>2</sub>	Roads	14/01/08	1
Limavady	NO <sub>2</sub>	Roads	01/03/06	1
Newry & Mourne	NO <sub>2</sub> & PM <sub>10</sub>	Roads	11/04/06	5
Newtownabbey	NO <sub>2</sub>	Roads	29/01/08	3
Strabane	PM <sub>10</sub>	Domestic	30/06/04	3

Seven Councils - Antrim, Ballymena, Ballymoney, Belfast, Derry, Limavady and Strabane - have submitted final Air Quality Action Plans to the Department. To date, Newry and Mourne DC has yet to complete its final Action Plan.



**Belfast City Hall in high summer - and a clear, cloudless day!**

# 3 Networks and data



A wide range of air quality monitoring activities is carried out in Northern Ireland. Some monitoring sites are run as part of UK-wide monitoring networks; others are operated by District Councils in order to meet local objectives. The following pollutants were monitored in Northern Ireland during 2007:

- ▶ Carbon Monoxide (CO)
- ▶ Oxides of Nitrogen (NO<sub>x</sub>) and Nitrogen Dioxide (NO<sub>2</sub>)
- ▶ Sulphur Dioxide (SO<sub>2</sub>)
- ▶ Particles (as PM<sub>10</sub> and PM<sub>2.5</sub>, also using the older Black Smoke technique)
- ▶ Ozone
- ▶ Benzene
- ▶ 1,3-Butadiene
- ▶ Polycyclic Aromatic Hydrocarbons (PAHs)

During 2007, there were 38 air quality monitoring stations in Northern Ireland, each equipped with continuous monitoring equipment for some or all of the above pollutants. The locations of the automatic monitoring sites are shown in Figure 1; they provide high-resolution hourly information on a wide range of pollutants. In the case of sites comprising the national network, this can be communicated rapidly to the public, together with warnings when levels approach or exceed the 'high' pollution band. A recently established roadside automatic monitoring site- Belfast Stockman's Lane – is shown in Figure 2.



**Figure 1 Automatic monitoring stations in Northern Ireland**

Northern Ireland's automatic sites are supplemented by a large number of non-automatic monitoring sites, which use less expensive techniques to provide additional information on air quality. The majority of these are diffusion tubes: low cost single-use samplers that absorb the pollutant directly from the air and need no power supply. These measure average concentrations over a specified sampling period (typically one month) instead of instantaneous concentrations, but still provide invaluable data for screening purposes, 'hot-spot' identification, local impact assessment and mapping overall levels of pollution

across the country as a whole. The pollutants measured, site numbers and areas covered are summarised in Table 3.



**Figure 2 Belfast Stockman's Lane automatic monitoring station**

**Table 3 Summary of measurements made for the most important air pollutants**

Pollutant	Major sources	Site numbers	Areas covered
Nitrogen Dioxide (NO <sub>2</sub> )	Road transport and industry	18 (Auto)	Mostly urban
Ozone (O <sub>3</sub> )	Sunlight and heat, acting on road transport and industrial emissions	3 (Auto)	Urban & rural
Particles (PM <sub>10</sub> , 2.5)	Road transport, industry, construction, soil and natural sources	29 (Auto) 3 (Non-auto: black smoke)	Mostly urban and industrial
Sulphur dioxide (SO <sub>2</sub> )	Industry and fuel combustion	17 (Auto)	Mostly urban
Carbon Monoxide	Road transport	2 (Auto)	Urban
Benzene	Road transport, industry	2 pumped tubes	Urban
Polycyclic Aromatic Hydrocarbons (PAHs)	Domestic fuels, industry, transport,	3 PAH	Urban, residential
Acid Deposition	Fuel burning, agricultural and other emissions	2 (Non-auto)	Rural

Northern Ireland's first PM<sub>2.5</sub> monitoring site became operational in October 2006, when Belfast Centre began monitoring PM<sub>2.5</sub> particulate matter in addition to the PM<sub>10</sub> fraction. 2007 is therefore the first full year of PM<sub>2.5</sub> monitoring in Northern Ireland.

### 3.1 Automatic Monitoring - key results for 2007

Here we summarise some of the results of Northern Ireland's air quality monitoring in 2007, including compliance with Air Quality Strategy Objectives. Further information is provided on the Northern Ireland Air Quality website at [www.airqualityni.gov.uk](http://www.airqualityni.gov.uk).

*Carbon monoxide* is monitored using automatic techniques at two sites - Belfast Centre and Londonderry (Brooke Park). Both achieved the Air Quality Strategy (AQS) Objective for this pollutant.

**Nitrogen dioxide** was monitored using automatic techniques at 18 sites during 2007. No sites exceeded the AQS Objective of  $200 \mu\text{g m}^{-3}$  for the hourly mean more than the permitted 18 times. However, three roadside automatic sites exceeded the AQS Objective for the annual mean ( $40 \mu\text{g m}^{-3}$ ). These were Belfast Newtownards Road, Belfast Stockman's Lane, and Newry Trevor Hill, all of which are close to busy roads. These sites have therefore failed to meet the annual mean objective for  $\text{NO}_2$ . One additional site, Newtownabbey Ballyclare Main Street, also recorded an exceedence of the annual mean objective. However, this site only started in December 2007, and therefore had less than one month of data, which is insufficient to for valid comparison against the annual mean objective.

**Sulphur dioxide** Sulphur dioxide was monitored at 17 automatic sites. 2007 was the fourth year running in which all the AQS Objectives for  $\text{SO}_2$  (15-minute, 1-hour and 24-hour mean) were met at all Northern Ireland's automatic monitoring sites. This is an indication of the progress that has been made in recent years in reducing ambient levels of this once highly problematical pollutant in Northern Ireland.

**Particulate matter –  $\text{PM}_{10}$**  Particulate matter as  $\text{PM}_{10}$  was monitored automatically at 29 locations in 2007. One monitoring station, Belfast Stockman's Lane, exceeded the AQS Objective of  $40 \mu\text{g m}^{-3}$  (gravimetric equivalent) for the annual mean  $\text{PM}_{10}$ . This site was the only one to also exceed the AQS Objective of  $50 \mu\text{g m}^{-3}$  (gravimetric equivalent) for the 24-hour mean on more than the permitted 35 occasions. Stockman's Lane is a busy road carrying large amounts of traffic in and out of Belfast.

**Particulate matter –  $\text{PM}_{2.5}$**  As highlighted above, 2007 is the first full year in which fine particulate matter as  $\text{PM}_{2.5}$  was monitored in Northern Ireland. An annual mean of  $15 \mu\text{g m}^{-3}$  (gravimetric equivalent) was obtained at Belfast Centre: this is well within the objective of  $25 \mu\text{g m}^{-3}$  (gravimetric equivalent) to be achieved by 2020. However, it will remain to be seen whether the site will also meet the exposure reduction target of 20%, between 2010 and 2020.

**Ozone** was monitored using automatic analysers at Belfast Centre, Derry (Brooke Park), and Lough Navar (rural). Ozone ( $\text{O}_3$ ) is a secondary pollutant that is formed by reactions involving other pollutant gases, in the presence of sunlight, and over several hours. Once formed, it may persist for several days and be transported over long distances. This means that District Councils have little control over ozone levels in their area.

Unlike some other pollutants, levels of ozone in Northern Ireland do not appear to be decreasing, but remain variable from year to year, depending substantially on weather conditions. Ozone exceedences therefore remain a possibility in future; the most recent occurred in 2003. However, during 2007 no sites exceeded the target value of the AQS Objective on more than the permitted ten days.

## 3.2 Non-Automatic Monitoring in 2007

Sampler-based pollution monitoring can provide a cost-effective way of determining overall pollution levels over large areas. Northern Ireland's automatic monitoring sites are therefore supplemented by over 200 District Council-operated sites using non-automatic sampling methods. The most widely used of these techniques is passive sampling, using diffusion tubes. The main programmes of sampler-based monitoring in Northern Ireland are as follows:

### 1) Diffusion tubes

These typically measure monthly concentrations of nitrogen dioxide ( $\text{NO}_2$ ). Diffusion tubes are easy to use and relatively inexpensive, so they can be deployed in large numbers over a wide area, giving good spatial coverage. They may also be used to complement detailed measurements made at automatic monitoring sites, or in circumstances where hourly measurements from automatic analysers are not required.

$\text{NO}_2$  diffusion tubes are widely used by the District Councils for the purpose of Local Air Quality Management (LAQM). Defra provides a central web-based  $\text{NO}_2$  diffusion tube data collation facility, together with QA/QC support for  $\text{NO}_2$  diffusion tube monitoring. Although the majority of Northern Ireland's diffusion tube sites (over 200 of them) monitor  $\text{NO}_2$ , a smaller number also provide indicative monitoring of ozone, sulphur dioxide and benzene.

## 2) Black smoke monitoring

In January 2006, the former national sampler-based network measuring black smoke and SO<sub>2</sub> was replaced by a smaller network, operated by National Physical Laboratory, monitoring black smoke alone at 21 sites in the UK. This includes three in Northern Ireland – at Belfast Centre, Strabane and Lisburn Dunmurry. The second annual report for this new UK Black Smoke Network, covering calendar year 2007, is available on the UK Air Quality Archive at:

[http://www.airquality.co.uk/archive/reports/cat05/0804281115\\_AS\\_22.pdf](http://www.airquality.co.uk/archive/reports/cat05/0804281115_AS_22.pdf)

## 3) Hydrocarbons

**Benzene** was monitored at Belfast Centre and Belfast Newtownards Road until October 2007. Both sites had easily met the objectives for this pollutant for many years, and following a review of the Non-Automatic Hydrocarbon Network, monitoring of benzene at Belfast Newtownards Road was discontinued. Benzene monitoring continues at Belfast Centre, and the site met the AQS Objective in 2007.

**1,3-Butadiene** was also monitored at Belfast Centre and Belfast Newtownards Road until August 2007. However, as with benzene, levels of this pollutant had been well below the AQS Objective for many years and following the network review in 2007, monitoring of 1,3 –butadiene was discontinued at all sites.

**Polycyclic aromatic hydrocarbons (PAHs)** were monitored at two sites in 2007: Lisburn Dunmurry and Derry Brandywell. Neither site met the 2010 AQS Objective for the PAH species benzo[a]pyrene. Section 6 deals with PAH monitoring in more detail.



**Figure 3 New PAH monitoring site at Ballymena Ballykeel**

## 3.3 Summary

Northern Ireland's air quality continues to improve. Results from Northern Ireland's network of air quality monitoring stations show that the Air Quality Strategy Objectives for the following pollutants have been met by the due dates –

- ▶ Carbon monoxide
- ▶ Benzene
- ▶ 1,3-Butadiene
- ▶ Sulphur dioxide

Non-automatic monitoring in previous years also established that ambient concentrations of lead were well within the AQS Objective.

However, there remain a small number of sites close to busy roads in Belfast and Newry that did not meet AQS Objectives for annual mean nitrogen dioxide and for 24-hour mean particulate matter as PM<sub>10</sub>. Also, benzo[a]pyrene concentrations at Lisburn Dunmurry and Derry Brandywell were above the AQS Objective for 2010.



## 4 Air quality trends

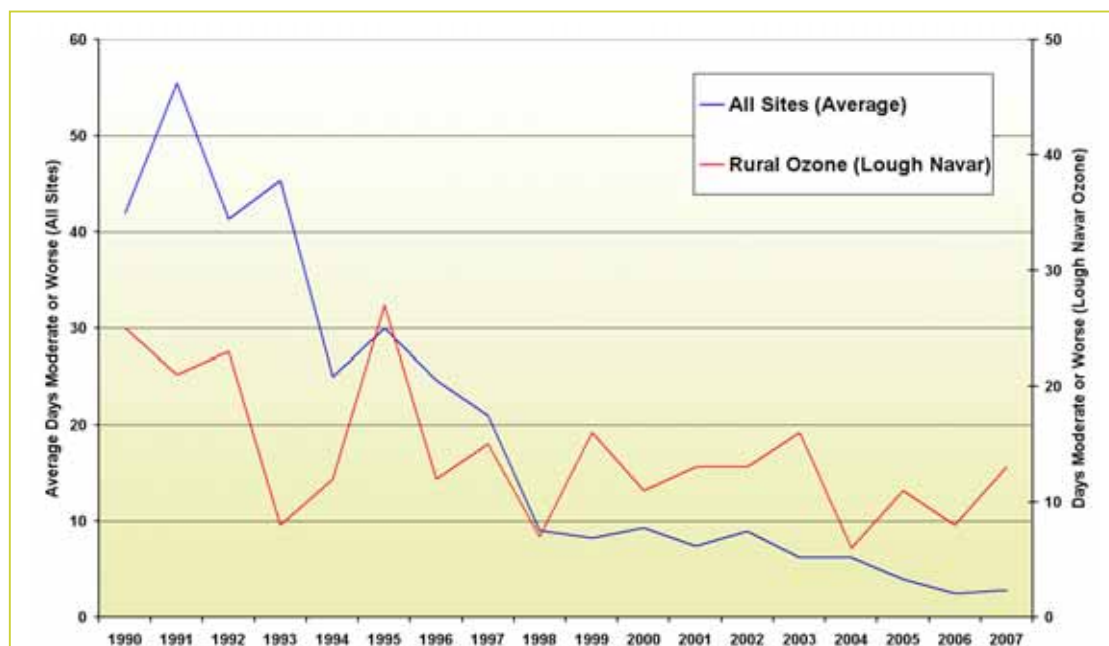


As highlighted in the introduction, recent years have seen a marked improvement in Northern Ireland's air quality. In particular, levels of pollutants associated with coal and oil combustion have reduced significantly over the past decade.

Here we examine how overall pollution levels in Northern Ireland have changed over the last 20 years. To an extent, these analyses are affected by changes in monitoring site numbers. Since these were relatively low up to 2000, trends in the earlier years should be regarded with caution.

In 1999, a first air quality 'headline' indicator was introduced in support of the UK Sustainable Development Strategy. In 2005, a new indicator was added, better reflecting the effects on health of long-term exposure to lower levels of pollution.

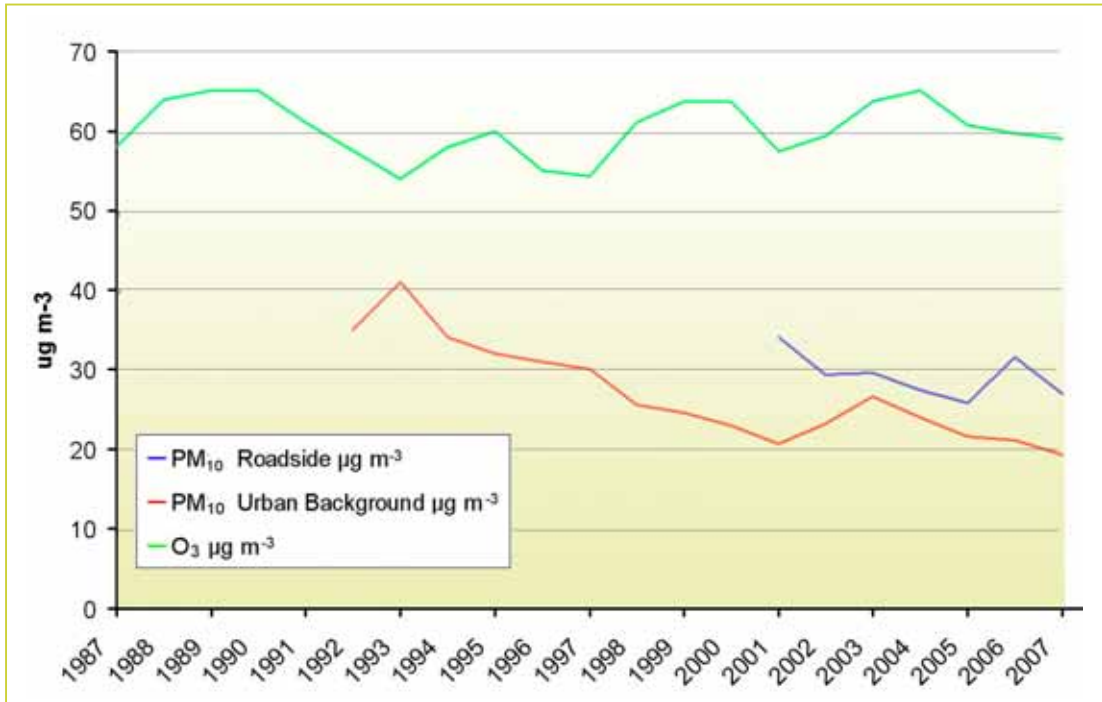
The original air quality 'headline' indicator (Figure 4) measures days of moderate or higher pollution according to the Air Pollution Information Service bandings used in the national forecasting service. At the 'moderate' level, the effects of pollution may start to be noticeable to sensitive people. Figure 4 shows the average number of days when air quality was 'moderate' or worse, for all sites, and for rural ozone at Lough Navar, for years 1990 onwards. There is a clear downward trend in the 'headline' indicator for all pollutants: less so for rural ozone measured at Lough Navar.



**Figure 4 The 'old' headline Air Quality Indicator: number of days of air pollution at urban and rural sites in Northern Ireland exceeding the moderate pollution band: 1990 – 2007**

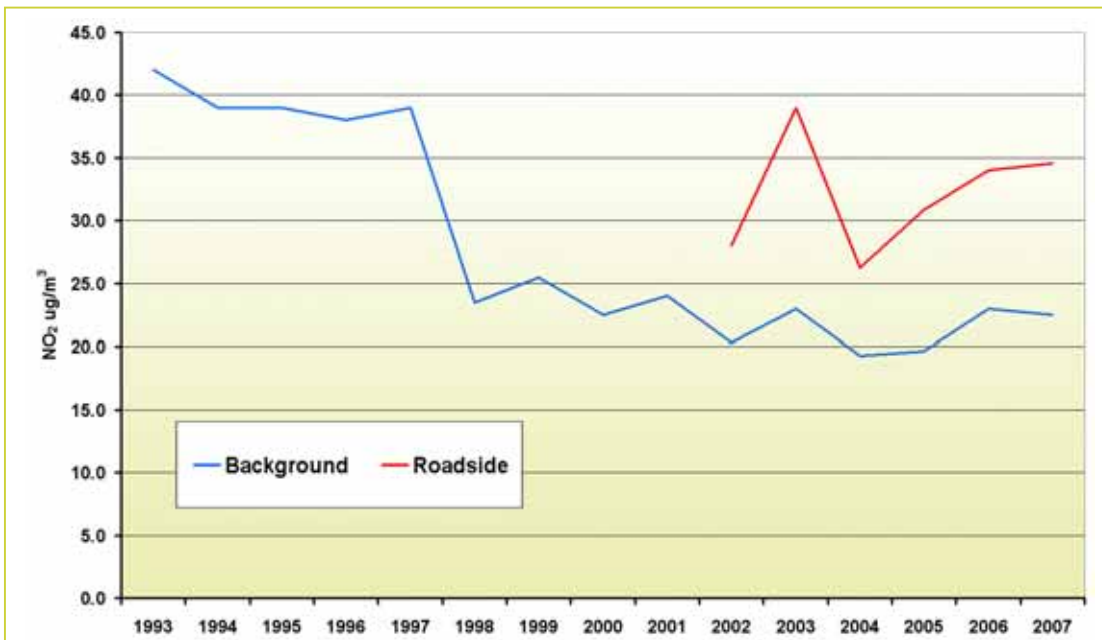
In 2005, a further indicator was added (Figure 5a): trends for annual exposure to particles and ozone. These trends are important because there is considerable evidence suggesting long-term exposure to even low levels of particles may have a significant effect on public health. Figure 5a shows annual mean concentrations of PM<sub>10</sub> (all roadside and urban background sites), and ozone (all sites, rural and urban) in Northern Ireland during the period 1990 to 2007.

This figure demonstrates that there has been a general reduction in urban background PM<sub>10</sub> concentrations since 1987. For roadside sites, this parameter can only be calculated from 2001 onwards, due to the lack of roadside PM<sub>10</sub> sites before that year. This indicator appears to show an overall decreasing trend from 2001 to 2007. By contrast, mean ozone concentrations in Northern Ireland do not appear to show any clear overall trend over the same period, although there is distinct year-to-year fluctuation.



**Figure 5a New Headline Air Quality Indicator: gravimetric PM<sub>10</sub> annual means at urban background and roadside sites, plus ozone mean maximum 8-hr running means at all sites: 1987 - 2007.**

Figure 5b shows annual mean concentrations of NO<sub>2</sub> concentrations at roadside and urban background sites. This graph shows a long-term decline in nitrogen dioxide concentrations in urban areas. (Data prior to 1998 should be treated with caution due to the small number of monitoring locations)



**Figure 5b Annual mean NO<sub>2</sub> concentration, urban background and roadside sites in Northern Ireland, 1993 - 2007.**

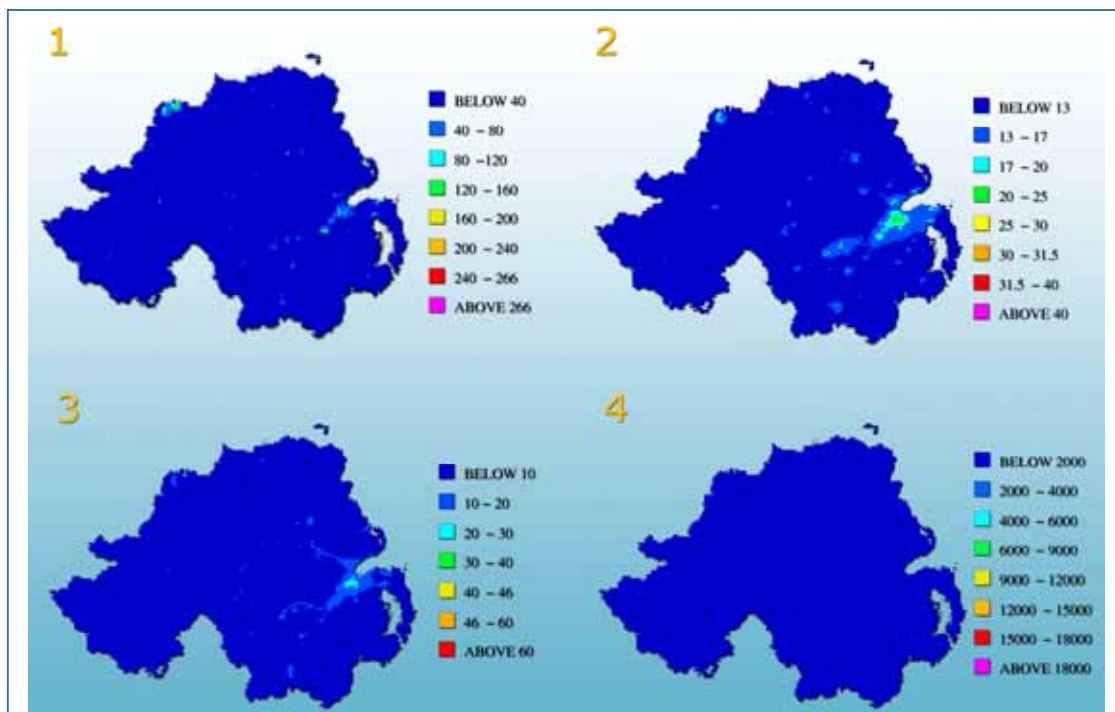
These trends are shown on the air quality website, 'Northern Ireland Air' at [www.airqualityni.co.uk](http://www.airqualityni.co.uk).

# 5 Maps of Air Quality



Data from the air quality monitoring sites in Northern Ireland have been combined with pollutant emissions data from the UK's National Atmospheric Emissions Inventory (NAEI) to produce detailed maps - at 1km resolution - of average or peak background pollutant concentrations across the country for 2007. These maps (Figures 6.1, 6.2, 6.3 and 6.4) illustrate that ambient air quality in Northern Ireland is generally good.

Figure 6.1 shows peak (99.9<sup>th</sup> percentile) 15-minute average concentrations of sulphur dioxide (SO<sub>2</sub>). The main sources of this pollutant are industrial and domestic fuel burning (particularly coal and oil). While peak concentrations are very low over most of Northern Ireland, there are clusters of elevated peak SO<sub>2</sub> concentration around Belfast, Derry and the Craigavon and Portadown area south of Lough Neagh. There are also isolated "hotspots" of higher concentration throughout the rest of the region. These may indicate small pockets of high domestic coal or oil use in rural small towns and villages. However, it is also likely that this is - to some extent - a feature of the emissions inventory used in the model, as monitoring data at corresponding locations indicates that measured concentrations of SO<sub>2</sub> in Northern Ireland are lower than these estimates suggest.



**Figure 6 Maps of air quality in Northern Ireland for four key pollutants:**  
**6.1 Estimated 99.9<sup>th</sup> percentile on 15-minute mean SO<sub>2</sub> µg m<sup>-3</sup>**  
**6.2 Estimated annual mean PM<sub>10</sub> µg m<sup>-3</sup>** **6.3 Estimated annual mean NO<sub>2</sub> µg m<sup>-3</sup>**  
**6.4 Estimated O<sub>3</sub> AOT40 µg m<sup>-3</sup>.hours\***

The gravimetric PM<sub>10</sub> map (Figure 6.2) is the most interesting one for Northern Ireland, showing the highest concentrations around Belfast and Londonderry, with smaller and less significant areas of elevated concentrations located around Lough Neagh. These areas match the areas of elevated peak SO<sub>2</sub> concentrations shown in Figure 6.1. It is likely that solid fuel combustion associated with domestic heating accounts for the geographic distribution of elevated concentrations in both pollutants shown by these maps.

Like the other pollutants represented in these maps, estimated background NO<sub>2</sub> concentrations modelled for Northern Ireland in 2007 (Figure 6.3) are low. The highest concentrations are limited to Belfast, although Derry can also be seen as an area of marginally elevated concentrations in the map. The map of ozone concentration (Figure 6.4) is based on the 'AOT40' statistic on which the EU target value is based. The map presented here clearly illustrates the low ozone year experienced by both Northern Ireland and the rest of the UK in 2007.

## 6 Polycyclic Aromatic Hydrocarbons



Northern Ireland's air quality monitoring also covers polycyclic aromatic hydrocarbons (or PAHs). Polycyclic aromatic hydrocarbons are organic compounds containing carbon and hydrogen only, which are composed of two or more fused benzene rings in linear, cluster or angular arrangements. One such compound, benzo[a]pyrene ( B[a]P ), is often used as a marker for the carcinogenic risk of PAHs in ambient air.

Major sources of PAHs include vehicle emissions, industrial combustion processes and domestic solid fuel combustion. The latter is of particular significance in parts of Northern Ireland where domestic solid fuel heating is still common.

Health effects from PAHs are thought to occur as a result of cumulative long-term exposure, so the averaging period for assessing inhalation exposure is the calendar year annual mean. An EC Target Value of  $1 \text{ ng m}^{-3}$  for the calendar year annual mean has been set for B[a]P, to be achieved from 2012. There is also a more stringent UK AQS Objective of  $0.25 \text{ ng m}^{-3}$  (again, measured as a calendar year annual mean) to be achieved by 2010.

A range of polycyclic aromatic hydrocarbons has been monitored at two sites in Northern Ireland for several years: Belfast Clara Street from 2001 to 2006, and Lisburn Dunmurry from 1999 onwards. Until 2008, the data have been collected as quarterly averages; as of 2008, the averaging period has been changed to monthly.

Annual mean B[a]P concentrations at the urban site Belfast Clara Street have consistently remained well below the EC Target Value of  $1 \text{ ng m}^{-3}$ , although occasionally exceeding the more stringent AQS Objective of  $0.25 \text{ ng m}^{-3}$ . However, levels of B[a]P at Lisburn Dunmurry are consistently higher, exceeding the AQS Objective and - in some years - coming close to the EC Target Value.

The differences between B[a]P concentrations found at Belfast and those at Lisburn Dunmurry are probably due to the proximity of the sites to local sources. The Lisburn Dunmurry site is situated in an area where domestic combustion of coal, other solid fuels and oil has remained widespread until the recent arrival of the natural gas network. By contrast, the Belfast Clara Street site is located in a Smoke Control area which has had a natural gas supply for longer, leading to less solid fuel burning in the area.

In late 2006, PAH monitoring commenced at Derry Brandywell, followed at the end of 2007 by a further PAH monitoring site at Ballymena Ballykeel.

Figure 7 shows annual mean B[a]P concentrations for 2007, at Lisburn Dunmurry, Derry Brandywell, and sites in other urban and residential areas outside Northern Ireland. (Ballymena Ballykeel is not shown, as it only began operating at the end of 2007 and therefore there are as yet insufficient data for a valid annual mean.) The two sites in Northern Ireland recorded relatively high concentrations of B[a]P, comparable with those measured at Scunthorpe Town and Port Talbot, both of which are near large industrial plant.

For comparison, this chart also shows the annual mean measured at Belfast Clara Street in 2006 (its last year of operation). This site was recording similar B[a]P concentrations to sites such as Newcastle Centre and Liverpool Speke, typical of those expected in any large city. Therefore, it was decided to cease monitoring at this site, and relocate the monitoring site to Derry Brandywell.

Although PAH concentrations at Lisburn Dunmurry are relatively high, there is evidence that they are decreasing over time. Figure 8 shows quarterly mean B[a]P concentrations measured at Lisburn Dunmurry from 1999 onwards. This clearly illustrates the strong seasonal pattern in PAH concentrations, with high winter concentrations likely to be resulting from the increased use of domestic solid fuels during winter. Also shown, and illustrated by the dotted purple line, is a linear trend line fitted to the quarterly mean data. This shows a significant downward trend in B[a]P concentration. However, the downward trend does not, at present, appear sufficient to allow the UK Air Quality Strategy Objective of  $0.25 \text{ ng m}^{-3}$  to be met by 2010.

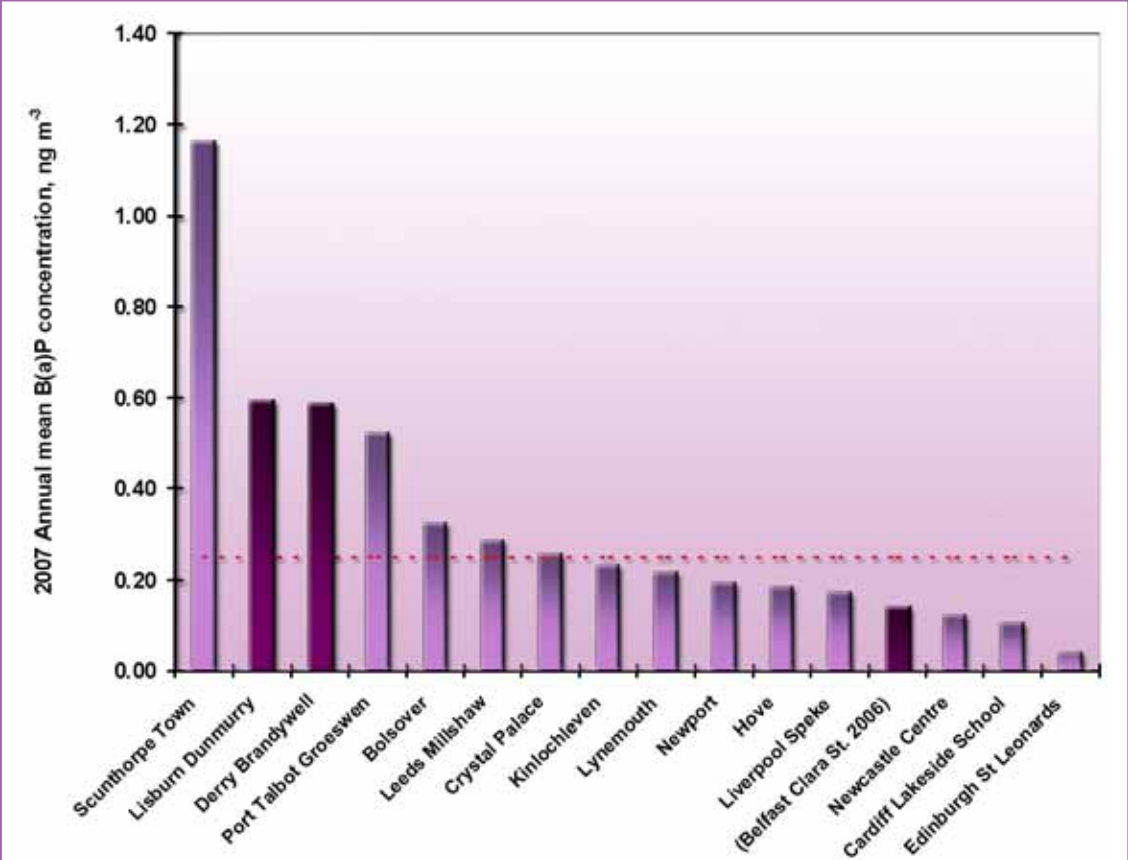


Figure 7 2007 Annual Mean benzo[a]pyrene concentrations at sites in Northern Ireland and elsewhere (dotted red line shows AQ5 Objective of 0.25 ng m<sup>-3</sup>; the darker bars show Northern Ireland sites)

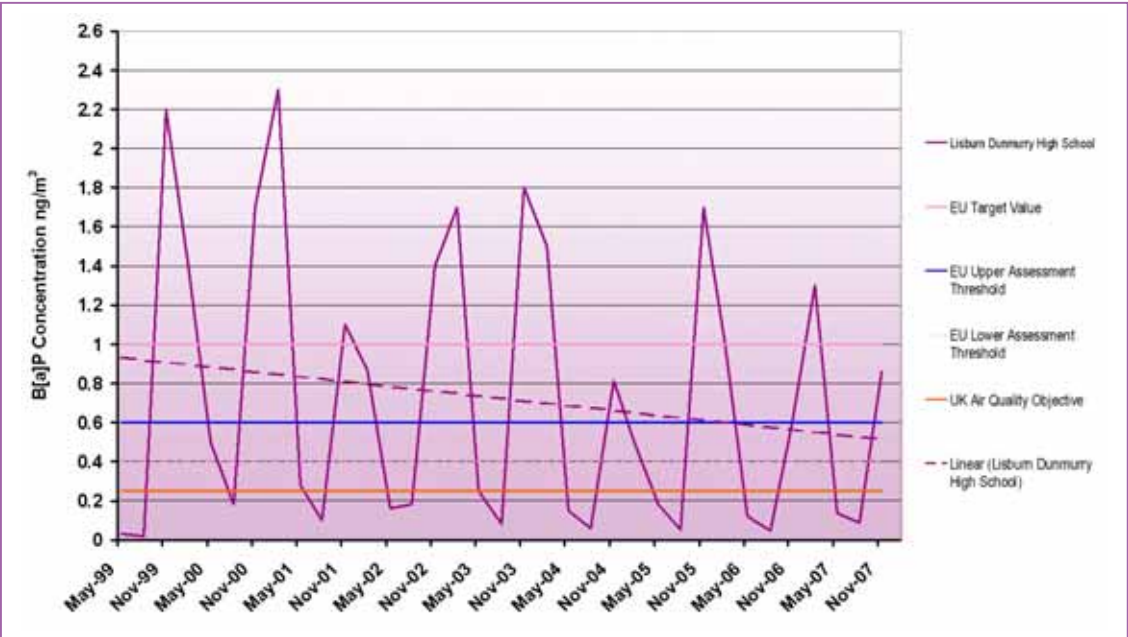


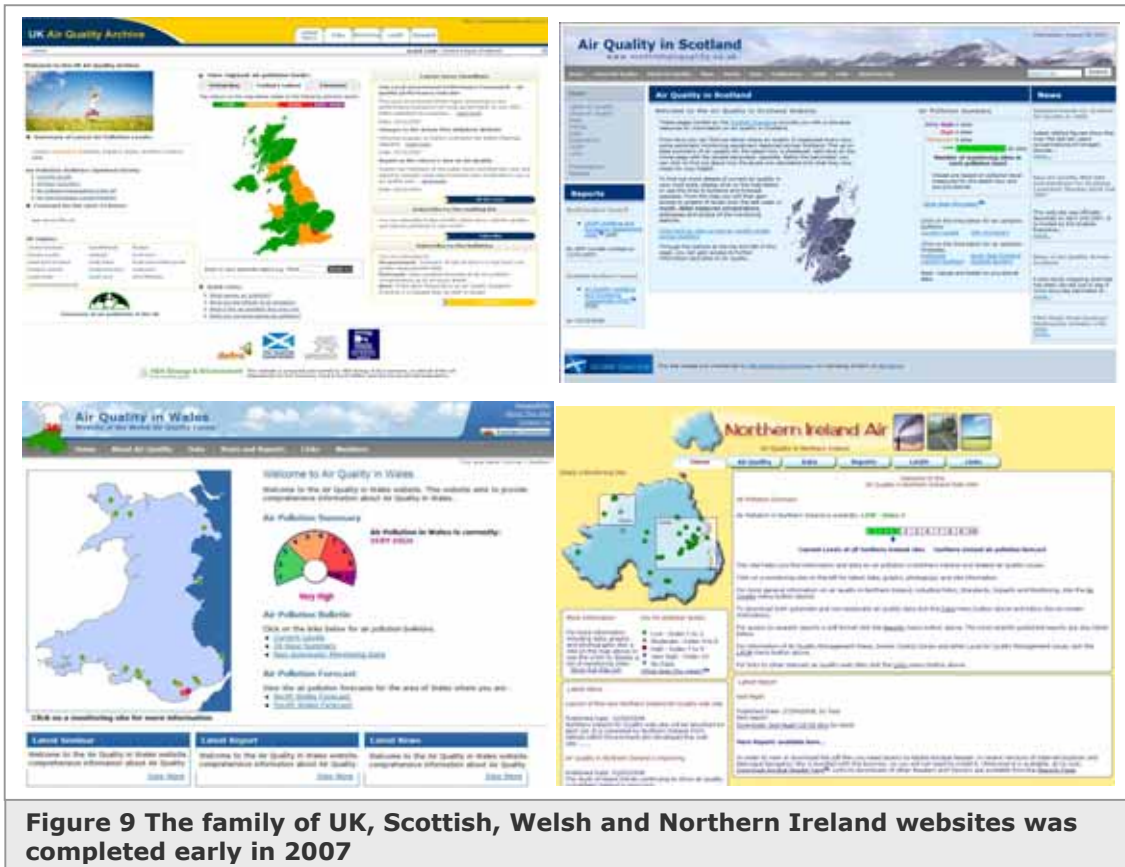
Figure 8 Quarterly Mean benzo[a]pyrene concentrations at Lisburn Dunmurry, with linear trend line, EC Target Value 1.00 ng m<sup>-3</sup> and AQ5 Objective of 0.25 ng m<sup>-3</sup>.

# 7 More information



## 1) The Northern Ireland Air Quality Website

The air quality website, 'Northern Ireland Air' at [www.airqualityni.co.uk](http://www.airqualityni.co.uk) has been created to provide a 'one stop shop' resource for information covering all aspects of air pollution in Northern Ireland. This site is part of a family of air quality websites covering UK, Wales, Scotland and Northern Ireland (Figure 9).



The site is funded by the Department of Environment in Northern Ireland. It was designed from the outset to be:

- ▶ Comprehensive
- ▶ User-friendly
- ▶ Easily navigable
- ▶ Interactive
- ▶ Able to meet the needs of the general public as well as technical, local government and regulatory user communities.

The website provides information on:

- ▶ Latest up-to-date air quality levels across Northern Ireland
- ▶ Reports and analysis of trends and historical data
- ▶ Information on both national air quality policy and the work of Northern Ireland's District Councils
- ▶ Descriptions of what causes air pollution, how it is measured, and relevant health, amenity and ecosystem impacts

The site also contains an interactive map showing where Northern Ireland's automatic monitoring stations are located. By clicking on the map, users can view details of each

monitoring site, a photograph of its location, and a list of the pollutants monitored. An 'Air Pollution Index' is used to provide a simple indication of current pollution levels.

A recent addition to the website is the 'Kids' Corner' section (Figure 10). This is designed to meet the emerging curricular needs of schoolchildren, as well as raising awareness of all aspects of air pollution and climate change. It is intended to be fun as well as informative.



**Figure 10 'Kids' Corner' page of the Northern Ireland Air Quality website.**

## 2) Current and forecast air quality (national and local)

In addition to the Northern Ireland Air Quality website, this information is also rapidly available from:

- ▶ Teletext page 156
- ▶ The Air Pollution Information Service on freephone 0800 556677
- ▶ The UK Air Quality Archive on [www.airquality.co.uk](http://www.airquality.co.uk)

## 3) General information on Air Quality

- ▶ The DoENI website at <http://www.doeni.gov.uk/>
- ▶ The Northern Ireland Environment Agency website at <http://www.ni-environment.gov.uk/>
- ▶ The UK Air Quality Information Archive on [www.airquality.co.uk](http://www.airquality.co.uk)
- ▶ The National Atmospheric Emissions Inventory on [www.naei.org.uk](http://www.naei.org.uk)
- ▶ The Defra air quality information web resource on [www.defra.gov.uk/environment/airquality/index.htm](http://www.defra.gov.uk/environment/airquality/index.htm)
- ▶ The Northern Ireland Air Quality website at: [www.airqualityni.co.uk](http://www.airqualityni.co.uk)

## 4) Local Air Quality Issues

For further information on air quality issues in your area, please contact the Environmental Health Department at your local District Council office. Further information on Local Air Quality Management may also be found at:

[www.defra.gov.uk/environment/airquality/laqm.htm](http://www.defra.gov.uk/environment/airquality/laqm.htm)

[www.airquality.co.uk/archive/laqm/laqm.php](http://www.airquality.co.uk/archive/laqm/laqm.php)

and the Local Authority support site at: <http://www.laqmsupport.org.uk>.

*This report has been produced by AEA on behalf of the Department of the Environment, in partnership with the Chief Environmental Health Officers Group.*

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*Some images used in front and rear cover layout, and page 4 are courtesy of Mike Hartwell.*

**ISBN: 978-1-905127-85-6**



**The view from Cave Hill, overlooking Belfast**

