

Dublin City Council, Fingal County Council, South Dublin County Council and Dun Laoghaire-Rathdown County Council

Dublin Region Air Quality Plan 2021

Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region



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The four Dublin Local Authorities – Dublin City Council, Dún Laoghaire-Rathdown County Council, Fingal County Council and South Dublin County Council are committed to protecting and enhancing air quality across the Dublin region. The exceedance of the EU limit value for nitrogen dioxide in the Dublin region in 2019 necessitated the preparation of the *Dublin Region Air Quality Plan 2021 - Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region*.

We the undersigned endorse and authorise this plan for submission to the Minister for the Environment, Climate and Communications and the EU Commission in accordance with Article 22(6) of the Air Quality Standards Regulations 2011 (180 of 2011).

Yours sincerely,



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Executive summary

Background to the Air Quality Plan

Ireland as an EU member state is obliged to implement EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe (also referred to as the CAFÉ Directive). This includes carrying out air quality monitoring for a number of specified air pollutants at a network of air quality monitoring stations throughout the country.

In 2019, there was an exceedance of the annual permissible limit value for one of these pollutants – nitrogen dioxide - at one monitoring station (St. John's Road West) in Dublin. There were no other exceedances recorded elsewhere for nitrogen dioxide or any other specified air pollutant during 2019. There have been no exceedances recorded at any monitoring stations subsequently during 2020 or 2021 to date. The situational analysis and the air quality data collected clearly indicates that the exceedance is due to transport related emissions that arise within the locality of the St. John's Road West monitoring station. The locality is situated immediately to the west of Dublin city centre and is a hub for road traffic, mainline and light rail services.

For the purposes of air quality assessment and management in Ireland, the country is divided into a number of zones, one of which is *Agglomeration A - the Dublin Conurbation*. This consists of the functional areas of Dublin City Council, South Dublin County Council, Dun Laoghaire – Rathdown County Council and most of Fingal County Council. These local authorities are obliged to prepare an air quality plan to identify the root causes and formulate measures to address the exceedance of that pollutant for submission to the EU within two years of the exceedance being reported i.e. the end of 2021. This air quality plan must conform to the criteria set down in Schedule 15 of the Air Quality Standards Regulations 2011. While the Dublin local authorities are a crucial element in preparing this air quality plan, other stakeholders have key roles in its implementation, and there is a shared reliance on the collaboration of all the stakeholders to achieve shared goals.

Preparatory steps to development of the Air Quality Plan

In order facilitate this collaboration the Department of the Environment, Climate and Communications (DECC) and the Department of Transport (DoT) established the Urban Transport-Related Air Pollution (UTRAP) Working Group in late 2019. The UTRAP group includes representatives from the Department of Health, Department of Finance, Department of Public Expenditure and Reform, National Transport Authority, Transport Infrastructure Ireland,

Environment Protection Agency, Dublin City Council, South Dublin County Council, Dublin Bus, Bus Eireann, Health Services Executive, Road Safety Authority and the Climate Action Regional Office. The terms of reference of UTRAP include consideration of the range of options for potential measures and any associated actions and supports required to facilitate their effective uptake to address nitrogen dioxide and other air pollution and to identify measures most suitable to Ireland and appropriate implementation bodies.

Once officially notified of the exceedance of the nitrogen dioxide annual limit value in the Dublin region in 2019, the four local authorities convened a project team to prepare this air quality plan. Invaluable assistance was also provided by the Environmental Protection Agency in carrying out the modelling component of this plan and the National Transport Authority provided the current and projected traffic data.

Policy considerations underpinning the Air Quality Plan

In the context of addressing transport related nitrogen dioxide emissions in the Dublin region the National Transport Authority *Draft Transport Strategy for the Greater Dublin Area 2022-2042* is a cornerstone policy in determining the direction of transport policy. This addresses the following challenges.

- Climate Change
- Recovery from the Covid19 Pandemic
- Servicing the Legacy Development Patterns
- Revitalisation of the City Centre and Town Centres
- Transformation of the Urban Environment
- Ensuring Universal Access
- Serving Rural Development
- Improving Health and Equality
- Fostering Economic Development
- Delivering Transport Schemes

The Transport Strategy, in combination with other Government policies and programmes is forecast to lead to a significant reduction of 88% (in kg) in nitrogen dioxide emissions compared to 2016.

The *Five Cities Demand Management Study* issued by the Department of Transport provides the tool kit of measures at national, regional and city level to address climate action, air quality, urban planning and traffic demand management.

These two transport policy drivers, combined with the powers of local authorities in the preparation of city and county development plans form the basis of the measures identified in this air quality plan to address the exceedance of the nitrogen dioxide annual limit value in Dublin in 2019.

SEA /AA Assessment and Public Consultation

The measures and actions set out in this air quality plan have been screened for both Strategic Environmental Assessment and Appropriate Assessment and the conclusions of these screening assessments are that the Plan will not result in land use activities that have the potential to result in negative impacts on the on the qualifying features of interest of European Sites occurring within or surrounding the plan area and will not have the potential to comprise the achievement of the conservation objectives of these European Sites.

A draft plan was issued for public consultation which resulted in a diverse range of responses, particularly in the matter of low emission zones. These responses are addressed in this final draft.

Air Quality Plan Measures and Actions

This air quality plan sets out 14 broad measures and a number of associated actions to address the exceedance of the nitrogen dioxide annual limit value. In summary these are as follows:

Measure 1

Integrate “15 Minute Neighbourhoods” concept in City and County Development Plans

Action: Dublin local authorities to adopt as appropriate “15 Minute Neighbourhoods” approach in their 2022-2028 Development Plans.

Measure 2

Public Parking Controls

Action: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to maintaining and enhancing public parking control Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to maintaining and enhancing residential parking standards.

Measure 3

Residential Parking Standards

Action: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to workplace parking standards.

Measure 4

Workplace Parking Standards

Action: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to workplace parking standards.

Measure 5

Continued Delivery of the Active Travel Programme

Action: The local authorities in the Dublin region to continue implementation of the Active Travel Programme.

Measure 6

Electrical Vehicle (EV) Charging Strategy

Action: Dublin local authorities to finalise their Electrical Vehicle (EV) Charging Strategy.

Measure 7

Publication of National Clean Air Strategy

Action: Publication of National Clean Air Strategy by the Minister for Environment.

Measure 8

Air Quality Enabling legislation

Action: The Dublin local authorities will advocate to the relevant government department for enhanced legal powers in respect of air quality management be delegated to them.

Measure 9

Introduction of Clean Air Zones/ Low Emission Zones

Action: An appraisal be carried out of the current provisions in the Air Pollution Act 1987 to determine if they are fit for purpose regarding the delegation of powers to local authorities for the introduction of clean air zones or low emission zones and identification of any potential amendment necessary. Furthermore, an overall appraisal into the feasibility of introducing Low Emission Zones in the Dublin region where appropriate to be carried out.

Measure 10

Remote/Flexible Working

Action: Implementation of National Remote Work Strategy.

Measure 11

Enhanced Air Quality Monitoring and Modelling

Action: Additional national air quality monitoring station to be established in Dublin north inner city.

Action: On completion of the indicative nitrogen dioxide campaign (end 2021) being carried by the EPA carried out by, The Dublin local authorities will work with the EPA to establish additional monitoring stations in the Dublin region as required in line with findings.

Action: The Dublin local authorities will collaborate with the EPA on ongoing indicative monitoring across the Dublin region.

Action: Air quality modelling - The work carried out on the limited modelling incorporated in the preparation of this plan highlights both the challenge required to complete that task and the necessity of having that level of detail available . Concurrently the Dublin local authorities are also commencing the process of gathering data for the preparation of noise actions plans in compliance with the EU Environmental Noise Directive. In order to make best use of the data available within local authorities, other public bodies and other sources, the Dublin local authorities will investigate in conjunction with the EPA the feasibility of establishing regional air quality modelling capacity within the local authorities.

Measure 12

Air Quality - Citizen Engagement

Action: Dublin City Council to establish public dashboard on Airview study results for Dublin City

Action: Dublin local authorities to explore with other stakeholders such as An Taisce, or the Asthma Society on the establishment of a public consultative process or forum on air quality.

Measure 13

Air Quality and Health Research

Action: Dublin local authorities to formally engage with research teams on their emerging findings and to collaborate on the formulation of practical measures and guidelines from this research.

Measure 14

Behavioural Change Campaigns to cleaner fleets

Action: Commuter/Travel surveys carried out by public bodies to include determining public attitudes towards air quality measures and commuting behaviour.

Action: Air quality forum to address and gauge public attitudes on behaviour change to improve air quality.

Action: Public consultation on City and County Development Plans to include eliciting feedback on public view on introduction of cleaner fleets and clean air/low emission zones.

An indicative timescale for implementing these measures and actions up to 2030 is provided for in this air quality plan.

1.0 Introduction – Setting the context

1.1 Why is this air quality plan for nitrogen dioxide for Dublin necessary and what is its purpose?

Ireland as an EU member state is obliged to implement EU Directive [2008/50/EC](#) on ambient air quality and cleaner air for Europe (also referred to as the CAFÉ Directive). One element of the implementation of this Directive involves carrying out air quality monitoring for a number of specified air pollutants at a network of air quality monitoring stations throughout the country. These requirements were transposed into national legislation in Ireland by the Air Quality Standards Regulations 2011 (S.I.180/2011).

In 2019, there was an exceedance of the annual permissible limit value for one of these pollutants – nitrogen dioxide - at one monitoring station in Dublin. There were no other exceedances recorded elsewhere for nitrogen dioxide or any other specified air pollutant during 2019.

Under the national legislation, Air Quality Standards Regulations 2011 (S.I.180/2011), if this occurs the relevant local authorities are obliged to prepare an air quality plan to identify the root causes and formulate measures to address the exceedance of that pollutant for submission to the EU within two years of the exceedance being reported. For the purposes of air quality assessment and management in Ireland, the country is divided into a number of zones, one of which is *Agglomeration A - the Dublin Conurbation*. This consists of the functional areas of Dublin City Council, South Dublin County Council, Dun Laoghaire – Rathdown County Council and most of Fingal County Council.

For the purposes of readability of this plan, the term *Dublin Region* will be used in the text to describe this legally defined area. For the purposes of air quality management, this zone would be classified as a city. The reasoning behind the legal obligation for the four local authorities preparing this plan together include:

- The root causes for an exceedance of the permissible limit for a given pollutant at one location may be influenced by regional as well as local factors.
- It is crucial that measures taken to address an exceedance in one location do not inadvertently displace the burden of pollution elsewhere.

This last point is particularly relevant in this instance as nitrogen dioxide is an air pollutant primarily associated with transport emissions. Therefore, the purpose of this plan is to address reducing nitrogen dioxide emissions from transport in the Dublin region.

1.2 Arrangement and layout of this air quality plan for nitrogen dioxide

One of the legal obligations under the Air Quality Standards Regulations 2011 on local authorities in preparing this air quality plan is to ensure that it is “clear, comprehensible and accessible”.

Therefore the flow of this plan is to firstly give an overview of the reasons for and purpose of preparing this plan (see above); then give the a contextual overview of the area covered by the plan in terms of physical geography , demography population and climate.

The plan will then describe the policies and legislation dealing with air quality in Ireland and then address the origin, occurrence and health impacts of nitrogen dioxide.

It will also deal with relevant transport and land use plans. It will then describe the emissions and dispersion modelling carried out for this plan and from this elaborate the proposed measures and actions required to achieve the target of bringing nitrogen dioxide levels back into compliance with legal limit values.

1.3 Overview of the Dublin region, Geographic and Population Profile

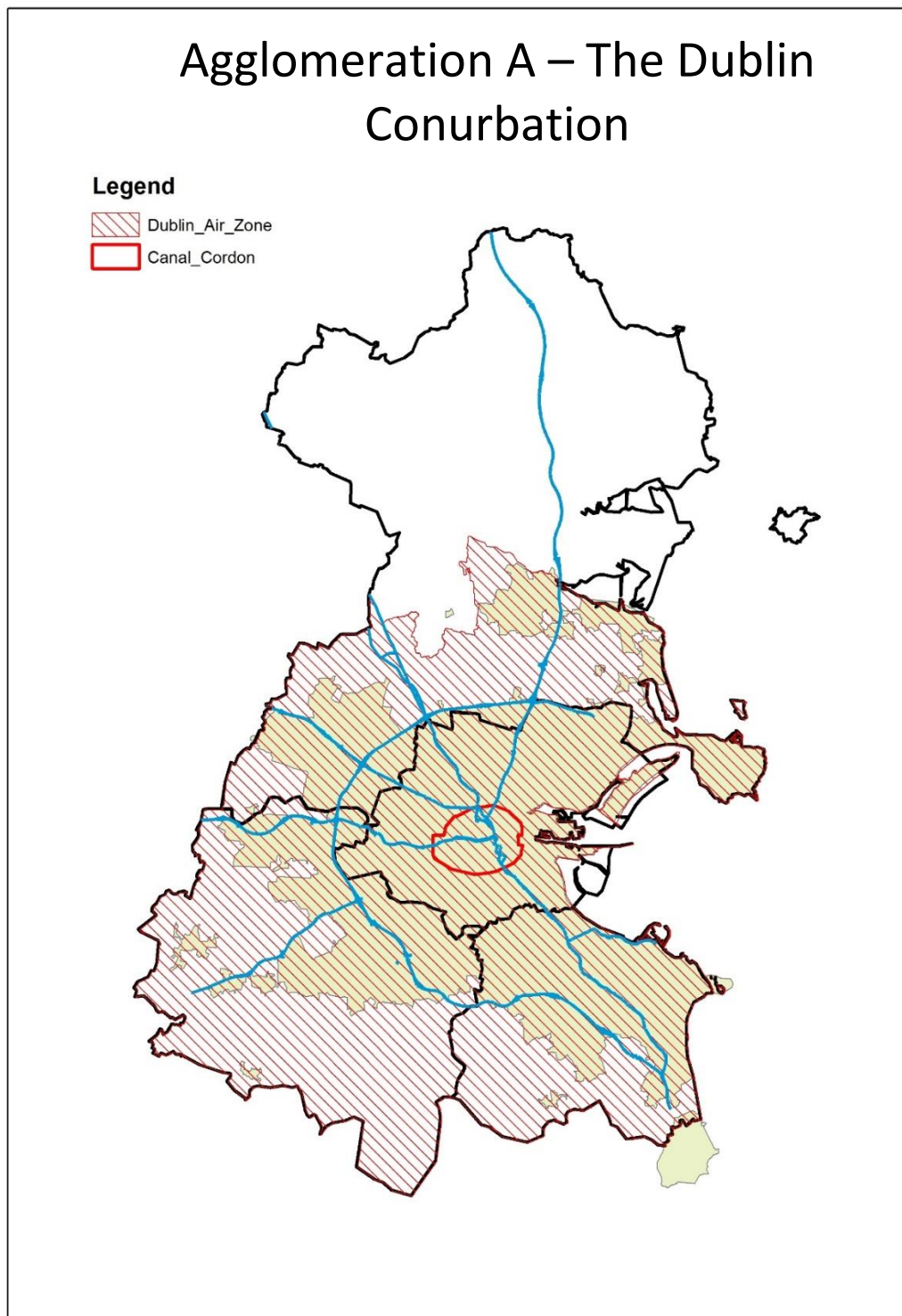
The Dublin Region occupies an area of 922 square kilometres and is situated on the east coast of Ireland on the River Liffey, which discharges into Dublin Bay and the Irish Sea. The area of Agglomeration A - the Dublin Conurbation, which is the subject of this Plan, is 637 square kilometres. The area around St. John’s Road West, where the recorded exceedance of nitrogen dioxide occurred in 2019 is situated in the west of Dublin City. The road in question is highly trafficked and serves as a feeder route to two motor ways (M50 and M4). There is a main railway station immediately to the north of the air quality station (located at 53.3457°N, -6.2958°E) and the area is a hub for national and urban bus services as well as the a taxi rank serving the railway station (see local map below fig.1.1) .



Figure 1.1 Local Map around St John's Road West Air Monitor

The region is a relatively low-lying area with rich pastures to the west and north of the city. In addition to the River Liffey, two other major rivers run through the region and include the River Tolka from the northwest and the River Dodder from the southwest. The latter rises in the Wicklow Mountains that together with the smaller Dublin Mountains are located to the south west of Dublin City. The highest peaks in the Dublin Mountains extend to around 750metres, where those in the Wicklow Mountains extend to above 1000 metres in places. The mountains are known to have an influencing effect on the weather in Dublin, primarily reducing precipitation that falls extensively over the mountain ranges. In addition, the region also contains two canals linking the city centre to the River Shannon in the Midlands.

The map below shows the extent of Agglomeration A - the Dublin Conurbation relative to the overall region.



In terms of Information on the type of targets requiring protection in the zone, these are addressed in Chapter 8 - Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) Screening.

The population of the Region was 1,347,359 in the 2016 census that represented approximately 28% of the State's population.

The overall Dublin Region consists of four local authority administrative areas - Dublin City Council, Dun Laoghaire Rathdown, Fingal County, and South Dublin County. With the exception of Dublin City, each of the county administrative areas has a mix of rural and urban Electoral Districts. The population of each of these functional areas as determined in the 2016 Census is as follows:

<u>Area</u>	<u>2016 Population</u>
Dublin City	554,554
Dún Laoghaire-Rathdown	218,018
Fingal	161,548 (inside the Dublin Region)
South Dublin	278,767
Total	1,212,887

Of the above, 110,000 people live within the canal cordon formed by the Grand and Royal Canals. It should also be noted that the population living in the Electoral Areas where (or adjacent) the exceedance at St. John's Road West was recorded is 29,423 persons. (CSO Census Data 2016). Dublin is both a vibrant and a historic region, whose heritage is complemented by being a major centre for multinational operations Information and communications technology; it has also seen significant ongoing transport and urban renewal activities over the past decade. The Region includes an International Airport and two main seaports, one of which is the largest in the State.

As the population of Ireland increased by 3.8% between 2011 and 2016, the largest increase was at a regional level – with Dublin at 5.8% followed by the Mid-East region at 5.3%.

In 2016, 28.3% of the population of Ireland lived in Dublin while 14.5% lived in the Mid-East. Thus, just under 43% of all Irish people lived in the Dublin or the Mid-East regions in 2016. Recently published data by the Central Statistics Office indicate that while the national population topped over 5 million people for the first time in over 150 years, population growth in Dublin has now actually levelled out.

Climate of the Dublin region

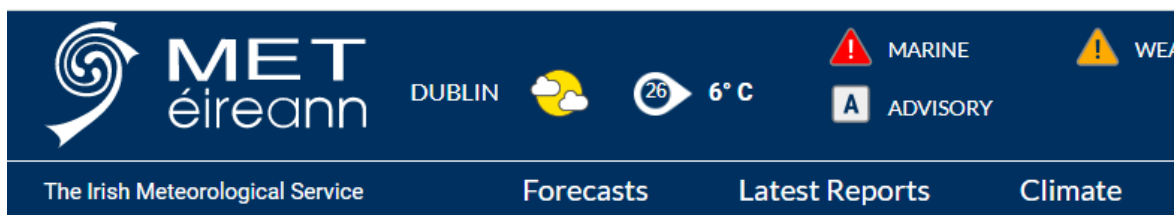
The climate of a region and day-to-day changes in weather profoundly influence air quality in that region. Weather determines how quickly pollutants are dispersed, diluted or blown by the wind from their source. Conversely, pollutants can also be trapped close to the ground. If wind speeds are weak and the air close to the ground cools down this can result in warm air moving over it. This creates an “inversion” condition that keeps pollutants close to the surface. Such inversions typically occur on clear, dry, still nights.

Poor air quality can also result from high temperatures. In hot, sunny weather, photochemical smog can form through complex chemical reactions involving a range of air pollutants such as nitrogen oxides, ozone, and volatile organic compounds. Air pollution can also be washed out by rain, fog or snow.

The climate of Dublin is oceanic (due to the influences of the Atlantic Ocean), cool and humid throughout the year. Consequently, it does not experience the extremes of temperature experienced by many other countries at similar latitude.

The average temperature ranges from 5 °C in January and February to 15.5 °C in July and August. While Dublin is on the drier coast of the island of Ireland total precipitation does amount on average to a total 750 millimetres per year. This means that certain amounts of air pollutants are washed out of the atmosphere in the course of a year. The table below demonstrates the typical variation seen in terms of temperature and rainfall in Phoenix Park Dublin over the course of the last 4 years and the Long Term Average.

Table: 1.1 Rainfall and Temperature for Phoenix Park



The Irish Meteorological Service Forecasts Latest Reports Climate

MONTHLY DATA - PHOENIX PARK

MONTHLY VALUES FOR PHOENIX PARK UP TO 05-DEC-2021

Total rainfall in millimetres for PHOENIX PARK

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2021	115.6	61.7	34.2	16.2	96.9	14.2	83.6	51.2	33.4	75.2	17.5	9.7	609.4
2020	39.6	141.5	30.7	13.6	8.3	68.9	100.7	89.3	56.3	80.4	55.6	79.5	764.4
2019	27.1	19.9	87.7	71.6	34.8	74.3	49.7	68.7	93.1	73.2	155.4	52.1	807.6
2018	85.1	29.4	100.5	76.2	25.6	4.1	30.5	40.7	47.8	44.4	120.8	81.6	686.7
LTA	65.3	51.3	54.0	52.7	61.4	69.1	54.9	73.1	60.0	79.4	75.6	76.9	773.7

Mean temperature in degrees Celsius for PHOENIX PARK

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2021	4.3	6.6	8.0	6.9	10.0	14.7	17.1	15.5	15.5	12.3	8.0	5.1	10.8
2020	6.6	6.2	6.6	9.7	12.3	14.1	15.2	15.6	13.7	10.1	8.6	5.1	10.3
2019	5.7	7.7	7.9	8.7	11.4	13.3	16.8	16.2	13.7	9.8	6.6	6.3	10.4
2018	5.6	3.8	4.9	8.9	12.3	15.7	17.1	16.0	13.0	9.9	8.5	8.0	10.3
LTA	4.9	5.2	6.6	8.2	10.8	13.5	15.6	15.2	13.1	10.2	7.1	5.3	9.7

Source: Met Éireann - <https://www.met.ie/climate/available-data/monthly-data>

2.0 Air Quality Assessment and Management in Ireland under the CAFÉ Directive

2.1 Air Quality Assessment in Ireland

Overview

The European Commission originally launched the Clean Air for Europe (CAFE) programme in 2001, with the aim of reviewing the EU's air quality policies and assessing progress towards attainment of the EU's long-term air quality objectives. Amongst a number of milestones in this ongoing programme was the adoption by the Member States of the EU Directive [2008/50/EC](#) on ambient air quality and cleaner air for Europe (the CAFÉ Directive)

The provisions of this Directive were transposed into Irish law by The Air Quality Standards Regulations [SI 180 of 2011](#). These regulations established the Environmental Protection Agency (EPA) as the competent authority for assessing air quality in Ireland.

The regulations stipulate the:

- Air quality standards to be met in common by all Member States.
- Requirements for national networks of air quality monitoring stations
- Establishment of distinct air quality zones for assessing and managing air quality
- Requirement for short- term action plans in the event of certain kinds of acute exceedances of permitted limit values
- Requirement for Air Quality Plans to be made to bring air quality into compliance in the event of more exceedances.

The Environmental Protection Agency as the competent authority, in cooperation with a number of partners, (such as some local authorities and third level institutes) operate the National Ambient Air Monitoring Programme (NAAMP). This programme includes a national network air quality monitoring stations, reporting data on a continuous, real-time basis. The raw data on air quality gathered is open to public access on a number of platforms including <https://airquality.ie/>. This data is subject to rigorous quality control and assurance. Following this process the final air quality data for the previous calendar year is reported on an annual basis to the EU Commission (usually in the third quarter of the year). If any exceedances of mandatory limits are recorded during a calendar year this triggers a process under the CAFÉ Directive whereby a member State has to prepare an action plan to address such exceedances.

As well as the national monitoring stations network, there are a growing number of “local” air quality monitoring stations. These utilise lower cost monitoring equipment that give a rapid indication of air quality in a locality.

In addition to the national and local monitoring network, the EPA (again in conjunction with some partners) also carry out indicative air quality monitoring campaigns (i.e. using basic low cost sensors over a period of time varying from several months to a year) to identify potential air quality “hot spots” where it may be necessary to establish permanent monitoring stations.

As last reported by the EPA that there are 95 monitoring stations (national and local combined) in Ireland. In 2019 alone there were 24 new stations established (9 national and 15 local) and further expansion is ongoing. The map below shows the general geographical spread nationally of these monitoring stations.

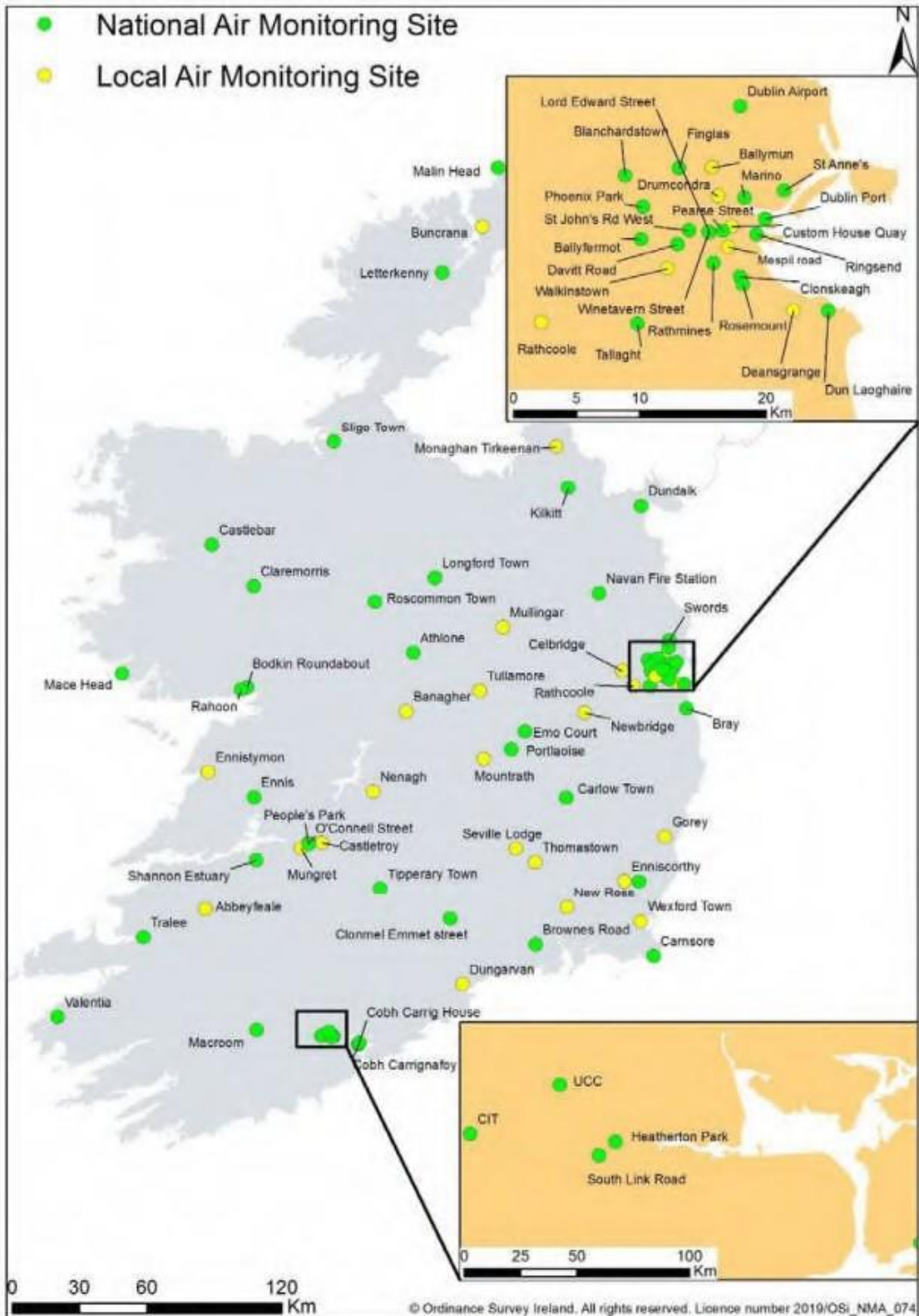


Figure: 2.1 National Ambient Air Quality Monitoring Network in Ireland 2020

(Source -EPA – Air Quality in Ireland 2019)

2.2 Air Quality Standards under the CAFÉ Directive

Each of the pollutants monitored in the national network in Ireland have associated EU legal limit values assigned to them, which if exceeded, require action to be taken by the relevant authorities. These legal limit values are focused on the protection of human health and are based on the World Health Organisation Air Quality Guidelines Global Update 2005. It should be noted that the World Health Organisation issued revised air quality guidelines in 2021, and these are under consideration by the European Union in terms of formulating future clean air directives (see 2.3 for more detail).

Before setting out the air quality standard for nitrogen dioxide, a very brief overview of the monitoring method is useful to explain the context.

Each nitrogen dioxide analyser (using EN 14211:2005 'Ambient air quality — standard method for the measurement of the concentration of nitrogen dioxide and nitrogen monoxide by chemiluminescence) in the network continuously monitors nitrogen dioxide levels in the air and every hour it calculates the one-hour average concentration of that pollutant.

Therefore in a complete calendar year, there would be a maximum 8760 one-hour results (i.e. the number of hours in a calendar year). In practice, there is some tolerance (10%) built in to allow for analyser servicing, calibrations and unscheduled stoppages (power cuts or breakdowns)

The first legal limit value stipulates that a concentration of 200 micrograms per cubic metre should not be exceeded more than 18 times in a calendar year. In other words, no more than 18 of all the one-hour values recorded in a calendar year may exceed this level. This first limit value is important if there are short episodes of very high nitrogen dioxide levels over a number of days. In practice, these kinds of pollution episodes have not been experienced in Ireland.

The second legal limit value stipulates that the average of all the one hourly results in a calendar year must not exceed 40 micrograms per cubic metre. This limit value is focused on the long-term exposure to nitrogen dioxide, and is of relevance to the air quality picture in Ireland.

Apart from nitrogen dioxide, there is a range of other air pollutants monitored under the CAFÉ Directive. While these are not the subject of this plan, for the sake of completeness they are listed below:

Sulphur dioxide, Carbon monoxide, Ozone, Polycyclic Aromatic Hydrocarbons, Particulates (PM10 and PM2.5), and dioxins. As stated previously in this plan, the levels of these pollutants are within legal limit values in Ireland.

2.3 Health Effects of Nitrogen dioxide

The EU air quality standards above are based on the criteria for the protection of human health set down in the World Health Organisation [Air Quality Guidelines Global Update 2005](#).

The World Health Organisation issued New WHO Global Air Quality Guidelines (AQGs) on 22 September 2021. These new guidelines recommend new air quality levels to protect the health of populations, by reducing levels of key air pollutants, some of which also contribute to climate change. The goal of the guideline is for all countries to achieve recommended air quality levels. Conscious that this will be a difficult task for many countries and regions struggling with high air pollution levels, WHO has proposed interim targets to facilitate stepwise improvement in air quality and thus gradual, but meaningful, health benefits for the population.

It has been signaled in 2021 by the European Commission that closer alignment of the EU air quality standards with improving scientific knowledge including these latest findings of the World Health Organization (WHO) are a priority action.

Nitrogen dioxide and general health effects

One of the group of air pollutants of concern are nitrogen oxide gases (or NO_x for short) and from a human health perspective, one of that group - nitrogen dioxide is the one of most concern as it has been demonstrated to be associated with number of health effects including:

- 1.1.1 increased inflammation of the airways;
- 1.1.2 Worsened cough and wheezing;
- 1.1.3 Reduced lung function;
- 1.1.4 Increased asthma attacks including a likely cause asthma in children
- 1.1.5 Greater likelihood of emergency department and hospital admissions.

Nitrogen dioxide can also react with other chemicals in the air to form other pollutants such as particulate matter and ozone.

2.4 Nitrogen dioxide and health in Ireland

Longer exposures to elevated concentrations of nitrogen dioxide may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as young children and older adults have increased sensitivity to its effects and are generally at greater risk for the health effects of nitrogen dioxide. Asthma is of particular importance in the Irish context.

The Asthma Society of Ireland in its 2019 report has estimated:

- That 1 in 13 people in Ireland have asthma.
- Asthma affects at least 1 in 5 Irish children at some stage of their life
- There are 2.4 million asthma GP consultations in Ireland annually.

Recent EPA sponsored research in Ireland among over 50's found an association between local air pollution and asthma among older adults at relatively low concentrations of nitrogen dioxide. The study drew its sample from the Irish Longitudinal Study on Ageing (TILDA) and used estimated levels of ambient pollution i.e. local nitrogen dioxide concentrations at each participant's residential address. The results found a positive association between local air pollution generally and the probability of suffering from asthma for a large representative sample of older adults in Ireland.

Another study by Quinyne et al (2019) used routine available data to examine the relationship between poor air quality and hospital admissions due to cardiovascular and respiratory diseases in Dublin City & County between 2014 and 2018. The study findings indicated significant rises in admissions with change in AQIH from good to very poor for asthma, chronic obstructive airways disease and heart failure.

A number of other Irish health studies on the relationship between nitrogen dioxide and health are either ongoing or planned, and these provide a valuable benchmark not only in terms of estimating current health burdens but will also in terms of assessing the effectiveness of interventions that will be introduced over time.

2.5 The Air Quality Index for Health (AQIH) for Ireland

This index was devised by the Environmental Protection Agency in collaboration with the Health Service Executive and is accessible at www.airquality.ie where it is an integral element of how air quality monitoring data is presented to the public.

The Air Quality Index for Health (AQIH) is essentially a map of Ireland, showing the colour/number coded air quality (ranging from green for "good" to red for "poor") at each monitoring station so a viewer can quickly see what air quality is like in their area. The index has specific health advice for those who are more sensitive to air pollution – for example, people with heart or lung conditions. The advice includes guidance to the public on what to do if air quality is poor in their area.

2.6 Air Quality Management in Ireland

Overview

This section of the plan will provide an overview of the administrative arrangements and policies in place in Ireland regarding air quality management. There is also a wider European Union dimension to some of these policies which will also be addressed.

Role of national government and agencies

The Department of the Environment, Climate and Communications (DECC) is the government department charged with the protection of the natural environment and its impact on the health and wellbeing of citizens. It creates policies and measures to prevent and minimise activities that cause environmental damage such as air, water and land pollution.

The Environmental Protection Agency (EPA) as stated earlier, is the competent authority for all matters dealt with in the Air Quality Standards Regulations 2011. The EPA also have wider enforcement powers including oversight of the performance of local authorities of their statutory functions in relation to environmental protection under the Air Pollution Act 1987 and the Environmental Protection Agency Act 1992.

Role of local authorities

Local authorities are the enforcement agencies for the Air Pollution Act 1987, which covers a wide range of matters including addressing air pollution incidents, regulating sales of solid fuels, issuing permits for specified facilities and preparation of air quality plans. A number are also engaged in air quality monitoring under the auspices of the EPA.

2.7 EU Level Policies relevant to air quality 2013 Clean Air for Europe

This further iteration of the original Clean Air for Europe (CAFE) programme 2001 provides for national emission reduction targets set in the National Emission Ceilings Directive for the main transboundary air pollutants: sulphur oxides, nitrogen oxides, ammonia, volatile organic compounds and particulate matter. It also addresses emission standards for the main sources of pollution, from motor vehicles and ships to power generation and industry. These standards are defined at EU level in legislative acts targeting industrial emissions, emissions from power plants, vehicles and fuels, as well as the energy performance of products.

Fit for 55 – European Green Deal

In July 2021, the European Commission adopted a package of proposals to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. Achieving these emission reductions in the next decade is crucial to Europe becoming the world's first climate-neutral continent by 2050 and making the European Green Deal a reality. With these proposals, the Commission is presenting the legislative tools to deliver on the targets agreed in the European Climate Law and fundamentally transform the EU economy and society for a fair, green and prosperous future.

2.7.1 National Level Policies relevant to air quality

National Clean Air Strategy

The Department of the Environment, Climate and Communications (DECC) is developing a national Clean Air Strategy with the aim of promoting clean air policies to enhance and protect air quality. The National Clean Air Strategy will set out a framework for how all government departments can work to reduce air pollution and promote cleaner air. It will work alongside other plans, such as the National Air Pollution Control Programme and the National Energy and Climate Plan, to tackle the key challenges of air pollution. These include:

- Transport emissions, especially road transport emissions of Nitrogen Oxide (NOx) and fine particulate matter (PM 2.5)
- Emissions from industry, agriculture, and shipping
- The persistent problem of “smoky” emissions from burning solid fuel in home, it is anticipated this Strategy will be published in 2021.

Climate Action Plan 2019 and the Climate Action Act 2021

Given the sources involved, there is an obvious synergy between developing measures to address ambient nitrogen dioxide levels and addressing the wider climate action and carbon reduction agenda. While The **Climate Action Plan 2019** deals with a wider range of issues (of which air quality is but one), it does sets out an ambitious course of action for each sector within Ireland to achieve the targets needed to adhere to the Paris Agreement. For the transport sector, the target is a reduction of 45- 50% in transport related emissions by 2030, with a significant reduction expected in the latter half of the decade. This will require a significant modal shift from car to public transport and active travel, as well as a significant uptake of electric vehicles and increased use of biofuels.

Action 81 of the Plan is of particular relevance to this plan as it commits to: *Develop a regulatory framework on low emission zones and parking pricing policies, and provide local authorities with the power to restrict access to certain parts of a city or a town to zero emission vehicles only. Examine the role of demand management measures in Irish cities, including low emission zones and parking pricing policies.*”

The Climate Action and Low Carbon Development (Amendment) Act 2021 was signed into law on 23 July 2021. Amongst a wide range of measures, this Act provides a statutory basis for:

- The approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050
- Carbon budgets and a sectoral emissions ceiling to apply to different sectors of the economy;
- Local authority climate action plans
- Local authorities shall, when making development plans, to take account of their climate action plans

Climate Action Plan 2021

The Climate Action Plan 2021 was published on 4th November 2021. The Plan aims to put Ireland on a more sustainable path, cutting emissions, creating a cleaner, greener economy and society and protecting Ireland from the consequences of climate change. The Climate Action Plan follows the Climate Act 2021, which commits Ireland to a legally binding target of net-zero greenhouse gas emissions no later than 2050, and a reduction of 51% by 2030. These targets are a key pillar of the Programme for Government. The plan sets out indicative ranges of emissions reductions for each sector of the economy. It also sets out the actions needed to deliver on our climate targets.

[2.7.2 Regional level measures and policies](#)

[Dublin Regional Air Quality Management Plan for improvement in levels of nitrogen dioxide in ambient air quality.](#)

In September 2010, the Environmental Protection Agency informed the City and County Managers in the Dublin Region that an exceedance of nitrogen dioxide levels had occurred at the Winetavern Street monitoring station during 2009. Accordingly, the four local authorities prepared a plan to address these matters, which was submitted to the Environmental Protection

Agency in 2011. In the intervening decade, nitrogen dioxide levels recorded at the monitoring stations in the Dublin region were within EU limit values up to the exceedance recorded in 2019.

2.8 Air Quality Assessment in the Dublin Region – Practice and Results

While an overview of general air quality assessment in Ireland has been addressed earlier in this Chapter, the specific practice of air quality monitoring in Dublin and the knowledge gained from that is central to the narrative in this plan.

Local authorities in the Dublin region have carried out air quality monitoring since 1973. The knowledge gained from that monitoring was instrumental in providing the evidence base that led to the introduction of the bituminous coal ban in Dublin in 1990.

Following the establishment of the Environmental Protection Agency in 1992, these authorities have worked closely with the EPA in developing and expanding the national monitoring network in the Dublin region as well as developing local monitoring networks.

Under the National Ambient Air Monitoring Programme (NAAMP), the following national monitoring stations have been established in the Dublin region:

Table: 2.1 Monitor Locations and Pollutant Measured

<u>No.</u>	<u>Location</u>	<u>Pollutants Monitored</u>
1	Ballyfermot Library Dublin 10	Particulate (PM10 &2.5), Nitrogen dioxide
	Blanchardstown Dublin 15	Particulate (PM10 &2.5), Nitrogen dioxide
3	Davitt Road Inchicore Dublin 8	Particulate (PM10 &2.5), Nitrogen dioxide
4	Dublin Airport Swords Co Dublin	Particulate (PM10 &2.5), Nitrogen dioxide, Ozone, Sulphur dioxide
5	Dublin Port Dublin 1	Particulate (PM10 &2.5), Nitrogen dioxide, Sulphur dioxide
6	Dun Laoghaire Co Dublin	Particulate (PM10 &2.5), Nitrogen dioxide
7	Pearse Street Dublin 2	Nitrogen dioxide. Ozone
8	Ringsend Dublin 4	Particulate (PM10 &2.5), Nitrogen dioxide, Sulphur dioxide
9	Rathmines Dublin 6	Particulate (PM10 &2.5), Nitrogen dioxide, Sulphur dioxide , Ozone
10	St John's Road West Dublin 8	Particulate (PM10 &2.5), Nitrogen dioxide
11	Swords Co Dublin	Nitrogen dioxide, Ozone
12	Tallaght Dublin 4	Particulate (PM10 &2.5), Nitrogen dioxide
13	Winetavern Street Dublin 8	Nitrogen dioxide, Sulphur dioxide, Carbon monoxide, Particulate (PM10)
14	Phoenix Park	Particulate (PM10 &2.5)
15	Marino Dublin 3	Particulate (PM10 &2.5)
16	St. Anne's Park Dublin 5	Particulate (PM10 &2.5)
17	Finglas Dublin 11	Particulate (PM10 &2.5)
18	Clonskeagh 14	Particulate (PM10 &2.5), Ozone

The geographic distribution of these monitoring stations can be seen on the map below:

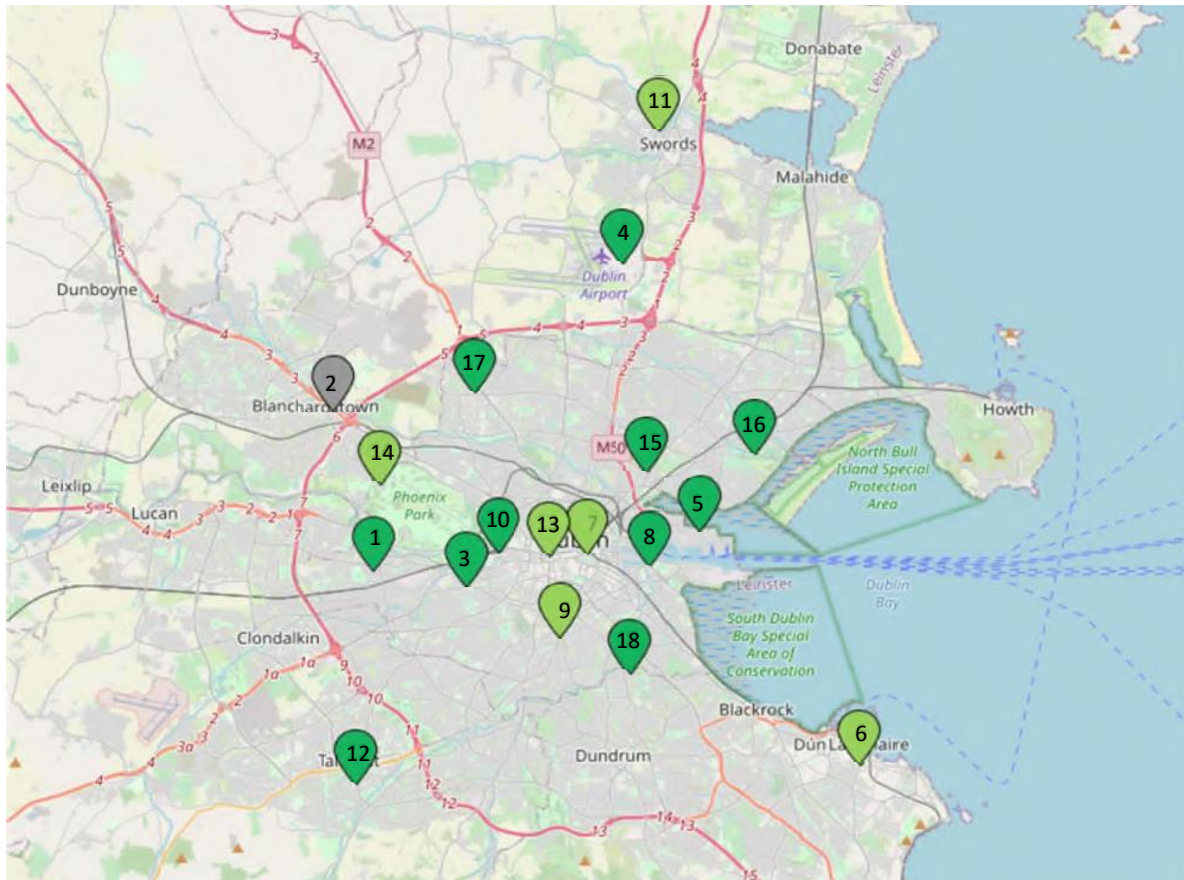


Figure: 2.2 Map of Monitoring Station Locations in Dublin Region

2.9 Nitrogen dioxide monitoring results in Dublin 2011-2021

The levels of nitrogen dioxide in an urban area can vary dramatically over a short distance (a few metres), with the highest concentrations within 10 metres of the roadside. As stated previously, nitrogen dioxide pollution is strongly linked with traffic emissions and the levels decrease significantly with distance from the road carriageway. Levels of nitrogen dioxide also vary depending on factors such as:

- Traffic volume and density
- Ages of vehicles
- Vehicle fuel (diesel vehicles are associated with higher levels of nitrogen dioxide than petrol engines)
- Speed of vehicles
- Width of streets and their buildings
- Weather conditions

In the context of the Dublin region, The Graph/Chart below illustrates the annual average nitrogen dioxide levels as measured during the period 2011-2021. There are individual graphs/charts provided for each station in the Appendices to this plan. As can be seen, while levels at all stations have been below the legal limit value of 40 micrograms per cubic metres over the period, there is the one exceedance at St. Johns Rd. West for 2019 - which was the first calendar year of monitoring at that location. However, the significance of this exceedance and the reasons for establishing an air quality monitoring station at this location are central to the ongoing efforts of assessing and managing nitrogen dioxide levels in the Dublin region.

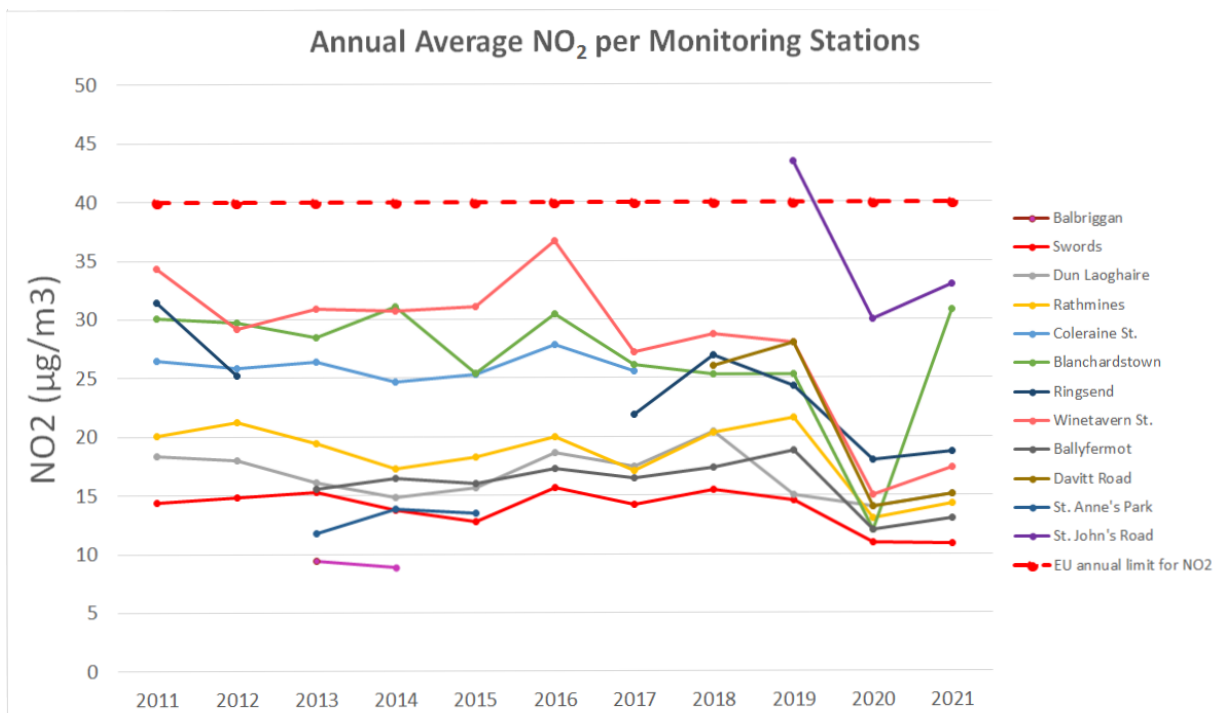


Figure: 2.3 Annual Average Nitrogen Dioxide Levels

It should be noted that the 2021 (to date) results for Tallaght and Pearse Sreet are not included in this graph as this is the first year that data is available for these locations.

The 2021 (to date) data for both these locations is included in the table below. It must be emphasised that all the 2021 (to date) is unverified and will go through a quality assurance process before final release.

Table: 2.2 Annual Average Nitrogen Dioxide levels across monitoring stations

Stations	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021 Year to Date unverified
Balbriggan			9.38	8.90							
Swords	14.41	14.86	15.31	13.78	12.80	15.67	14.22	15.51	14.60	11.0	10.9
Dun Laoghaire	18.33	17.98	16.07	14.80	15.61	18.59	17.44	20.47	15.01	14.0	15.1
Rathmines	20.10	21.20	19.45	17.26	18.27	19.95	17.10	20.32	21.58	13.0	14.3
Coleraine St.	26.45	25.85	26.42	24.63	25.27	27.79	25.55				
Blanchardstown	30.14	29.71	28.47	31.11	25.37	30.43	26.17	25.31	25.31	12.0	30.8
Ringsend	31.47	25.25					21.86	26.96	24.32	18.0	18.7
Winetavern St.	34.36	29.21	30.91	30.73	31.12	36.71	27.20	28.75	28.02	15.0	17.4
Ballyfermot			15.5	16.5	16.0	17.3	16.5	17.4	18.8	12.0	13.0
Davitt Road								26.05	28.02	14.0	15.1
St. Anne's Park			11.75	13.80	13.50						
St. John's Road									43.43	30.0	33.0
Tallaght											12.4
Pearse St.											35.5

2.10 St. John's Road West 2019 results

The data behind the exceedance of the EU limit value for nitrogen dioxide recorded at the St John's Road West site in 2019 is worth further analysis. The actual average nitrogen dioxide concentration measured at the site for the year was 43 micrograms per cubic metre. This level of air pollution is wholly consistent with the levels of heavy traffic passing this monitoring station. It should be stated in this instance for nitrogen dioxide the pollution is not imported from other regions. The Figure below shows the average nitrogen dioxide concentrations by hour of day observed there over the entirety of 2019. The classic pattern of pollution levels matching commuter traffic flow can be seen between two peaks in pollutant levels- one during the morning and one during the evening rush hours. Also of note is the quite high baseline level of nitrogen dioxide, which suggest quite consistent traffic volumes in this area. It should be noted that annual nitrogen dioxide levels at St. John's Rd. West were below 40 micrograms per cubic metre for 2020 and 2021 (see above). Nitrogen dioxide levels at other locations also remain below 40 micrograms per cubic metre at other monitoring locations for the same period.

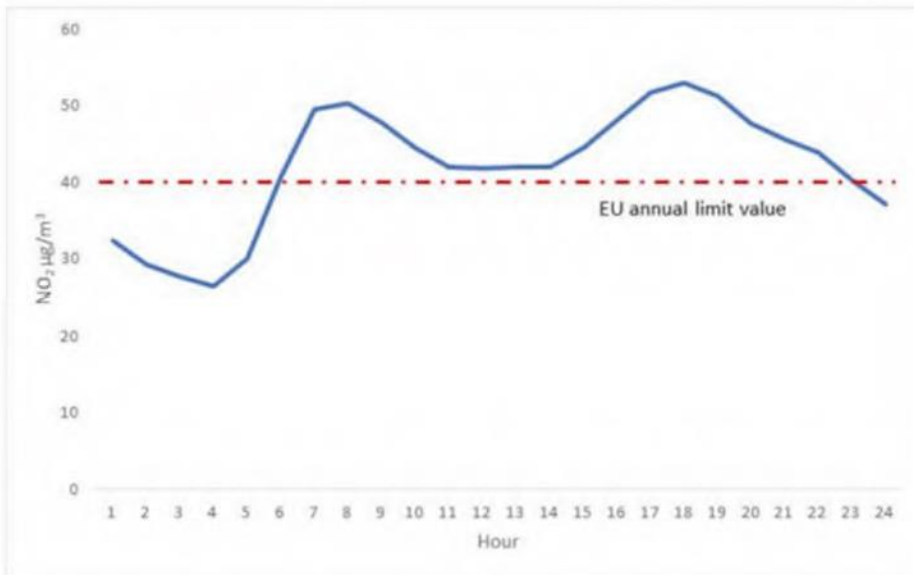


Figure: 2.4 Average NO₂ concentrations by hour of day as St. John's Road West in 2019

2.11 The EPA Urban Environmental Indicators: Nitrogen dioxide levels in Dublin

Report 2019

The reasons behind establishing an air quality station at St. John's Road West, and other locations, can be traced back to work carried out by the EPA (in collaboration with Dublin City Council) during 2016 and 2017, which was subsequently published in their Urban Environmental Indicators: Nitrogen dioxide levels in Dublin Report 2019

This work was prompted by observation by the EPA in annual air quality reports, that nitrogen dioxide levels in urban areas have been steadily increasing and at times in some locations approached the EU limit value.

As part of the National Ambient Air Monitoring Programme, novel approaches and equipment to assess air quality are utilised to complement the national monitoring network. One of these approaches involved carrying out diffusion tube surveys in two phases during 2016 and 2017 in Dublin to investigate nitrogen dioxide levels near both traffic sites and at suburban background sites.

These diffusion tube surveys involve installing plastic tubes mounted vertically on walls or similar structures that contain a chemical that absorbs nitrogen dioxide directly from the air, which can be taken to a laboratory and analysed. They are a relatively inexpensive form of indicative sampling but only give an estimate of longer-term average nitrogen dioxide concentrations.

The national reference stations on the other hand use highly sophisticated methods to provide accurate, continuous and precisely measured nitrogen dioxide concentrations in the field.

In Phase 1, diffusion tubes were sited at 12 locations close to existing reference stations to compare their levels. Once satisfied with tube performance the numbers of sampling sites were expanded to include in phase 2 a number of heavily trafficked locations.

In Phase 2, 25 locations were used during 2017. Of these 11 locations indicated a potential breach of EU limit values. In general, concentrations of nitrogen dioxide were highest at urban traffic locations, clearly showing the impact of traffic on busy roads from nitrogen dioxide. The report also utilised mathematical modelling to predict nitrogen dioxide levels across the rest of the Dublin region.

The three key findings of the Urban Environmental Indicators Report were as follows;

1. Highest levels of nitrogen dioxide are at locations with heavier traffic. This clearly shows the impact traffic has on the levels of nitrogen dioxide in areas close to busy roads in Dublin.
2. There are many areas where nitrogen dioxide is problematic – In some locations, the NO₂ levels were high which indicates an increased risk that EU limits could be exceeded.

Some areas of concern include:

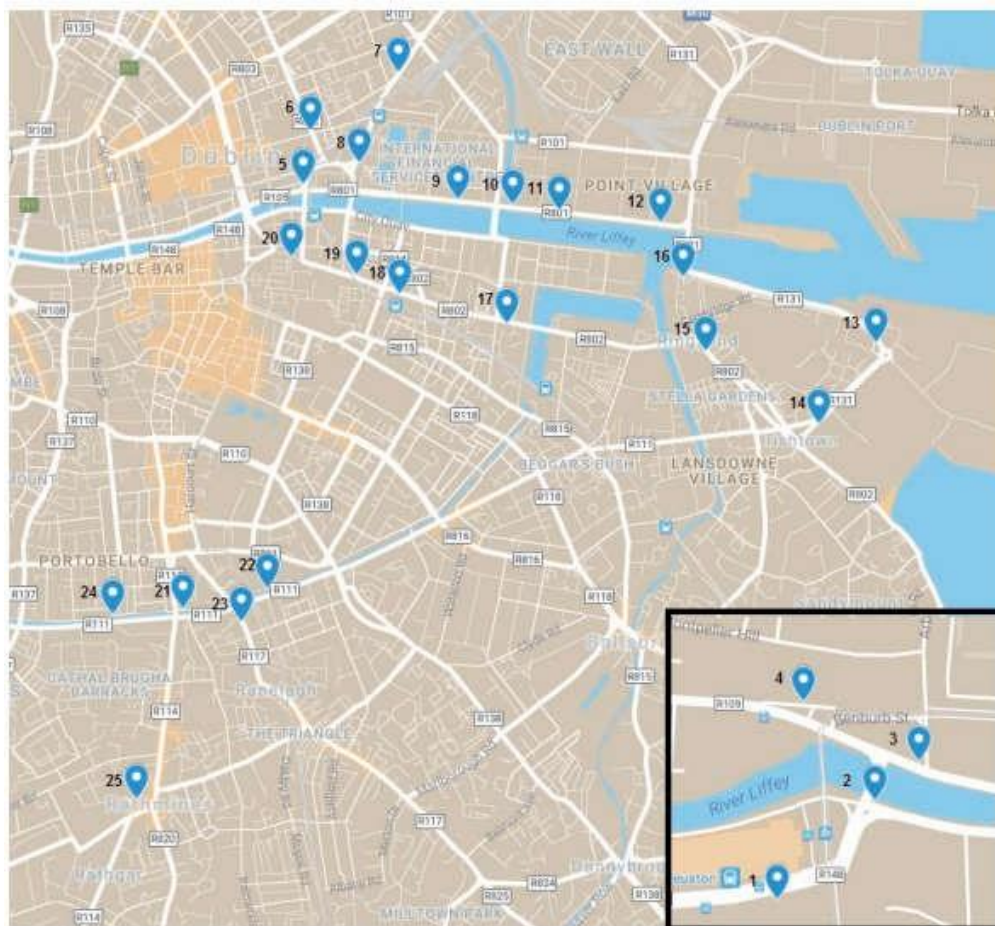
- certain city centre streets,
 - the M50 motorway, and
 - the entrance to and exit from the Dublin Port Tunnel.
3. Levels of nitrogen dioxide are well within the EU limits in many residential areas – Away from busy roads the levels of nitrogen dioxide drop significantly and are well beneath the recommended EU limits in many residential areas.

As a direct consequence of these diffusion tube studies, nitrogen dioxide monitoring stations were subsequently established at St John's Road West (commenced first full year of monitoring in 2019), Pearse Street (commenced first full year of monitoring in 2020) and Dublin Port (commencing first full year of monitoring in 2020). It is worth noting that the

measured exceedance at St. Johns Rd. West in 2019 confirmed the predicted exceedance presented in the EPA's Urban Environmental Indicators Report. This in turn led to the necessity to prepare this plan and underlines the importance and value of such studies.

The two figures below indicate

- i. the geographic spread of the diffusion tubes deployed in Dublin during 2017
- ii. the results obtained



- | | | |
|--------------------------|---------------------------------|----------------------|
| 1. Dr Steevens' Hospital | 10. North Wall Quay 2 | 19. Pearse Street 3 |
| 2. Victoria Quay | 11. North Wall Quay 3 | 20. Pearse Street 4 |
| 3. Wolfe Tone Quay | 12. North Wall Quay 4 | 21. Charlemont Mall |
| 4. Benburb Street | 13. 13 Pigeon House Road | 22. Charlemont Place |
| 5. Old Abbey Street | 14. Sean Moore Road | 23. Ranelagh Road |
| 6. Gardiner Street Lower | 15. Ringsend Fitzwilliam Street | 24. Kingsland Parade |
| 7. Amiens Street North | 16. York Street | 25. Wynnefield Road |
| 8. Amiens Street South | 17. Pearse Street 1 | |
| 9. North Wall Quay 1 | 18. Pearse Street 2 | |

Figure 2.5: Location of diffusion tube sampling sites (2017)

With respect to the results below, it should be noted that the diffusion tubes were dispersed in groups (or clumps) in close proximity to each in different locations. Therefore, as might be

expected, the results for each location in each group would be broadly similar. In deciding where to subsequently locate a national reference air quality monitoring station in a given general area (i.e. around St. John's Road West or Pearse Street, due regard to the siting criteria in the Air Quality Standards Regulations 2011 was necessary.

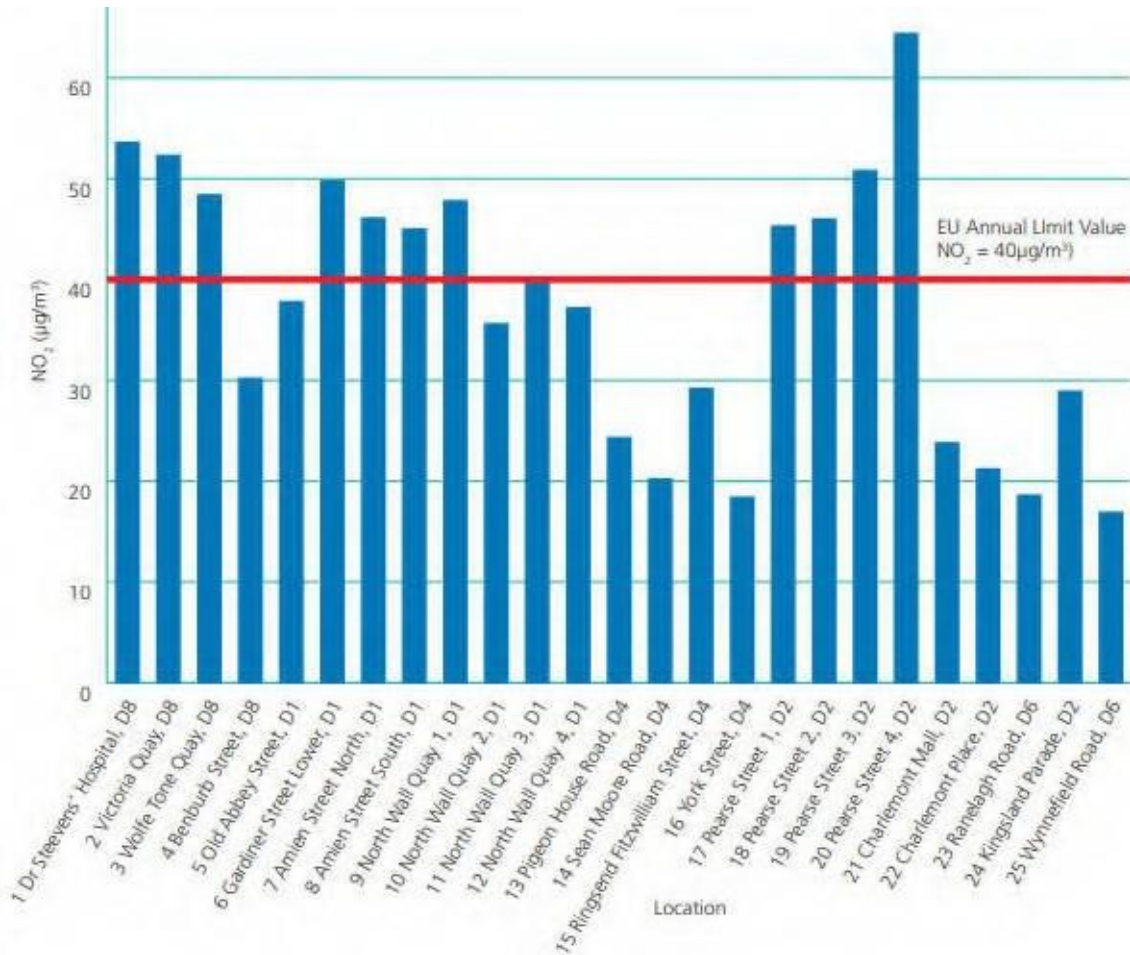


Figure 2.6: Nitrogen dioxide diffusion tube results (2017)

2.12 Follow Up Steps - Urban Transport Related Air Pollutants (UTRAP) Working Group.

The Environmental Protection Agency formally informed the European Commission on 30 September 2020 of the exceedance recorded at St. John's Road West for 2019, and outlined the procedure that would be followed to address this matter. It is crucial to make clear at this juncture, that as a direct result of the findings of the *EPA Urban Environmental Indicators: Nitrogen dioxide levels in Dublin Report*, the Department of the Environment, Climate and Communications (DECC) and the Department of Transport (DoT) established the Urban Transport-Related Air Pollution (UTRAP) Working Group in late 2019. Further information on UTRAP can be found at: <https://www.gov.ie/en/publication/3f634-urban-transport-related-air-pollution-utrap-working-group/>

The UTRAP group includes representatives from the Department of Health, Department of Finance, Department of Public Expenditure and Reform, National Transport Authority, Transport Infrastructure Ireland, Environment Protection Agency, Dublin City Council, South Dublin County Council, Dublin Bus, Bus Eireann, Health Services Executive, Road Safety Authority and the Climate Action Regional Office.

The Terms of Reference or UTRAP are as follows:

1. Enhance awareness of clean air legislation and its requirements generally, and specifically in relation to nitrogen dioxide and other transport related air pollutants, amongst relevant stakeholder organisations;
2. Provide a forum to enhance understanding of the causes and the health and environmental impacts of nitrogen dioxide air pollution and other transport related air pollutants in conurbations;
3. Identify developments that may impact on nitrogen dioxide levels and other transport related air pollutants in conurbations, e.g. evolving technical standards, and quantify the impact under likely future scenarios;
4. Identify examples of best practice in combatting nitrogen dioxide air pollution and other transport related air pollutants in conurbations, particularly road traffic-related air pollution, assess applicability and any barriers to their implementation in an Irish context;
5. Consider a range of options for potential measures and any associated actions and supports required to facilitate their effective uptake to address nitrogen dioxide and other air pollution; identify measures most suitable to Ireland and appropriate implementation bodies; and
6. Present the final UTRAP recommendations to both Ministers for consideration by Government.

An interim progress report has been issued and the UTRAP group will issue a final report later in 2021. This report will detail the final suite of recommendations designed to support a decrease in nitrogen dioxide levels in the urban environment and set out a timeline for implementation. The group will continue to meet to support the implementation phase. The development of the Dublin Regional Air Quality Plan is an essential element in informing the conclusions of UTRAP in these matters.

This initiative of establishing UTRAP is a clear recognition that addressing nitrogen dioxide levels in the Dublin region involves multiple stakeholders, each playing their respective roles to the full. While the Dublin local authorities are a crucial element in preparing this air quality plan, other stakeholders have key roles in its implementation, and as will be borne out by the measures

proposed, and there is a shared reliance on the collaboration of all the stakeholders to achieve shared goals. In particular the pivotal role and responsibilities of two national bodies who are stakeholders on UTRAP, are crucial to understanding the dynamics in addressing air quality challenges related to the transport sector in Ireland.

The National Transport Authority (NTA) is a statutory non-commercial body, which operates under the aegis of the Department of Transport. The NTA is responsible for developing and implementing strategies to provide high quality, accessible, sustainable transport across Ireland. One of the primary statutory functions of NTA is to develop and implement a transport strategy for the Greater Dublin Area, and the Authority is also closely involved in developing transport strategies in regional cities.

NTA funds and oversees Public Service Obligation (PSO) public transport, ensuring that vital bus and rail services are available to communities in all parts of the country under the Transport for Ireland brand. NTA is also the licensing authority for the commercial bus sector and Small Public Service Vehicles (SPSVs). The NTA also has responsibility for the regulation of the small public service vehicle (SPSV) sector in accordance with the Taxi Regulation Act (2003). The NTA also enforces the vehicle clamping legislation and has established a statutory Code of Practice to provide guidance to parking controllers, and clamping operators.

Transport Infrastructure Ireland (TII) was established through a merger of the National Roads Authority and the Railway Procurement Agency. The TII's primary function is to provide an integrated approach to the future development and operation of the national roads network and light rail infrastructure throughout Ireland. TII brings together two organisations to provide high quality transport infrastructure and services, delivering a better quality of life and supporting economic growth.

TII provide opportunities to combine the expertise and proven record of the organisations which have delivered the Luas (Light rail) and the National Motorway Network thereby offering the potential for innovation and optimised delivery in the context of national roads, light rail and other infrastructure initiatives and programmes.

3.0 Sources of NOx Emissions

3.1 Introduction

Many areas of activity impact on air quality, power plants, industry, gas and oil boilers, however in relation to urban areas it is largely transport activities and the internal combustion engine which cause exceedances of NO₂. Accordingly, this plan is focused on road transport emissions.

The EPA report on national air pollution emissions as part of Ireland's obligations under the Convention on Long Range Transboundary Air Pollution and the National Emissions Ceiling Directive. Below is a breakdown of the sources of NO_x and the trend in transport NO_x emissions for Ireland as reported by the EPA to the European Environment Agency. Table 3.1 below shows the breakdown of overall national emissions. Emissions from road transport will be a higher percentage in urban Areas, which is the focus of this plan; however, it is informative of the overall emissions and sources of NO_x.

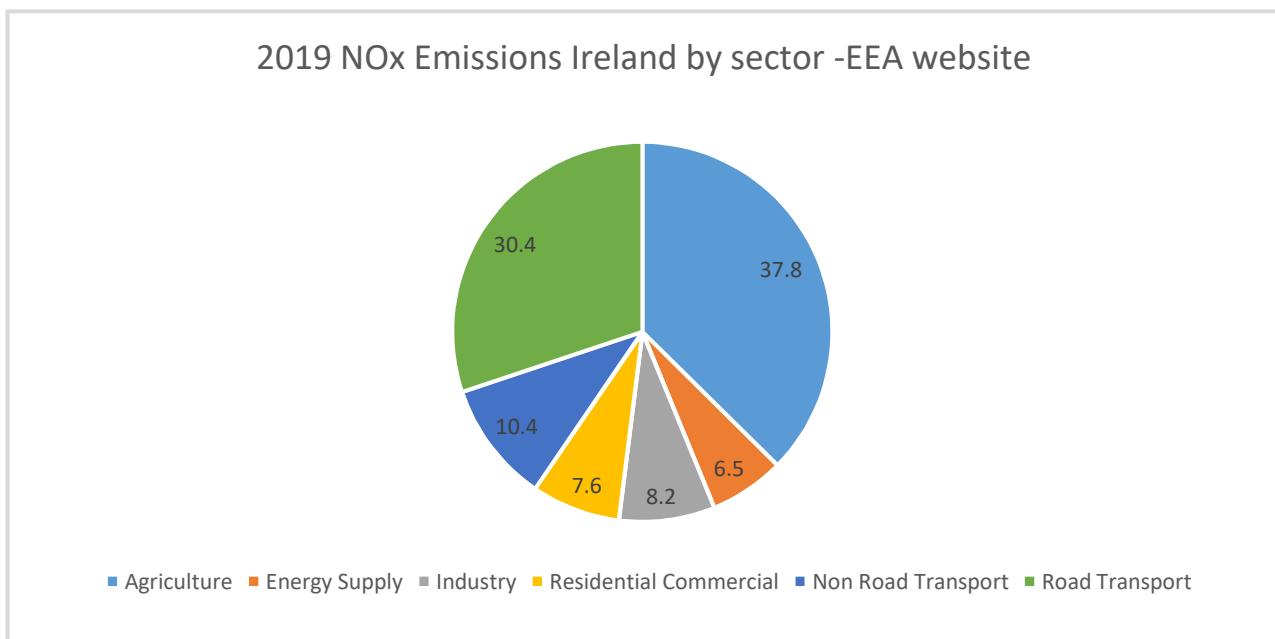


Figure 3.1 2019 NO_x Emissions Ireland

Figure 3.2 below shows transport emissions have halved over a period of 30 years despite an increase in traffic volumes.

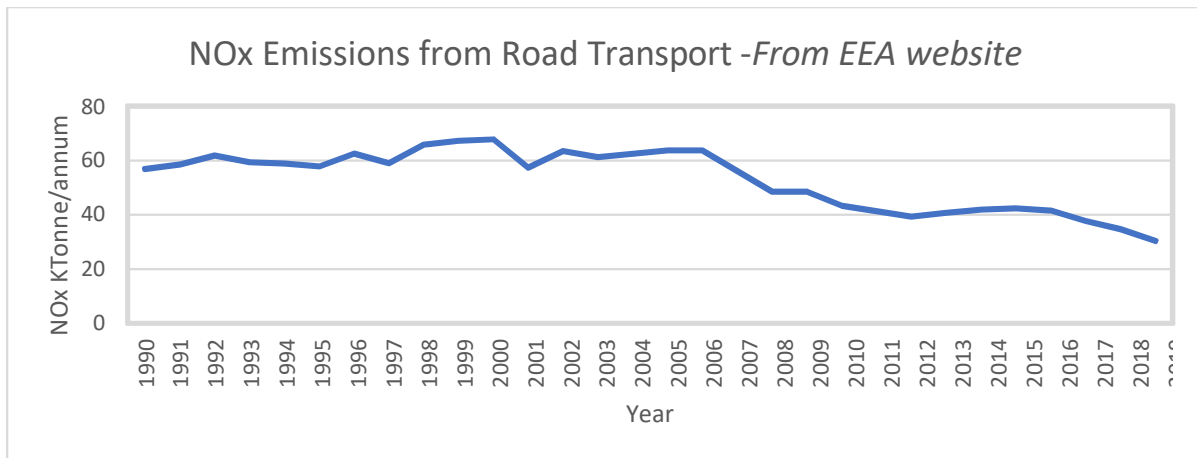


Figure 3.2 NOx Emissions from Road Transport

The EPA also published a study on Urban Air Quality Modelling of Dublin July 2019 that calculated reported on NOx emissions in the Dublin Area and is shown below in Figure 3.3

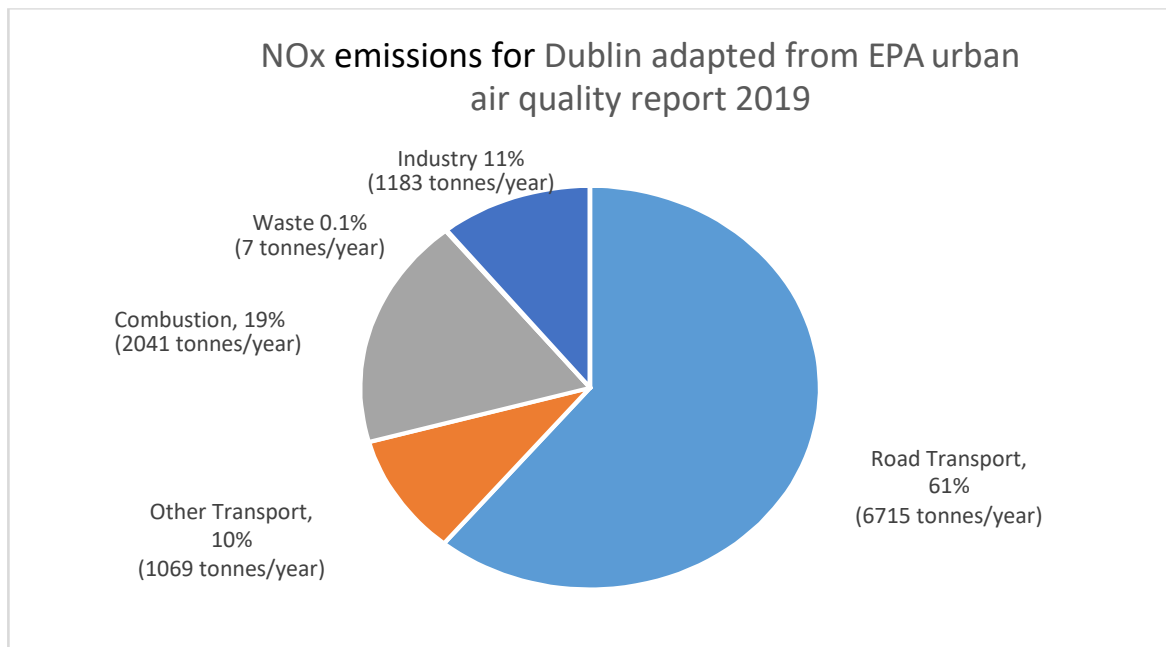


Figure 3.3 NOx Emissions for Dublin by source

3.2 Vehicle Emissions Standards

Vehicle emission standards road vehicles are governed by EU directives and regulations - Regulation (EC) No. 715/2007 and its implementing Regulation (EC) No. 692/2008, as amended) Table 3.1 below shows the limits for the range of pollutants for the various Euro standards. There has been controversy over the NO_x standards for diesel vehicles in that real driving emissions are sometimes a factor of 10 greater than the laboratory conformity test in the regulations. Figure 3.4 below shows the discrepancy. In addition, defeat devices to cheat the test were discovered to have been installed by a number of manufacturers. This led to a revision of the standards and the inclusion of a RDE (Real Driving Emissions) conformity test. The emissions from the RDE test were allowed to exceed the standard for an interim period that expired in January this year.

Table 3.1 from European Environment Agency 2016¹

Emission limits (g/km) of the successively introduced Euro emission standards for passenger vehicles

Diesel	Date	CO	NMHC	NO _x	HC + NO _x	PM	PN
Euro 1	July 1992	2.72	-	-	0.97	0.14	-
Euro 2	January 1996	1.0	-	-	0.7	0.08	-
Euro 3	January 2000	0.64	-	0.50	0.56	0.05	-
Euro 4	January 2005	0.50	-	0.25	0.30	0.025	-
Euro 5a	September 2009	0.50	-	0.180	0.230	0.005	-
Euro 5b	September 2011	0.50	-	0.180	0.230	0.005	6.0 × 10 ¹¹
Euro 6	September 2014	0.50	-	0.080	0.170	0.005	6.0 × 10 ¹¹
Petrol	Date	CO	NMHC	NO _x	HC + NO _x	PM	PN
Euro 1	July 1992	2.72	-	-	0.97	-	-
Euro 2	January 1996	2.2	-	-	0.5	-	-
Euro 3	January 2000	2.3	-	0.15	-	-	-
Euro 4	January 2005	1.0	-	0.08	-	-	-
Euro 5	September 2009	1.0	0.068	0.060	-	0.005	-
Euro 6	September 2014	1.0	0.068	0.060	-	0.005	6.0 × 10 ¹¹

¹ Explaining road transport emissions, a non-technical guide, EEA 2016

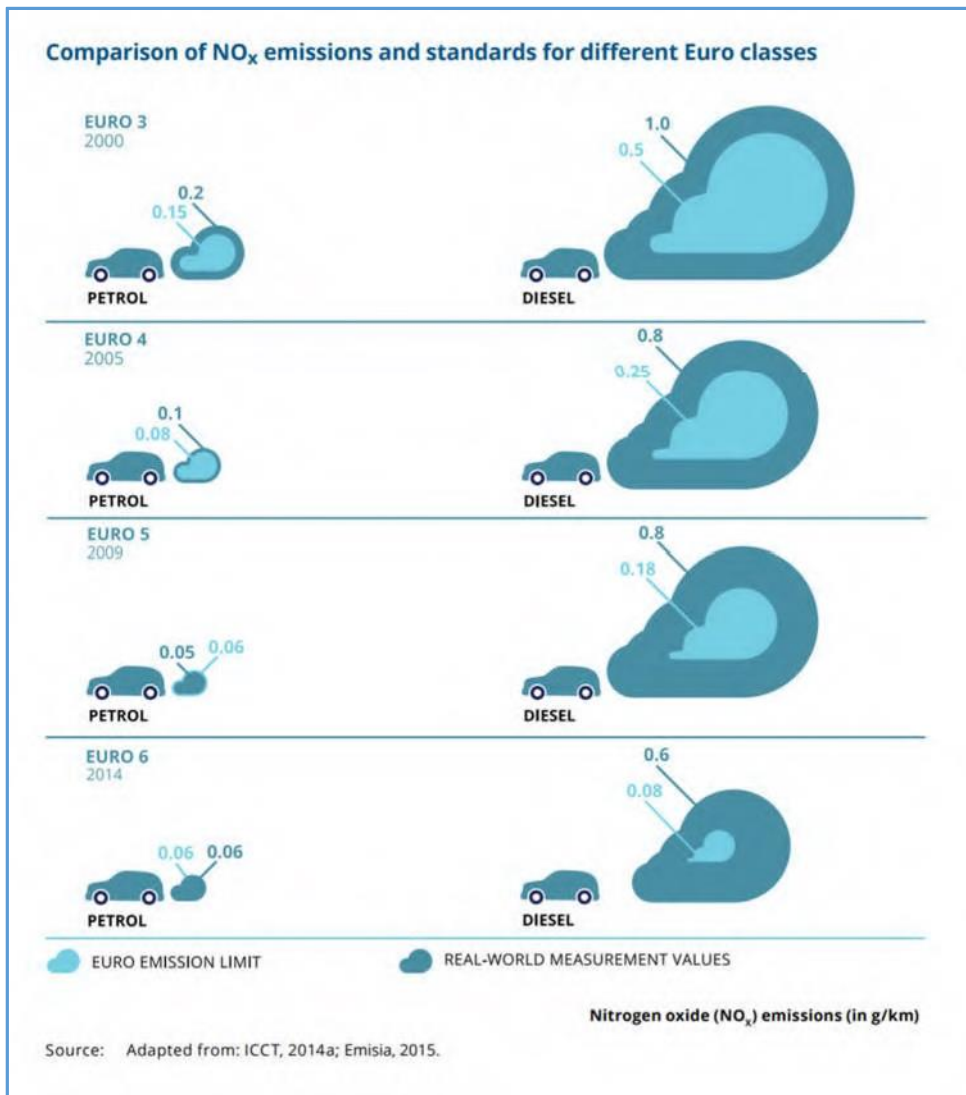


Figure 3.4 (EEA 2016)

EU emissions standards for vehicles

A useful document explaining the revision of standards was published by the European Environment Agency “[Explaining road transport emissions](#)” 2016. Vehicle emissions are speed dependent and congestion causing slow speeds, engine idling and acceleration can increase emissions.

Five Cities Demand Management Study

As part of the background work to the preparation of the Five Cities Demand Management Study, the consultants engaged carried out a study of the of cars entering the city centre to establish the average emission factor using real driving emissions calculation, the study also predicted changes to the average emission factor over this decade based on existing policy measures and emission standards. The forecast shows a drop in the emission factor in Dublin from 0.284 g/km in 2019 to 0.123 g/km in 2030, a reduction of 57%.

Potential Changes to EU Emissions standards

The European Green Deal foresees a proposal for more stringent emission standards to be adopted in 2021 (Euro 7).

Electric Vehicles Strategy

The national climate change strategy has a target of 936,000 electric vehicles by 2030. This will require additional measures to incentivise electric vehicles or disincentivise internal combustion engine vehicles. The abovementioned reduction in average emission factors does not take into account the climate change target, the achievement of which will lead to a further substantial reduction in vehicle emissions beyond the 57% reduction forecast for 2030.

The Dublin Climate Change Action Plan has included an action to improve the roll out of electric vehicle chargers especially for dwellings without driveways to charge their own vehicles. A recent study has estimated the charging requirement based on various scenarios for the roll out of electric vehicles. Policy measures to achieve targets for EVs remain uncertain; however, a more rapid replacement of internal combustion engines by electric vehicles will lead to a more rapid improvement in air quality in the city including NO₂.

Low Emission zones

Low emission zones are zones that charge entry into a zone based on emission factors for individual vehicles. These are being examined by the Five Cities Demand Management Study and have the potential to target reductions in NO₂ in urban areas and are dealt with further in chapter 5.

London Ultra Low Emission Zone

In 2019, a low emission zone was introduced in central London. A daily charge of £12.50 is imposed on the following vehicles

- Motorbikes that do not meet Euro 3 standards (most vehicles pre-2007)
- Petrol cars and vans that do not meet Euro 4 standards (most vehicles pre-2006)
- Diesel cars and vans that do not meet Euro 6 standards (most vehicles pre-2015)

This will in the future apply to residents of the zone and is in addition to the congestion charge

A daily charge of £100 is imposed on Buses, Coaches and Lorries that do not meet Euro VI standards
Compliant vehicles increased from 39% February 2017(announcement of the charge) to 75% after the first four months of operation.

Road Transport Emission Inventories

Road traffic modelling calculating, traffic flows and speeds for different classes of vehicles combined with emission factor functions are used to calculate total emissions by link, grid or area. This modelling allows for the air quality assessment of different future transport scenarios and vehicle emissions standards. Final results of recent modelling are not fully available to show the impact of proposed public transport measures to 2030; however, it is likely that there will be significantly greater reduction due to changes to the fleet emissions compared to reductions in traffic volumes.

4.0 Transport, Vehicle Emissions and Land USE and their impact on Air Quality

4.1 Introduction

Transport related emissions of NO_x are the product of vehicle emission factors and volume of vehicles on the road. Vehicle emission factors are not static but are related to speed and can be increased due to traffic congestion. Table 4.1 below shows the canal cordon count for the previous 11 years and shows a small drop in car usage and a large increase in walking and cyclists and a more modest increase in buses.

Mode	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bus	1,680	1,740	1,814	1,704	1,688	1,539	1,503	1,539	1,504	1,528	1,652	1,637	1,837	1,852
Car	58,664	58,686	58,897	58,232	58,047	55,745	55,343	54,458	53,033	53,064	51,908	50,158	48,820	46,388
Taxi	3,825	4,583	5,079	4,980	4,809	4,862	5,277	5,458	4,955	4,699	4,779	4,098	4,399	4,292
Walk	17,114	18,594	18,360	14,618	15,092	14,551	17,070	17,495	19,711	18,727	21,473	24,936	23,858	24,691
Cycle	4,839	5,676	6,143	6,326	5,952	6,870	7,943	9,061	10,349	10,893	12,089	12,447	12,227	13,131
Goods	2,291	1,445	1,223	1,087	993	1,176	1,099	1,045	1,087	1,096	1,093	1,024	1,153	983
M.Bike	2,395	2,429	2,375	2,060	1,656	1,485	1,425	1,423	1,372	1,390	1,464	1,532	1,477	1,485

4.2 Greater Dublin Area Transport Strategy 2022-2042 (Draft)

This Transport Strategy for the Greater Dublin Area 2022-2042 (Transport Strategy) replaces the previous framework, titled the Transport Strategy for the Greater Dublin Area 2016- 2035, which was approved by the then Minister for Transport, in 2016. That prior transport strategy set out to contribute to the economic, social and cultural progress of the Greater Dublin Area (GDA) by providing for the efficient, effective and sustainable movement of people and goods. It did that by providing a framework for the planning and delivery of transport infrastructure and services in the GDA. It has also provided a transport planning policy around which other agencies involved in land use planning, environmental protection, and delivery of other infrastructure such as housing, water and power, could align their own investment priorities. It has been an essential component, along with investment programmes in other sectors, for the development of the GDA, which covers the counties of Dublin, Meath, Kildare and Wicklow.

The outcomes of the prior Strategy implementation include:

- An increase in the use of sustainable modes for travel into Dublin City in the morning peak, from 66% (2015) to 72% (2019);
- A reduction in the use of cars to enter Dublin City Centre in the morning peak, from 65,000 (2015) to 58,000 (2019);
- Growth in daily passenger trips on Irish Rail services in the GDA, from 119,000 (2015) to 150,000 (2019);

- Increase in total passenger trips on Dublin Metropolitan Area bus services, from 120 million (2015) to 153 million (2019);
- Growth in total passenger trips on the Luas system, from 35 million (2015) to 48 million (2019);
- 87% customer satisfaction among public transport users (2019)

This latest Draft Strategy, published in November 2021 and undergoing public consultation until 17th December 2021 addresses the following challenges:

- Climate Change
- Recovery from the Covid19 Pandemic
- Servicing the Legacy Development Patterns
- Revitalisation of the City Centre and Town Centres
- Transformation of the Urban Environment
- Ensuring Universal Access
- Serving Rural Development
- Improving Health and Equality
- Fostering Economic Development
- Delivering Transport Schemes

The Transport Strategy, in combination with other Government policies and programmes is forecast to lead to a significant reduction in air polluting emissions compared to 2016:

Table 3.2 Air-polluting Emissions 2016 and 2042 (Kg)

	NO_x	NO₂	PM10	PM2.5
2016	7,182,430	2,234,190	537,350	357,300
2042 With Strategy	1,217,850	259,640	445,270	247,590
Reduction	-83%	-88%	-17%	-31%

4.3 Five Cities Demand Management Study

The Department of Transport commissioned Systra Ltd. to undertake a study on traffic in the cities of Dublin, Cork, Galway, Limerick and Waterford titled “Five Cities Demand Management Study. Their final report was published on 25 November 2021 to provide a *“focused and evidence based approach to addressing the carbon, congestion and air quality challenges facing our cities”*. The report list and assess options for addressing the challenges. Many of the measures discussed in chapter 5 of this Air Quality Plan are consistent with this study.

4.4 Remote Working

Remote working has the potential to reduce the demand for travel and lead to a reduction in NOx emissions. Government Policy is for a degree of remote working in the public service and many firms are setting policies that would allow some remote working. It is too early to quantify the longer-term level and other impacts of remote working and therefore assess the impact on air quality. The reduction in commuting due to remote working might be offset by a reluctance to use public transport and any road space freed up by remote working might be taken up by public transport users transferring to car transport. Remote working might encourage a trend where people live further away from their place of employment, travelling to work fewer days a week but for a longer distance.

4.5 Land Use Planning

The four Dublin Authorities are responsible for the preparation of county and city development plans and local area plans at a sub county level. The development plans are required to be consistent with the GDA Transport Strategy and are assessed by the National Transport Authority in this regard. This plan has not identified any changes to land use plans.

4.6 Bus and taxis

In the city centre area buses and taxis are a significant portion of NOx emissions. On a per passenger basis. Euro 6d buses have an emission factor (Coper 5.4) of 0.597 g NOx/km compared to 0.17g/km for a small diesel car. The bus however would be much lower emitter on a per passenger basis.

Dublin Bus have a number of hybrid buses and announced a trial purchase of hydrogen buses and have a relatively modern diesel engine fleet. There is an action in the 2021 climate action plan to evaluate fully electric buses as part of bus procurement. The latter commits to a significant decarbonising of Ireland’s public transport fleet and requires that all new urban buses be electric hybrid or electric. The NOx emissions from the private bus fleet is also an

area for NOx reduction especially as this fleet is likely to have a higher proportion of older diesel engines which are higher emitters of NOx.

Similarly, for Taxis. A proportion of the Taxi fleet will be higher emitters of NOx and additional regulation to remove these from the Taxi fleet in the city centre area would lead to a reduction in NOx.

4.7 Heavy Duty Vehicles

Similarly to cars and buses Euro standards apply to heavy duty vehicles, however further regulation of deliveries and heavy duty vehicles in the city centre is an option to be considered in particular a low emission zone which could apply to these vehicles alone to speed up the replacement of older vehicles using the city centre which could be combined with the current regulation of 5 axle vehicles using the city centre.

5.0 Measures to be adopted to reduce nitrogen dioxide in Dublin

5.1 Introduction

This Chapter will address the measures and actions required to address nitrogen dioxide levels in the Dublin Region. These measure and actions are proposed are to be implemented over varying times scales and will require specific interventions by a range of stakeholders. In considering the measures required to reduce nitrogen dioxides level in the Dublin region, it must be emphasised that no single body has exclusive ownership of those measures. The measures are purposely presented in a “bottom up” fashion to support the principle that local authorities can take actions that have a definitive influence on air quality , albeit that may need using legal powers available under other legislation. This is particularly relevant in Ireland as the powers currently delegated to them in air quality plans are limited.

5.2 Measures

Measure 1 - Integrate “15 Minute Neighbourhoods” concept in City and County Development Plans

The Five Cities Demand Management Study <https://www.gov.ie/en/publication/c6571-five-cities-demand-management-study/> identifies the introduction of the 15 Minute Neighbourhoods concept as the No. 1 overall ranked intervention to address demand management, decarbonisation, air quality, and urban development.

This concept has been addressed in the Regional Spatial and Economic Strategy (RSES), which sets out the mechanism for delivering the National Planning Framework at a regional level. This concept of mixed-use development envisages a range of community facilities and services being accessible in short walking/ cycling timeframes from homes or accessible by high quality public transport in larger settlements.

In its Review of the Dublin City Development Plan 2016-2022 and the preparation of a City Development Plan for 2022-2028, Dublin City Council posed the question in the Pre – Draft Consultation Process – *Is the 15-minute City an achievable goal?*

Submissions received in the pre consultation process sought a renewed focus on urban living and that the liveability of the City should be an overarching theme of the plan. Submissions sought vibrant urban centres and also that the growth of the city is aligned with the ‘15 Minute City’ concept whereby people’s daily requirements can be reached within 15 minutes by foot, bike or public transport. City and County Development Plans are subject to their own SEA process.

PROPOSED ACTION: Dublin local authorities to adopt as appropriate “15 Minute Neighbourhoods” approach in their 2022-2028 Development Plans

Measure 2 - Public Parking Controls

The Five Cities Demand Management Study identifies public parking controls as the Number 4 ranked intervention to address demand management, decarbonisation, air quality, and urban development. Typically, the average car is parked at home for 80% of the time, parked elsewhere for 16% of the time and in active use for the remaining 3-4%.

The local authorities in the Dublin region each have comprehensive policies in their respective Development Plans to control the supply of parking in their functional area to achieve sustainable transportation policy objectives. These policies will be reviewed and updated as appropriate following statutory public consultation in the next iteration of City and County Development Plans 2022-2028.

PROPOSED ACTION: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to maintaining and enhancing public parking controls.

Measure 3 - Residential Parking Standards

Parking standards for residential developments stipulate the amount of parking (including both car parking and cycle parking) that must be provided as part of new developments. Parking standards for residential developments seek to balance ensuring there is an adequate amount of parking to cater for potential demand with restricting provision in areas on account of the proximity of various locations to public transport. Reducing residential parking can have a direct impact on car ownership and hence the demand for car travel across all journey purposes.

The Dublin local authorities have developed residential parking standards in their respective City and County Development Plans. These will be reviewed and revised as necessary following statutory consultation and screening in the 2022-2028 Development Plans.

PROPOSED ACTION: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to maintaining and enhancing residential parking standards.

Measure 4 - Workplace Parking Standards

Similarly to the above, The Dublin local authorities have developed workplace parking standards in their respective City and County Development Plans. These will be reviewed and revised as necessary following statutory consultation and screening in the 2022-2028 Development Plans.

It should be noted that in respect of the removal of parking at workplaces, COVID-19 provides an opportunity to consider reduce parking, as less staff are travelling to work locations. In the context of COVID-19 and greater levels of staff working from home, there may be opportunities to use staff car parking spaces for more sustainable mobility usage.

PROPOSED ACTION: Dublin local authorities to incorporate protection of air quality as appropriate in their 2022-2028 Development Plans with regard to workplace parking standards.

Measure 5 - Continued Delivery of the Active Travel Programme

In February 2021, The National Transport Authority announced a total of €240m to support sustainable transport projects across the country.

The NTA will be tasked with overseeing and supporting the development of the high-quality mobility infrastructure across all projects. The state agency will also ensure that projects are accessible, age- friendly and maximise comfort to people of all ages and abilities.

PROPOSED ACTION: The local authorities in the Dublin region to continue implementation of the Active Travel Programme

Measure 6- Electrical Vehicle (EV) Charging Strategy

The Climate Action Plan 2019 has set ambitious targets for the conversion of the national fleet to EV over the coming decade and beyond.

As part of this overall strategic approach, the Dublin Local Authorities launched their Electric Vehicle Charge Point Draft Strategy.

This Draft Strategy considers the public EV charging needs for a range of vehicle types out to 2030. Detailed stock modelling shows that there would be 140k EVs in the Dublin region by 2030, but only 25% (35k) of these will be reliant on public charging. Rapid hub charging has significant benefits compared to slow on-street charging and is therefore the priority technology recommended. It is this switch to EVs, supported by an adequate EV charging network that

will contribute to a significant reduction in emissions.

The Dublin region will require between roughly 500 and 4,000 residential (public) EVCPs by 2030, depending on how many rapid hubs are deployed (as preferred by each local authority). These results back up the strategic focus on rapid charging – approximately 50 well-located 10-charger hubs could meet all residential demand, compared to thousands of on-street devices. To develop a comprehensive charging network that drives EV uptake, up to approximately 2,500 destination EVCPs and 166 en-route EVCPs will be needed and delivery is expected to be largely private sector led.

Local Authorities are well placed to have a key strategic and enabling role but would not be involved with physical infrastructure delivery or operation. The strategic approach is aligned with best practice in more developed EV markets. Evidence from other cities/regions highlights the benefits of Councils planning and coordinating deployment. It is envisaged that the Dublin LAs collaborate and play a central strategic role in enabling a region-wide charging network.

The Five Cities Demand Management Study indicates that a suite of EV charging measures could deliver a reduction of 49% in nitrogen oxide emissions.

PROPOSED ACTION: Dublin local authorities to finalise their Electrical Vehicle (EV) Charging Strategy

National - Government Level Measures

Measure 7 Publication of National Clean Air Strategy

As mentioned earlier, the Department of the Environment, Climate and Communications (DECC) is developing a National Clean Air Strategy with the aim of promoting clean air policies to enhance and protect the quality of ambient air. The introduction of these policies will be a key step in underpinning many of the measures identified in this plan. A draft National Clean Air Strategy, is due for publication in 2021 and will be the subject of a public consultation process.

PROPOSED ACTION: Awaiting publication by the Minister for Environment

Measure 8 - Air Quality Enabling legislation

One of the specific measures that is of fundamental importance in the context of a National Clean Air Strategy is to provide a fit for purpose framework of measures in air quality enabling legislation. Such a framework would include providing for the delegation of legal powers to appropriate bodies, including local authorities to introduce enhanced air quality measures. The Department of the Environment, Climate and Communications (DECC) have indicated their

intention to commence work on a Clean Air Act.

The Five Cities Demand Management Study indicates that air quality enabling legislation could yield a 49% reduction nitrogen oxides emissions. While legislation in and of itself will not enact measures such as Low Emissions Zones it is expected that the existence of legislation and a framework for interventions will inform the public as to what actions might be taken. This knowledge is likely to inform vehicle purchasing behaviours and result in less demand for vehicles with the poorest air quality standards, e.g. older diesel cars.

The necessity to produce this Plan by the Dublin local authorities clearly highlights that the legislative supports for delivery are complex and that legislation should be provided for the emissions-related regulation of private cars, goods vehicles, taxis and buses.

As has been mentioned earlier in this plan, one direct consequence of the breach of nitrogen dioxide levels in 2019, led to the Department of Transport, together with the Department of the Environment, Climate and Communications, Climate & Communications establishing the multi-stakeholder UTRAP (Urban Traffic-related Air Pollution) working group. The ongoing work of UTRAP will be an important element in considering the development of appropriate air quality enabling legislation.

The Dublin local authorities are represented on UTRAP and will continue to actively engage to work with all stakeholders for going and sustained improvement in urban air quality. Specifically Dublin local authorities will utilise that representation to seek the acquisition of enhanced legislative powers.

PROPOSED ACTION: The UTRAP group will publish their final report in late 2021. This report will detail the final suite of recommendations designed to support a decrease in NO2 levels in the urban environment nationally and set out a timeline for implementation. The group will continue to meet to support the implementation phase. In parallel the Dublin local authorities will advocate to the relevant government department for enhanced legal powers in respect of air quality management be delegated to them.

Measure 9 - Introduction of Clean Air Zones/ Low Emission Zones

While there is no one single additional legal power that will address all potential scenarios, one enhanced legal power deserving of detailed consideration is for local authorities to be given the authority to introduce clean air zones or low emission zones

The Five Cities Demand Management Study identifies that the introduction of clean air zones or low emission zones could reduce NOx emissions from transport by between 60-71% depending on the approach taken.

This approach has been used successfully in countries across Europe to restrict vehicles with higher emissions entering certain zones. The evidence suggests that the introduction of such legislation in itself influences consumer behaviour in terms of vehicle purchase and subsequently on air quality. Currently local authorities in Ireland do not have the legal powers to introduce such zones.

One of the targets of the Carbon Plan 2021 is to implement decarbonising zones in each local authority by 2030. Furthermore, Action 244 of the National Climate Action 2021 gives a commitment to:

Examine the role of demand management measures in Irish cities, including low emission zones and parking pricing policies

The nearest existing approximation to such powers under the Air Pollution Act 1987, enable the Minister for Environment as follows:

53.—(1) The Minister, for the purpose of preventing or limiting air pollution, may make regulations in relation to—

(a) the standard, specification, composition and contents of any fuel of a type which is used in mechanically propelled vehicles or in mechanically propelled vehicles of a particular class or description or mechanically propelled vehicles in a particular area or a particular class of areas; It should also be noted that under the current provisions of Part IV of the Air Pollution Act 1987, there is provision for the introduction of Special Control Areas. It is not clear however if these provisions are appropriate or provide for the introduction of clean air zones or low emission zones in relation to vehicle or transport related emissions. Therefore an appraisal of the current legal provisions to determine if they are fit for purpose regarding the introduction of clean air zones or low emission zones and identification of any potential amendment necessary is required.

The enactment of primary and secondary legislation is subject to Statutory Impact Assessment by the appropriate Government Department introducing such legislation.

PROPOSED ACTION: An appraisal be carried out of the current provisions in the Air

Pollution Act 1987 to determine if they are fit for purpose regarding the delegation of powers to local authorities for the introduction of clean air zones or low emission zones and identification of any potential amendment necessary. This appraisal should include consideration of amending Section 53(1) (a) of the Act to delegate powers to local authorities as well as the current the provisions of Part IV of the Act. Furthermore, an overall appraisal into the feasibility of introducing Low Emission Zones in the Dublin region where appropriate to be carried out. These are tasks that should be undertaken by the UTRAP Working Group (which includes the Dublin local authorities) or a sub-group of UTRAP as may be determined by the UTRAP stakeholders.

Measure 10 - Remote/Flexible Working

Making Remote Work – National Remote Work Strategy 2021

The European Environment Agency reported that lockdown measures introduced during the Covid-19 pandemic had led to levels of nitrogen dioxide falling by more than 60% in April 2020. While this gave some insight into the potential air quality benefits of reducing work related commuting it does not reflect the impact of recent patterns of home working as part of the response to the COVID-19 pandemic on long-term travel demands.

Recent studies suggest that a large majority of respondents favour a hybrid model where time working remotely blended with time in the workplace.

In January 2021, the Government announced the new ‘National Remote Work Strategy’ to ensure that remote working is a permanent feature in the Irish workplace in a way that maximizes and balances economic, social and environmental benefits. The strategy includes proposals for the following:

- Mandating that home and remote work should be the norm for 20 percent of public sector employment.
- Reviewing the treatment of remote work for the purposes of tax and expenditure in the next Budget.
- Mapping and investing in a network of remote working hubs across Ireland
- Legislating for the right to request remote working.

PROPOSED ACTION: Implementation of National Remote Work Strategy. As part of that implementation local authorities are commencing a process to considerations for flexible work arrangements for their own work force

Measure 11 - Enhanced Air Quality Monitoring and Modelling

National Ambient Air Quality Monitoring Programme (AAMP)

Following a review of ambient air quality monitoring in Ireland, a national ambient air quality monitoring programme commenced at the end of 2017. The AAMP provides real-time air quality information from a total of 95 monitoring stations (national and local combined) nationwide of which 24 were installed in 2019. This network of stations monitor a range of important air quality parameters including particulates, heavy metals, inorganic and organic gases.

The national ambient air quality monitoring programme is built around three key pillars:

- A greatly expanded national monitoring network with automatic monitoring stations, providing enhanced real-time information to the public.
- Modelling and forecasting capability, to provide an ongoing air quality forecast to the public.
- Encouraging greater understanding and involvement of the public in air quality issues utilising citizen engagement and citizen science initiatives.

One of the direct results of the AAMP was the establishment of the monitoring station at St. John's Road West in Dublin.

The Five Cities Demand Management Study suggests that that increased air quality monitoring will lead to earlier action on air quality limit exceedances, which will contribute to driving a switch in the fleet away from older, more polluting vehicles. The Study further suggests this measure could contribute to a decrease of 48% in nitrogen dioxide levels as a result of driving this switch.

It is planned to establish a further multipollutant (including nitrogen dioxide) monitoring station in the Dublin north inner city area in the very near future, and ongoing indicative monitoring is being carried out to establish further suitable sites.

While air quality monitoring is a central pillar of air quality management, modelling is another important tool. In 2019, the EPA published their 'Urban Environmental Indicators Report'.

This report that was based on data from the year 2015, included dispersion modelling techniques that showed that the concentrations of NO₂ were highest around:

- the M50 motorway in Dublin,
- certain city centre streets,
- the entrance / exit of the Dublin Port tunnel.

The LIFE Emerald project (see below) and the expansion of the modelling carried out in preparing this Plan (see Chapter 7) will be central to enhancing air quality surveillance in the Dublin region.

PROPOSED ACTION:

- 1. Additional national air quality monitoring station to be established in Dublin north inner city.**
- 2. On completion of the indicative nitrogen dioxide campaign (end 2021) being carried by the EPA carried out by, The Dublin local authorities will work with the EPA to establish additional monitoring stations in the Dublin region as required in line with findings**
- 3. The Dublin local authorities will collaborate with the EPA on ongoing indicative monitoring across the Dublin region**
- 4. Air quality modelling - The work carried out on the limited modelling incorporated in the preparation of this plan highlights both the challenge required to complete that task and the necessity of having that level of detail available . Concurrently the Dublin local authorities are also commencing the process of gathering data for the preparation of noise actions plans in compliance with the EU Environmental Noise Directive. In order to make best use of the data available within local authorities, other public bodies and other sources, the Dublin local authorities will investigate in conjunction with the EPA the feasibility of establishing regional air quality modelling capacity within the local authorities.**

Measure 12 - Air Quality - Citizen Engagement

Ireland has a significant track record in successful citizen engagement in the area of environment, health and air quality. The successful introduction and ongoing extension of the ban on the burning of bituminous coal in cities and towns nationwide is one clear and internationally cited example of how public engagement has led and shaped public policy. In terms of building and strengthening public engagement in improving air quality in Dublin, it is vital to build on the high levels of support for continued roll out of air quality monitoring stations and citizen engagement programmes. The Five Cities Demand Management Study reported that stakeholders noted these measures could contribute to better quality of life, place making, improved air quality and the Smart City concept. There was also a suggestion that engagement

programmes should emphasise and promote active travel as a solution to air quality issues, with awareness of such issues being high. In that context there a number of current citizen engagement initiatives that are central to the success of this plan.

LIFE EMERALD

In 2021, the EPA commenced the *LIFE EMERALD* project aimed at improving understanding of Ireland's air quality. This 3-year project that will improve the level of air quality information available to the public and policy makers in Ireland.

The main objectives are:

- an operational 3-day ambient air quality forecast;
- near real-time mapping of the main air pollutants throughout the country and in major cities and towns;
- annual mapping of air pollutants across the country

The project will support Irish citizens in making decisions that positively benefit their health on a day- to-day basis. The LIFE EMERALD project will also improve Ireland's ambient air quality management capabilities, by using an air quality modelling system to gain a better understanding of the factors contributing to poor air quality and develop a system that will provide better information to the public.

The EPA will work with a number of main project partners, namely the Department of the Environment, Climate and Communications, the Health Service Executive, the Asthma Society of Ireland, University College Cork and the Belgian research institute VITO. The project will also involve consultation and co-operation with other national stakeholders, namely the Department of Health, the Department of Transport, the Department of Agriculture, Food and the Marine, Met Éireann, Dublin City Council, An Taisce, The Central Statistics Office, Teagasc, Transport Infrastructure Ireland, the ESRI and The Irish Heart Foundation.

GLOBE Project

The Global Learning and Observations to Benefit the Environment (**GLOBE**) Programme is an international science and education programme that provides school students with the opportunity to participate in citizen science. In Ireland, GLOBE is managed by An Taisce in partnership with the EPA. Participating schools learn about air quality and the weather by making scientific measurements and using their data to carry out research.

The GLOBE Air Quality Campaign is specifically a citizen science project to assess traffic-

related air pollution at schools. The campaign measures nitrogen dioxide gas in the air, and is designed to raise awareness about air pollution and showcase the potential of citizen science to gather unique datasets and insights in the r environment. To date, 100 schools have participated in the GLOBE Air Quality campaigns, collecting over 350 nitrogen dioxide measurements. The campaign also provides a collaborative platform for schools to share their research and insights.

Airview Project

In May 2021, Google and Dublin City Council launched “Airview Dublin” - a partnership initiative to capture Dublin’s air quality street by street as part of the Dublin Smart Cities programme.

The initiative will see Google’s first electric Street View car, deployed around the city measuring air quality for one year. In Ireland, this is the first time a Google Street View car has been used to capture air pollution measurements, in addition to Google Maps Street View imagery. The car has been equipped with specialised mobile air sensors that can measure nitrogen dioxide (NO₂), nitrous oxide (NO), carbon dioxide (CO₂), carbon monoxide (CO), fine particulate matter (PM_{2.5}), and ozone (O₃).

The air pollution measurements will be used to develop maps of street-level air pollution. These, in addition to air quality pollution data insights, will be available for use by city authorities and by the public.

This project was born from a clear and urgent need for hyperlocal insights on air quality and the overall objective of the initiative is to make air pollution data and insights available to city and government authorities, the scientific community, not for profit organizations, and the public.

Google and Dublin City Council are hopeful that access to this data will encourage more people to join the conversation around air quality and enable people to make small but informed daily changes to contribute to its improvement.

In particular, the data will provide valuable insights to walkers, cyclists and outdoor enthusiasts to help them find the healthiest routes and locations for their commutes, trips and activities.

Clean Air Together Project

This project aims to measure levels of nitrogen dioxide across Dublin. It will involve recruiting between 1000 and 1200 participants to deploy nitrogen dioxide diffusion tubes across the region in late 2021.

The five primary objectives of the project are to:

- Develop and deliver a methodology for large-scale citizen-based air quality monitoring of NO₂.
- Generate data will provide input to the validation of EPA air quality models.
- Increase public knowledge and engagement with the topic of air quality.
- Assess the impacts of citizen-based air quality monitoring on awareness, attitudes and the potential for this to lead to behaviour change.
- Inform policy-change by working in partnership with stakeholders.

PROPOSED ACTION:

- 1. Dublin City Council to establish public dashboard on Airview study results for Dublin City**
- 2. Dublin local authorities to explore with other stakeholders such as An Taisce, or the Asthma Society on the establishment of a public consultative process or forum on air quality.**

Measure 13 - Air Quality and Health Research

As part of its range of functions the Environmental Protection Agency manages an environmental research programme to deliver essential scientific support for environmental policy development, implementation and broader decision-making. Since 1994, the EPA has funded research that has increased national understanding of the environment, the challenges it faces and responses to these. EPA Research focuses on achieving environmental objectives, informing policy and bringing together researchers and research users. In the context of this plan, there are two EPA funded research projects ongoing of particular interest, whose findings will be of particular interest in informing and shaping public discourse and policy in relation to nitrogen dioxide levels nationally and in particularity in the Dublin region.

Project 1: Impact of NO₂ on Health with particular emphasis on vulnerable groups

A team of engineers, hospital consultants and environmental scientists from Trinity College Dublin are collaborating on this EPA funded project to examine the impacts of nitrogen dioxide (NO₂) on health and quality of life. Although it is possible that, to some extent, NO₂ acts as a marker for the effects of other traffic-related pollutants, the epidemiological and mechanistic evidence elsewhere now suggests that it would be sensible to regard NO₂ as causing some impact on health and quality of life. Research on this topic is particularly important in the context of very significant challenges across Europe in meeting targets for the reduction of NO_x emissions from the transport sector.

The TCD team will assess how the recent findings elsewhere in relation to the associations

between NO₂ and health impacts pertain to Ireland, with particular emphasis on vulnerable groups including children, the elderly and the socio-economically disadvantaged. Using currently available air pollution measurements, and recent research results on the influence of meteorological and source parameters (including transport vehicle and population mobility demands), they will identify a set of characteristics for the locations in Ireland that are at most risk of experiencing high levels of NO₂.

They will also examine the HSE-Primary Care Reimbursement Service (PCRS) prescribing database to establish much needed baseline data linking NO₂ levels with the prescription of drugs used to treat asthma and chronic obstructive airways disease with the intention to consider methodologies to facilitate the collection of prospective data in the future.

Other databases, such as the Growing up in Ireland (GUI) and the Irish Longitudinal Study on Ageing (TILDA), subject to their availability, will be explored to investigate if relationships between prevalence of respiratory symptoms in vulnerable groups and NO₂ levels exist. Finally, the team will review policies and strategies being implemented by other countries to bring NO₂ within compliance levels and identify a set of effective and efficient solutions to reduce and mitigate the impact of the transport sector on NO₂ levels in Ireland, given its predominance in the output of NO₂ emissions.

Project 2: Redmap Project

This project involves measuring and modelling emissions from in-use vehicles in Dublin. The project is funded by EPA-Ireland and co-funded by the Department of Transport. The REDMAP project team comprises engineers from Trinity, University College Dublin and Ricardo from the UK. The team will measure and model real-world emissions using Remote Sensing (RS) and Portable Emission Measurement Systems (PEMS) from more than 150,000 vehicles at four locations over a 16-week period in Dublin. Emissions from real-world driving are often higher than estimated emission levels calculated based on Euro emissions standards and laboratory tests. This has given rise to widely published controversy and consequently, the air quality in cities has not improved as much as was originally anticipated from stringent emission regulations in European regions and associated renewals of vehicle fleets. Due to the high density of on-road vehicles and proximity of pollutant generation to high density urban dwellings the impact of air pollution is higher in urban areas such as Dublin, so it is imperative that projects such as REDMAP accurately assess the true levels of traffic emissions.”

The real emission contribution of different vehicles considering Euro standard, fuel type, make, and categories and vehicle modifications will be utilised to improve the existing emission

inventory generated using literature values. A new traffic-emission model and paired air quality model estimating pollutant concentrations will be formulated based on real-world emission factors (RD-EF). The modelling framework will illustrate the potential environmental, economic and health impacts of real emission due to new Real-Driving Emission (RDE) legislation, related policy changes and future growth considering scenario-based modelling. The project will generate guidelines on measures and opportunities to reduce actual vehicular emission on roads in Dublin.

PROPOSED ACTION:

Dublin local authorities to formally engage with above research teams on their emerging findings and to collaborate on the formulation of practical measures and guidelines from this research.

Measure 14 - Behavioural Change Campaigns to cleaner fleets

The Five Cities Demand Management Study identifies this measure of targeted behavioural change campaigns to encourage low emission vehicle purchase as being highly effective and enjoying general support. – estimated that a 49% reduction in nitrogen oxides emissions is achievable. Stakeholder feedback to the study highlighted COVID-19 as creating an opportunity for change in behavior. These reductions refer to the percentage change in the emissions per kilometre from the average private car in city centre traffic in 2030, relative to 2019 levels, based on ANPR data collected in Cork in February 2020.

Nitrogen Dioxide Modelling

As part of the production of this Plan, the Environmental Protection Agency (EPA) supported the four Dublin local authorities by specifically modelling nitrogen dioxide levels for a number of scenarios, involving a base year and four future scenarios.

To inform this Plan, the EPA assessed monitoring and modelling data to get a wider understanding of the current and future air quality situation around the local area of the measured exceedance. The area of assessment within the vicinity of St Johns Road West is the area covered by the bold rectangle in Figure 5.1 below. Completing Air Quality modelling across the Dublin Region would be a significant undertaking beyond the timeframe available for the production of this Air Quality Plan and has thus not been possible at this time. However, at the time of drafting of this Plan it is known that the EPA are progressing wider air quality modelling of Dublin and this will be published in 2022.

The approach adopted for this plan thus makes best use of the work underway by the EPA and

focuses output at the location of the St John's Road West monitoring station to demonstrate the positive impacts that predicted future changes to transportation fleet, and emissions from same, is likely to have on air quality in the vicinity of the St John's Road West monitoring station.

A copy of the EPA report is available in Appendix D.

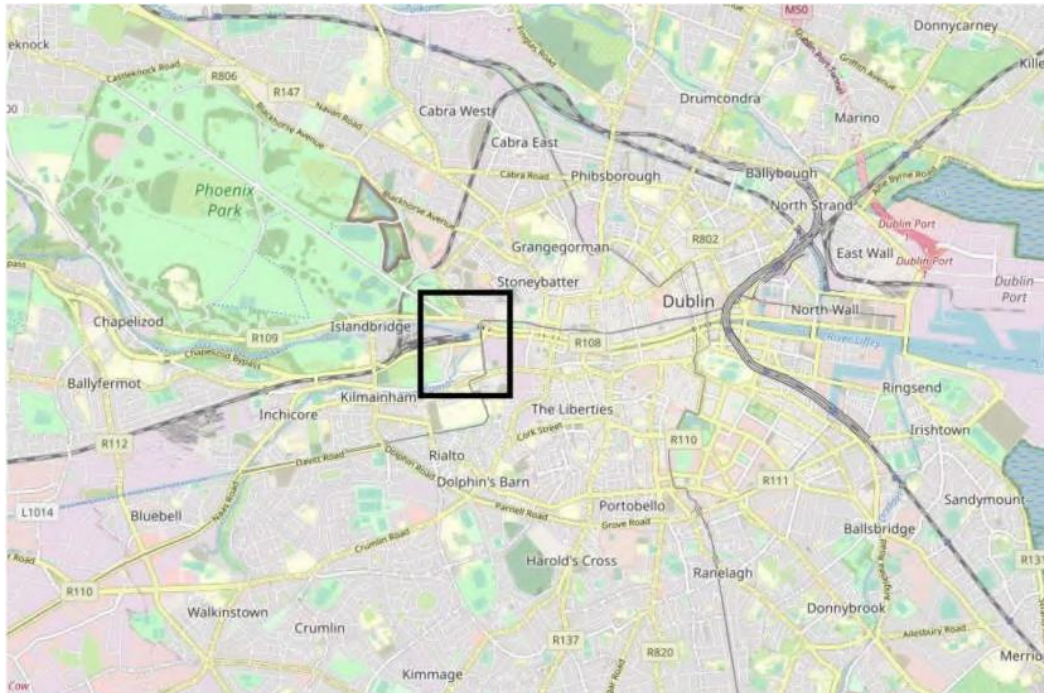


Figure 5.1 – Area of Air Quality Modelling Assessment (Marked in Bold)

Modelling Methodology

The EPA completed the air quality modelling of the assessment area using the urban scale model ADMS-Urban. The outputs have been evaluated and verified by the EU DELTA tool in conjunction with the model developers own model evaluation tool kit. The full EPA report is available in Appendix D.

As noted above the modelling was completed for a base year and four future scenarios. These scenarios were chosen by the four Dublin Local Authorities and are set out below;

- 2019 Basecase scenario
- 2028 Business as Usual scenario
- 2028 Intervention scenario
- 2030 Business as Usual scenario
- 2030 Intervention scenario

A fuller explanation of these scenarios is included below. The traffic data for each scenario was provided by the National Transport Authority (NTA). Emission factors and relevant transport fleet profiles are based on National and UK sources. As mentioned above the Five Cities Demand Management Study identified a measure of targeted behavioural change campaigns to encourage low emission vehicle purchase as being highly effective to contribute to achieving greater NO₂ emission reductions.

The 'business as usual' case reflects the projected changes to both traffic volumes and the fleet profile. It's anticipated that the future fleet will be cleaner as older vehicles are replaced by less polluting newer vehicles. The intervention scenarios are a selection of sensitivity assessments to demonstrate the future impact of increased electrification in relation to nitrogen dioxide. The intervention scenarios (sensitivity interventions) are detailed as followed:

- 50% electrification of the taxi fleet
- 50% electrification of the bus fleet
- 20% electrification of the passenger car fleet

Modelling Results

The modelled results for each of the five scenarios is set out in the table below;

Scenario	Modelled Annual Average NO ₂ St John's Road Receptor (µg/m ³)	Measured Annual Average NO ₂ St John's Road Receptor (µg/m ³)	Absolute NO ₂ Concentration Reduction (µg/m ³)	Percentage NO ₂ Reduction from 2019 Basecase Scenario (%)
2019 Basecase	39.0	43.4	-	-
2028 Business as Usual	31.3	-	7.7	19.7
2028 Intervention	29.4	-	9.6	24.6
2030 Business as Usual	30.6	-	8.4	21.5
2030 Intervention	29.0	-	10.0	25.6

As can be seen from the above results the model output concentration for NO₂ at St. John's Road West in 2019 is close to the measured concentration at the location in 2019. The results are within 10%.

The results from the scenarios all show significant reduction in the nitrogen dioxide concentrations when compared to the 2019 basecase scenario with the results for the business as usual case showing reductions of 21.5% out to 2030 and up to 25.6% where the further sensitivity interventions outlined are achieved within this timeframe. These scenarios all bring the predicted annual average air quality values for NO₂ at this location back within the legal limit of 40 µg/m³.

Based on the modelling results, which show reduced NO₂ levels within the modelled area, it would be reasonable to conclude that the realisation of the anticipated “business as usual” traffic volumes and fleet changes will have a beneficial effect on reducing NO₂ levels across the Dublin Region. However, the actual reductions across the region will vary depending on local traffic patterns. Further EPA modelling will provide additional information in 2022.

It is thus reasonable to conclude, that the Dublin agglomeration will be compliant with the NO₂ limits by 2028. Measures 1 to 13 will help to accelerate the timeline to achieve compliance, although it is not possible to quantify their benefit through modelling work. In particular, incentives to move to lower emission vehicles such as financial incentives or the introduction of low emissions zones (Measure 9) is likely encourage a more timely transition.

PROPOSED ACTIONS:

- 1. Commuter/Travel surveys carried out by public bodies to include determining public attitudes towards air quality measures and commuting behaviour.**
- 2. Air quality forum (see Measure 12) to address and gauge public attitudes on behaviour change to improve air quality.**
- 3. Public consultation on City and County Development Plans to include eliciting feedback on public view on introduction of cleaner fleets and clean air/low emission zones.**

5.3 Framework for Measures and Actions

The following table provides a synthesis of the measures and actions detailed above in respect of their time scale for implementation and the level (i.e. local authority, national etc.,) for that implementation.

The definition of timescales used below are referenced from the Five Cities Demand Management study whereby “Short Term” indicates implemented by 2025, “Medium Term” indicates by 2030 and Long Term indicates by 2040.

These timescales need to be considered in the context of a dynamically evolving wider environmental management priorities not least of which is the delivery of the climate action agenda.

The Five Cities Demand Management Study also provides a framework for consideration of measures in the context of an Avoid/Reduce- Shift-Improve- Manage approach as follows:

Avoid/Reduce Demand – avoid or reduce the need to travel.

Shift Demand – to more sustainable transport modes.

Improve – environmental sustainability of residual vehicular traffic.

Manage – day to day efficiency of the transport network.

Where the Five Cities Demand Management Study has predicted an estimate for the potential reduction in nitrous oxides (NO_x) associate with such a measure this has also been included for information.

No.	Measure /Action	5 City Demand ref. if applicable	Time scale to implementation	Estimated NOx reduction (if available)
Local Authority Measures				
1	"15 Minute Neighbourhoods"	PP08 Avoid/Reduce Demand & Shift Demand	Short (commencement) To (ongoing) Long	
2	Public Parking controls	PTM04 Avoid/Reduce Demand & Shift Demand	Short (commencement) To (ongoing) Long	
3	Residential parking standards	PTM08 Avoid/Reduce Demand	Short	
4	Workplace Parking standards	PTM09 Avoid/Reduce Demand	Short	
5	Continued Delivery of the Active travel programme		Short (commencement) To (ongoing) Long	
6	Electrical Vehicle Charging Strategy	PTM02 Improve	Short (commencement) To (ongoing) Long	-49%
National - Government Level Measures				
7	Introduction of National Clean Air Strategy	n/a	Short (commencement) To (ongoing) Long	
8	Air Quality Enabling legislation	AQ1 Manage & improve	Short	-60%
9	Clean Air Zones/ Low Emission Zones	AQ4 Manage & Improve	Short	-71 %
10	Flexible Working	BC05 Manage Shift Demand	Short (commencement) To (ongoing) Long	
National Agencies in cooperation with Local Authorities				
11	Air Quality Monitoring and Modelling	AQ2 Shift Demand	Short	-48%
12	Air Quality Citizen Engagement	AQ3 Shift Demand	Short	
13	Research		Sort to medium	
14	Behavioural Change Campaigns to cleaner fleets	BC10 Improve	Medium to long	-60%

6.0 Measures or Project Planned or Envisaged for the Long Term

In addition to those measures dealt with in the previous chapter there are a number of other emerging or future measures that merit consideration for the long term. These include:

- Modelling capacity at local authority level
- Research Funding
- Resourcing/Capacity Building

6.1 Modelling Capacity at local authority level

The value of modelling as a predictive tool for air quality management, with inputs based on known and predicted traffic volumes, vehicle types and profiles, is universally recognised. While there are measures planned by the Environmental Protection Agency to enhance their air quality modelling within the context of the National Ambient Air Quality Monitoring Programme, as described in the previous chapter, it has become evident in the preparation of this plan that having analogous modelling capacity at local authority level would be beneficial, not only for air quality management but also across a number of other sectors such as noise mapping and city planning.

Recommendation:

The Dublin local authorities to carry to a feasibility study on developing modelling capacity for air quality management and noise mapping

6.2 Research Funding

Air quality and health research have played an important role in developing public policy in Ireland. The EPA, as part of their Research Programme 2021-2030, recently launched their Research Call 2021. Amongst the research topics included in the call, two have particular relevance to nitrogen dioxide in the Dublin region:

Topic Title: Review of emerging technologies / novel approaches for detection and quantification of the levels for Nitrogen Dioxide (NO₂)

“In Ireland and in much of the EU, NO₂ is monitored by using a certified ‘Indirect Monitoring’ technique. The EU is currently reviewing the use of ‘Direct Monitoring’ techniques that measure only NO₂. Research in emerging air quality monitoring technologies and novel approaches that are EU compliant could help further tackle Ireland’s issues in relation to increases in air

pollutants (existing and emerging) from transport that is resulting in exceedances in NO₂. Research would allow Ireland to explore mechanisms for achieving the highest international air quality standards. This research is considered an opportunity to improve monitoring and assessment, inform regulatory decision making, assist in the development of technologies and identify solutions to reduce unnecessary exposure to poor air quality, for Ireland.”

Topic Title: An international best practice review of the localised and wider pollutant contribution of large railway hubs on air quality, in large urban centres

This innovative research project will gather information on the best international practice in assessing the impact of rail emissions at large railway hubs and the impact on the localised air quality in high- density residential/urban centres. It will allow the provision of the best evidence-based advice to the public and other stakeholders. The proposed research project should also ensure alignment with the Urban Transport-Related Air Pollution (UTRAP) Working Group process.

Proposals are invited to:

- Undertake a comprehensive review of best EU practice and apply to Irish data on how to mitigate against/reduce high contributions of harmful emissions.
- Apply this assessment of best international practice to Ireland by ground truthing on selected Irish sample sectoral sites/case studies to pilot.

Recommendation: Dublin local authorities to request the EPA to grant them representation on the Technical Steering Committees of these projects

6.3 Resourcing/Capacity Building

Local Authority Resources

The Programme for Government provides a commitment to develop a regional approach to air quality and noise enforcement. This approach could also consider possibility of developing capacity for air quality monitoring, modelling and management at a regional level in the Dublin Agglomeration.

Such an approach, with appropriate resources in place could be fundamental in the successful implementation of this plan and has other positive benefits in complementary areas such as noise mapping and noise action planning.

Urban Traffic Management Centres

The Five Cities Demand Study identifies urban traffic management as an effective traffic demand management tool. Dublin City Council operate Dublin's Traffic Management Centre in collaboration with Dublin Bus, and An Garda Síochána.

Using over 300 CCTV cameras and SCATS signalling technology, traffic volumes at hundreds of junctions are monitored and junction timings are adjusted dynamically depending on traffic flows. When traffic accidents occur, traffic light timings can be overridden to reduce congestion. Investment is ongoing to use the data gathered to drive further automation and incident detection.

Further integration of traffic management with public transport operation will take place when Dublin City Council's Traffic Management Centre is co-located with the recently approved new National Train Control Centre to be constructed at Heuston Station.

This control centre will oversee management of all train traffic in the country and all road transport in Dublin. There are potential benefits for continued NTA investment in control centres for all public transport modes in each of the cities, as public transport supply increases through the delivery of the planned city strategies.

Such a traffic control centres has a key role in more efficiently managing the capacity of the existing transport network, smoothing demand through integrated partnership working and the pushing out of key disruption information combined with travel alternatives. They offer substantial congestion management benefits, with correlating benefits for reducing carbon and improving air quality and the urban environment.

These traffic management systems can also integrate environmental monitoring as one of the criteria in traffic management and the evolution of the next generation of reliable and relatively low cost air quality sensors opens up the possibility of developing this capacity.

7.0 Public & Stakeholder Consultation

7.1 Overview of legislative requirements

The Ambient Air Quality and Cleaner Air For Europe (CAFE) Directive (2008/50/EC) sets air quality standards for European Union member states and has been transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No 180 of 2011 as amended). The directive and regulations records air quality standards in Ireland and other member states for a number of pollutants. One element of the implementation of this Directive involves carrying out air quality monitoring for a number of specified air pollutants at a network of air quality monitoring stations throughout Ireland. These Regulations also provide for the dissemination of public information, including information on any exceedances of the target values, the reasons for the exceedances, the area(s) in which they occurred and appropriate information regarding effects on health and impact on the environment.

As mentioned in Chapter 1 of this Air Quality plan, in 2019 there was an exceedance of the annual permissible limit value for Nitrogen dioxide at one of the monitoring stations in St. John's Road West, Dublin. As a result of this exceedance, under the national legislation, the relevant local authorities are obliged to prepare an air quality plan to identify the root causes and formulate measures to address the exceedance of that pollutant. One of the legal obligations under the Air Quality Standards Regulations 2011 on local authorities in preparing this air quality plan is to ensure that it is "clear, comprehensible and accessible".

However, within the regulations, there is no mention of a requirement to go to Public Consultation with the Air Quality Plan. The legislation does include a requirement to consult with a list, set out in Schedule 17, of Prescribed Bodies as follows: The Minister for Health, The Health Service Executive, Local Authorities, An Bord Pleanála, Cystic Fibrosis Association of Ireland, The Asthma Society of Ireland, Met Éireann, Teagasc.

Notwithstanding this the Dublin Local Authorities are aware of their obligations to encourage and promote public engagement and consultation and enable citizens' voices to be heard, though such instruments as the Aarhus Convention on Access to information, Public Participation in Decision- Making and Access to Justice in Environment Matters(Directive 2003/4/EC on Public Access to Environmental Information). Therefore, in the interests of involving the public and seeking engagement and consultation with the public a decision was made to engage members of the public and go to Public Consultation for a four week period on the 18th October 2021. Our Methodology for Public Consultation is set out below in Section 7.2

7.2 Methodology adopted

One of the legal obligations under the Air Quality Standards Regulations 2011 on local authorities in preparing this air quality plan is to ensure that it is “clear, comprehensible and accessible”.

Despite there being no legal requirement for public consultation a 2-step approach to Consultation was adopted for both Stakeholder/Prescribed Bodies and with members of the Public.

Stakeholder/Prescribed Bodies Consultation:

The initial approach towards engagement with Prescribed bodies, as listed in Schedule 17 of the Air Quality Standards Regulations 2011 (S.I.180/2011) involved writing to each of them to notify them of the Air Quality Plan and invite them to a consultation meeting/workshop to discuss same. In addition to the prescribed bodies an invitation was extended to An Taisce who had previously expressed an interest in the drafting of the Air Quality Plan. A positive response was received and on 1st September 2021 a consultation meeting/workshop was held with the following prescribed bodies and An Taisce:

- Asthma Society of Ireland
- Health Service Executive – Public Health
- Health Service Executive – Environmental Health
- Teagasc
- Met Eireann
- An Taisce (not a Prescribed Body)

The consultation meeting/workshop took the form of a presentation and discussion around the drafting of the Air Quality Plan to improve levels of nitrogen dioxide (NO₂) in ambient air in Dublin. Initial feedback was sought at the workshop and the participants were advised of our plans for formal consultation with the Public later in the year.

Public Consultation:

Regarding Public Consultation, the public were initially notified through the following media, a Newspaper advert was published on 23rd July 2021 and also published on Social media. This notification advised that the four Local Authorities (Dublin City Council, Fingal County Council, Dun Laoghaire Rathdown County Council and South Dublin County Council) were together preparing a new Air Quality Plan to address a single exceedance of the annual NO₂ level. It advised that the draft Plan would be subject to a period of public consultation later in the year and that it must be submitted to the European Union by the end of 2021. The notification invited members of the public at this initial stage to submit their views on the exceedance of Air Quality in the Dublin Region and the drafting of the Plan.

Following this initial step, a period of formal Public Consultation commenced on the 18th October 2021 for a 4 week period until 15th November 2021. The Public Consultation was hosted online on Dublin City Council's online Consultation hub on behalf of all four Local Authorities. Each of the four Local Authorities advertised the public consultation on their own websites and social media accounts and provided a direct link to the Dublin City Council Consultation hub.

A summary of the responses and issues raised by the public consultation process are detailed in section 7.3 below and also Appendix B.

7.3 Summary of responses and replies

Background

The public consultation on the Dublin Region Air Quality Plan, Air Quality Plan to improve Nitrogen Dioxide levels in Dublin Region was open for submissions from 18 October 2021 to 15 November 2021. A total of 219 unique submissions were received, 208 via the Consultation Portal and 11 by email.

Only a small number of submissions were specifically related to the actual draft Air Quality Plan document itself and its requirements as set out by Europe. The majority were instead comments on air pollution in general, how it can be addressed and paying for it through taxes. While these submissions could not be directly incorporated into the Air Quality Plan itself at this time, they give a valuable insight into public feelings on the issue, and will feed into ongoing work in the area including the development of many of the measures included in the plan.

Appendix B of the Plan includes details of the public consultation submissions and the analysis undertaken in relation to same. Appendix B1 includes a report with graphs produced from the Consultation Hub which contained an online survey with 25 questions relating to the Air Quality Plan. A quantitative summary of the submissions taken from that data set out in that consultation hub report is presented in the section below. Questions 22 to 25 and emailed submissions have been reviewed, tagged by Theme and analysed against the measures in the plan. The subsequent section of this chapter, and the table in Appendix B3, deals with the review and analysis of the consultation responses which tagged them by Themes and presented responses and amendments to be made to the Plan.

Quantitative Summary of the Public Consultation Responses

There were 208 responses to the online Public Consultation on the AQP. These were mainly from private individuals, however, a list of organisations that responded is listed in Appendix B. Of those that responded approximately 52% resided in Dublin City with 18% in Fingal and 15% from Dun Laoghaire Rathdown, 10% from South Dublin. 4% of those that responded reside outside of Dublin County.

By far the main reason for driving, almost 64%, was for day-to-day getting around and travelling to shops and local services.

The vast majority of people had an understanding of the health impacts of elevated NO₂ levels and vehicular emissions were considered to be a greater contributor to NO₂ levels than agriculture, power plants or heating by about half of those responding. National Government led awareness campaigns were felt to be the best way to make the public aware of the health impacts of air pollution (specifically NO₂) and these were closely followed by restricting drop off locations at schools and publicity about high transport related emissions in local areas.

Approximately half of those who took part in the Public Consultation agreed with the recommendations of the Citizens' Assembly in relation to the climate actions that impact on air quality.

Almost 80% of responders support the idea of reviewing and strengthening Local Authority and Environmental Protection Agency (EPA) powers in relation to dealing with air pollution.

With regard to considering Low Emission Zones, over 75% of those who took part in the Public Consultation support this, as well as the possibility of a charge being levied on those with polluting vehicles. A similar number of responders support the Government amending existing legislation to delegate powers to the Local Authorities to introduce Low Emission Zones.

Over 85% of the public involved are familiar with 10-15 minute neighbourhoods and over 70% think Local Authorities should examine the concept.

80% of those who took part in the Public Consultation want an electrical vehicle-charging network developed in Dublin.

Almost 95% of those involved feel that the Irish workforce should be given the option of remote working for a portion of the week.

Around 70% of those involved believe that consideration should be given to incorporating air quality considerations into vehicle taxation and that the NCT emissions testing should have a role in periodic assessment of air pollution emissions, to inform better regulation of 'in use' vehicle emissions.

Analysis of Public Consultation Responses

In addition to the quantitative analysis of the submissions as set out in the previous section, all the submissions that contained free text and those that were received by email were analysed for the comments, views and suggestions expressed. Rather than respond to each view within each individual submission, all submissions were reviewed to identify common themes against which all the comments and views could be captured. A response against each theme has been provided which sets out how the Air Quality Plan and/or other Plans and Strategies address the issues covered by the Theme and also whether any amendments or actions within the Plan are proposed. For a detailed overview of the Themes identified together with the responses and actions proposed please see table in Appendix B3 at the end of this report.

7.4 Conclusions and proposed actions arising from public consultation

Many different points were raised through the Public Consultation and an analysis of the general comments and suggestions was carried out as set out in Appendix B1 and B3.

The draft Air Quality Plan included 14 measures as summarised below.

- Integrate “15 Minute Neighbourhoods” concept in City and County development Plans
- Public Parking Controls
- Residential Parking Standards
- Workplace Parking Standards
- Continue delivery of the Active Travel Programme
- Electrical Vehicle (EV) Charging Strategy
- Publication of National Clean Air Strategy
- Air Quality Enabling Legislation
- Introduction of Clean Air Zones / Low Emission Zones
- Remote / Flexible Working
- Enhanced Air Quality Monitoring and Modelling
- Air Quality – Citizen Engagement
- Air Quality and Health Research
- Behavioural Change Campaigns to Cleaner Fleets

These 14 measures remain within the Final Plan. While there were varying comments and levels of support for each, the responses did not warrant the removal or a significant change to any one measure. Modification to two measures are proposed as set out below;

- **Measure 9** of the Plan to be amended to include an action as follows; The UTRAP Working Group, which includes the Dublin Local Authorities, should commit to further investigations into the adequacy of current legal provisions and feasibility of Low Emissions Zones in Dublin.
- **Measure 12** to be modified to reflect Smart Cities involvement in citizen engagement project

Many of the comments and suggestions, while very valid, fall outside the remit of the Air Quality Plan but are covered by other Government and Local Authority strategies and plans.

The public consultation was also very valuable exercise in that many respondents requested greater clarity around the linkage between the matters dealt with in Measure 14 dealing with predicted fleet changes and the subsequent Chapter on modelling of predicted fleet changes. Consequently these two elements of this air quality plan have been amalgamated and revised with a view to addressing these responses.

A number of other amendments were also made on foot of circumstances that arose during the drafting of this air quality plan. In particular, amendments were made to update information in the plan to reflect the publication of the following:

- Draft Greater Dublin Area Transport Strategy 2022-2042 – National Transport Authority – published 9 November 2021
- Air Quality in Ireland 2020 – Environmental Protection Agency – published 22 November 2021
- Five Cities Demand Management Study Research Report - Department of Transport - published 25 November 2021

As the above were updates of existing documents, there was no amendments required for the measures of the draft air quality plan as circulated in the public consultation phase.

8.0 Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) Screening

8.1 Overview of legislative requirements

The Dublin Regional Air Quality Action Plan to improve levels of nitrogen dioxide (NO₂) in ambient air in Dublin has been prepared in accordance with the requirements of S.I. No. 435/2004 - European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 and Article 6 of the Habitats Directive 92/43/EEC.

The SEA and AA process, carried out in tandem with the preparation of the Dublin Regional Air Quality Action Plan to improve levels of nitrogen dioxide (NO₂) in ambient air in Dublin, have ensured full integration and consideration of environmental issues throughout the action plan preparation process.

These are available as separate documents, to be read in conjunction with this Dublin Regional Air Quality Action Plan to improve levels of nitrogen dioxide (NO₂) in ambient air in Dublin.

The SEA Screening Report and Screening Statement in support of the AA are available online on the four Dublin Local Authorities websites. The proposed amendments to the Draft Plan arising from Public Consultation, were screened for both SEA and AA. This assessment is included in the updated SEA and AA Screening Reports on the Dublin Region Air Quality Plan. The SEA Determination, AA Determination and URL to the Screening Report and Statement are available in Appendix C.

8.2 Conclusion

The Screening of the Dublin Air Quality Plan shows that the plan will not result in land use activities that have the potential to result in negative impacts to the qualifying features of interest of European Sites occurring within or surrounding the plan area and will not have the potential to compromise the achievement of the conservation objective of these European Sites. The examination of the plan has found that the plan will have the potential to contribute to the conservation management of European Sites within and surrounding the plan area and will thus have positive implications for the conservation objectives of these European Sites. In light of the findings of this report, it is the considered view of the authors of this Screening Report for Appropriate Assessment that it can be concluded by the Dublin Region Local Authorities that the Plan is not likely, alone or in combination with other plans or projects, to have a significant effect on any European Sites in view of their Conservation Objectives and on the basis of best scientific evidence and there is no reasonable scientific doubt as to that conclusion.

9.0 Proposed framework for improving ambient nitrogen dioxide level

9.1 Overview

The preparation of this plan and the elaboration of measures (already in progress or proposed) highlights that addressing air quality involves a wide range of stakeholders working with common purpose as the measures identified include a raft of policy, legislative, and behavioural interventions. In practice, this requires ongoing action at national as well as regional and local level as well as a high level of engagement with the public. The following sets out the main elements of the framework required to address these matters.

9.2 National Level

As mentioned earlier in this plan, one direct consequence of the breach of nitrogen dioxide levels in 2019, was the establishment of the multi-stakeholder UTRAP (Urban Traffic-related Air Pollution) working group by the Department of Transport and the Department of the Environment, Climate and Communications, Climate & Communications

The UTRAP Working Group was established to achieve the following six objectives:

1. Enhance awareness of clean air legislation and its requirements generally, and specifically in relation to NO₂ and other transport related air pollutants, amongst relevant stakeholder organisations
2. Provide a forum to enhance understanding of the causes and the health and environmental impacts of NO₂ air pollution and other transport related air pollutants in conurbations
3. Identify developments that may impact on NO₂ levels and other transport-related air pollutants in conurbations, e.g. evolving technical standards, and quantify the impact under likely future scenarios
4. Identify examples of best practice in combatting NO₂ air pollution and other transport-related air pollutants in conurbations, particularly road traffic-related air pollution, assess applicability and any barriers to their implementation in an Irish context
5. Consider a range of options for potential measures and any associated actions and supports required to facilitate their effective uptake to address NO₂ and other air pollution; identify measures most suitable to Ireland and appropriate implementation bodies
6. Present the final UTRAP recommendations to the Minister for consideration by Government

The Interim Report issued by UTRAP in March 2021 made 23 Recommendations and in the context of providing a framework for oversight of the implementation of this plan this working group provides a platform for bringing appropriate stakeholders together.

Two of the recommendations made address this specific role i.e.

Recommendation 22

UTRAP Group to reconvene and review the findings and 'Road map' of the Five Cities Traffic Demand Management Study to support local authorities in implementing suitable traffic demand management measures identified for specific cities.

Recommendation 23

UTRAP Group to continue to meet at least bi-annually to monitor the implementation of the recommendations until completed.

9. 3 Local/Regional level

Local level

The Environmental Protection Agency (EPA) has designed a performance framework to measure the performance of local authorities in delivering their environmental enforcement activities. Local authorities provide data and plans annually to the EPA for the purposes of assisting implementing programmes of continual improvement in the areas of environmental enforcement and inspection. By providing local and national comparative data, a local authority can benchmark their own enforcement processes and plan for making performance improvements.

The plan submitted to the EPA is known as the Recommended Minimum Criteria for Environmental Inspections (RMCEI) Plan. The potential of adopting a regional approach to air quality management in the Dublin Agglomeration has been addressed elsewhere in this plan. One important consideration is the current resourcing of a quality functions within the Dublin local authorities.

The most recent evaluation published by the EPA in 2021 of the plans submitted by all local authorities emphasises the need to enhance capacity on a regional basis in terms of air quality management in order to protect public health.

On the basis of data provided by each of the local authorities in Dublin to the EPA (RMCEI Plan 2021) on their respective inspection and compliance plans for 2021, a total of 603 working days will be utilised for routine air quality inspections including air quality monitoring (90% of this accounted for by Dublin City Council which maintains its own extensive air quality

monitoring network) and 1175 days for reactive inspections related to public complaints for both air and noise issues (77% of this accounted for by Dublin City Council).

There is a compelling need to address capacity issues in the next iteration of RMCEI Plans for 2022 by the local authorities.

9.4 Enhancing Public Engagement

The role of the public, both individually and collectively is critical in terms of addressing air quality issues across the board. Addressing air quality issues cuts across a wide spectrum of other issues that are of public concern including climate action and transport policy. Rather than being a “tick box” exercise, enhanced public engagement can be the driver for change on matters that appear to be politically challenging. The convening of Citizen Assemblies to consider and ultimately address societal issues have been used to good effect in Ireland.

The Citizens Assembly on how the State can make Ireland a leader in tackling climate change made a number of recommendations that have a direct bearing on reducing nitrogen dioxide levels namely:

93% of the Members recommended that the number of bus lanes, cycling lanes and park and ride facilities should be greatly increased in the next five years, and much greater priority should be given to these modes over private car use.

96% of the Members recommended that the State should immediately take many steps to support the transition to electric vehicles.

92% of the Members recommended that the State should prioritise the expansion of public transport spending over new road infrastructure spending at a ratio of no less than 2-to-1 to facilitate the broader availability and uptake of public transport options with attention to rural areas.

In terms of implementing the measures in this plan, it could be argued that in terms of their thinking the public are ahead of progress on policy. A number of the measures identified in this plan are the basis of the framework to promote informed involvement and decision making by the public.

In particular, the proposed measure to explore with other stakeholders such as An Taisce, or the Asthma Society on the establishment of a public consultative process or forum on air quality will be a crucial initiative in this plan.

9.5 Integration/Cross Cutting Actions (Noise, Climate Action etc.)

Addressing nitrogen dioxide levels in Dublin in the coming years should be considered in the context of a number of other actions that come within the remit of local authorities. These include:

Environmental Noise Directive

The four Dublin local authorities are also classed as one agglomeration for the purposes of the European Communities (Environmental Noise) Regulations 2018, which implements the EU Environmental Noise Directive 2002/49/EC (END). The END requires the preparation and publication every 5 years, of strategic noise maps and noise management action plans for transport noise sources (i.e. roads, railways and airports) and industry.

Currently Round 4 of this noise mapping and action planning cycle (2020–2025) is underway which entails completing noise mapping during by mid-2022 and preparation and approval of noise action plans by mid-2023.

As this plan is primarily focused on addressing transport, related noise there is clear potential for cross over actions to promote and facilitate quieter and cleaner modes of transport.

Dublin Local Authorities Climate Change Action Plans 2019 – 2024

The urgency of the climate action agenda – as articulated in the most recent report from the Intergovernmental Panel on Climate Change (IPCC) underlines the need for urgent action on climate change by all sectors of society.

The report stated, strong and sustained reductions in carbon dioxide (CO₂) and other greenhouse gases would limit change and as a result, benefits for air quality would come quickly.

Dealing with the transport sector is central to implementing climate action and while challenging it also presents opportunities to address wider environmental issues in the round including reducing nitrogen dioxide emissions.

The four Dublin Local Authorities local authorities have produced Climate Action Plans for 2019 - 2024.

The four Dublin Local Authorities launched Dublin's first Climate Action Week (DCAW21), which ran from Monday 13th to Sunday 19 September 2021.

The agreed shared objectives of the initiative were:

- Demonstrate progress on the implementation of the four Dublin local authority Climate Change Action Plans, and a regional approach to climate action;
- Engage with a full range of partners to share knowledge on efforts and innovation across sectors;
- Make climate action a 'reality' allowing citizens to see what climate action looks like;
- Promote this initiative so as to fully engage with EU and international cities and our climate peers; and
- Create a legacy so that this initiative can carry forward to subsequent years in a variety of ways.

10.0 Conclusions and Recommendations

10.1 Conclusions

1. The 14 Measures set out in chapter 5 of this Plan has been screened for both Strategic Environmental Assessment and Appropriate Assessment and the conclusions of these screening assessments are that the Plan will not result in land use activities that have the potential to result in negative impacts on the qualifying features of interest of European Sites occurring within or surrounding the plan area and will not have the potential to compromise the achievement of the conservation objectives of these European Sites. In this regard the four Local Authorities have made a determination under section 9 (3) of S.I. No. 435/2004 – European Communities (Environmental Assessment of Certain Plans and Programmes) regulations 2004, that this Air Quality Plan for NO₂ is not likely to have significant effects on the environment and thus does not require the completion of a Strategic Environmental Assessment.
2. Levels of nitrogen dioxide in the ambient air have been in compliance with European Union limit values except for an exceedance in 2009 and again in 2019, when the limit value was exceeded at one location in these years. There is no room for complacency as levels recorded at various times and locations over a number of years have approached this limit value. There is a strong possibility that the limit value could be exceeded in subsequent years unless existing initiatives continue and additional appropriate measures are considered and implemented. It should be noted that nitrogen dioxide levels for 2020 have not exceeded EU limit values, and the results to date for 2021 do not indicate an exceedance.
3. It is generally accepted that the dominant primary source of nitrogen dioxide in ambient air in the Dublin Region is vehicular traffic. While individual vehicle engines have become less polluting and more efficient over time, the population increases, the number of vehicles and their pattern of movement have given rise to continuing elevated levels of nitrogen dioxide.
4. The overriding concern with regard to an exceedance of the European limit value for nitrogen dioxide is the public health dimension. The Clean Air for Europe Directive prioritises the need to reduce pollution to levels that minimise harmful effects on human health, paying particular attention to sensitive populations. The evidence base from previous experience in the Dublin Region of health effects from pollution from bituminous fuels is a clear reminder that timely action is of the essence to protect public health when air pollution levels are elevated. A recent 2020 study concluded that when the AQIH (Air Quality Index for Health) deteriorates, there is an impact on hospital admissions for individuals with asthma, chronic obstructive airways disease and heart failure.

5. The EU air quality standards are based on the criteria for the protection of human health set down in the World Health Organisation Air Quality Guidelines Global Update 2005. These legal limit values are focused on the protection of human health and are based on the World Health Organisation Air Quality Guidelines Global Update 2005.

6. The World Health Organisation issued New WHO Global Air Quality Guidelines (AQGs) on 22 September 2021. These new guidelines recommend new air quality levels to protect the health of populations, by reducing levels of key air pollutants, some of which also contribute to climate change. The goal of the guideline is for all countries to achieve recommended air quality levels. Whilst acknowledging that this may be a difficult task for some countries, WHO has proposed interim targets to facilitate stepwise improvement in air quality and thus gradual, but meaningful, health benefits for the population.

7. In the 2020 “State of the Environment Report “ the Environmental Protection Agency reported that “The publication and implementation of the planned National Clean Air Strategy is needed to protect Ireland’s air quality. The adoption of the World Health Organization guideline values as national air quality standards within the strategy would provide for a higher level of public health protection. Integrating air pollution controls, noise mitigation measures and climate action, for example in transport management, can bring multiple benefits.” The report also stated that measures to address NO₂ could include those used in other European cities, such as promoting the use of public transport, cycling and walking, and restricting more polluting vehicles from central areas. The announcement that Dublin has become the first Irish city to sign up to the WHO Breathe Life campaign, which entails making a commitment to meeting the WHO guideline values by 2030 (Breathe Life, 2020), is a positive step.

8. Land use and transportation planning strategies to deliver sustainable living, need to be continued and supported. They will also need to rigorously demonstrate how and to what degree their air quality benefits are to be achieved.

9. Many of the proposed transport infrastructure measures currently under consideration have considerable lead-in times, and funding for these measures needs to remain secured for these projects. Under these circumstances, there is also a need to harness public information measures and pro-active encouragement of behaviour change in transport usage.

10. There are real choices available to individual transport users and commuters in terms of their personal contribution to air emissions. While some initiatives have clearly been successful in demonstrating this, much still remains to be done. Linking such initiatives to potential savings

in transport fuel costs for individuals would strike a chord in current economic circumstances.

11. Given the advances in technology, it is now feasible and timely to consider measures to integrate real time air quality monitoring, predictive air quality modelling, and traffic management systems.

12. There is a compelling need for the local authorities in the Dublin region to review capacity issues in respect of air quality monitoring and management and in particular explore the added value of engaging in air quality modelling on an ongoing basis.

13. The emission modelling undertaken under the 5 City Demand Management Study and the dispersion modelling carried out by the EPA indicate that the agglomeration will be in compliance with the nitrogen dioxide limit by 2030 if not earlier. If the timescale to reach compliance is to be accelerated the most likely measures to achieve this acceleration will be to reduce emission factors from vehicles in particular cars. This can be achieved by:

- financial incentives to remove older diesel vehicles,
- incentives to increase the percentage of Electric Vehicles,
- or the introduction of low emission zones.

14. Dispersion modelling assessments complement existing monitoring techniques and can help to accurately predict pollution levels throughout the Dublin region and better inform decision making about how local areas might identify and tackle any rise in pollution levels. Any future expansion of the national monitoring network will depend on the results of nearby monitoring stations, indicative sampling and dispersion modelling assessments.

15. Modelling capacity at local authority level would complement the EPA's modelling activities and would produce useful data not only for air quality management purposes but also for other sectors such as noise mapping and city planning.

16. With publicly funded research it is imperative that the Dublin local authorities have a say in precisely what areas need to be researched and must be invited to participate on research steering groups.

17. No one agency or authority can bring about and sustain a reduction of nitrogen dioxide levels in ambient air in the Dublin region. Each key agency needs to maintain air quality to the forefront of their programmes.

18. Efforts have been made to incorporate ambient air quality considerations in a range of national, regional, and local transport strategies in the Dublin Region by a variety of agencies. It is imperative that these agencies continue to appraise their contribution to ensure air quality is prioritised, given the possibility of further exceedances of European Union limit values.

19. With indications that levels of NO₂ were approaching EU limit values in certain areas of Dublin the Urban Transport Related Air Pollution Working Group (UTRAP) was formed in 2019. UTRAP brings together for the first time all the key stakeholders including Government departments and agencies in the transportation sphere as well as local authorities and other key stakeholders. UTRAP provides a forum to enhance understanding of the causes and the health and environmental impacts of NO₂ air pollution and how to combat NO₂ and other air pollution levels.

20. The establishment of the UTRAP group is recognition that no one stakeholder can address all aspects of rising transport related pollution levels and that the activities of all the key stakeholders need to be coordinated. Any shortcomings or failures by any one key stakeholder could be detrimental to the success of this plan.

21. Public interest and concern in relation to air quality in Ireland is very significant and there is genuine buy in from the public in addressing air quality challenges. A number of projects and initiatives are underway to build on this public interest, and it is evident that the measures proposed in this plan depended on public cooperation and behavioural change over the long term. This plan identifies a number of ways in which public participation can be harnessed in a proactive rather than a reactive manner to reduce nitrogen dioxide levels and provide the opportunity to improve air quality generally.

22. The level of public interest in relation to air quality was evident from the public consultation process and the feedback received did result in changes to the draft air quality plan, particularly in relation to an appraisal of the feasibility of low emission zones.

10.2 Recommendations

Chapter 5 of this Plan sets out a number of specific measures and actions for consideration, this section sets out to provide a number of overarching recommendations to facilitate the further implementation and development of those measures and actions. This will require continued engagement across a range of local regional and national stakeholders.

The measures and actions identified in this plan highlight the absolute necessity for concerted action by the various agencies with input to national, regional, and local policy that influence reducing nitrogen dioxide levels in ambient air in the Dublin Region.

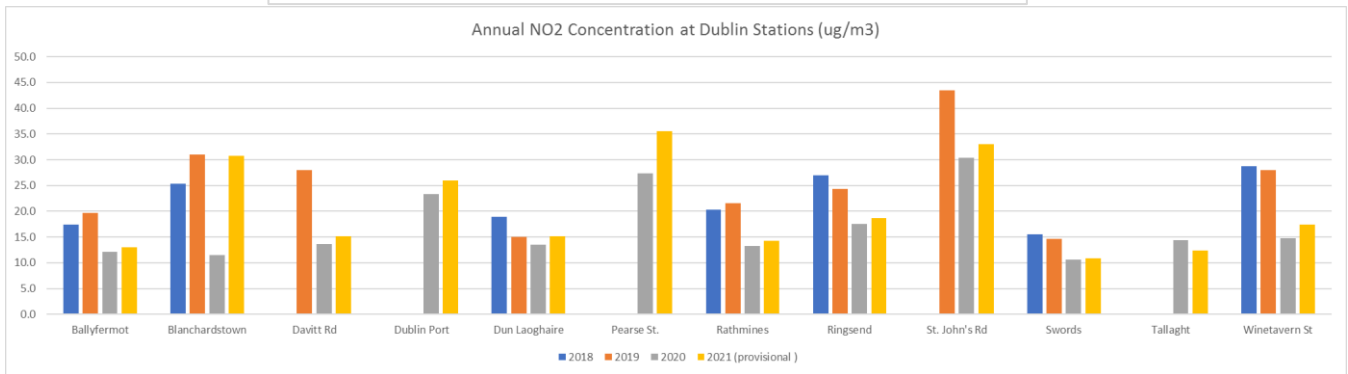
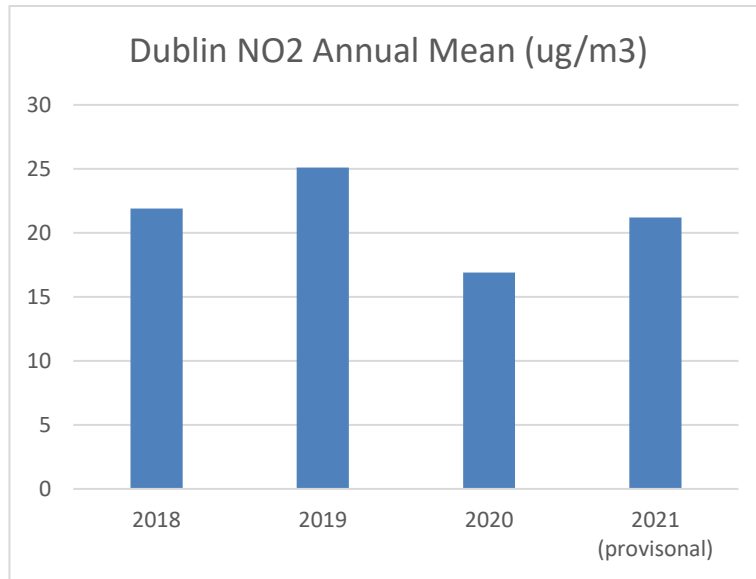
1. It is recommended that the Urban Transport-Related Air Pollution Steering Group (UTRAP) should remain in place to ensure that there is a forum to harness and direct that concerted action. It is acknowledged that the Group was established as a national initiative and that its future direction and configuration will be determined through stakeholder discussion and to maximise the impact of the group following the submission of the final UTRAP report to Government.
2. It is recommended that a coherent framework for addressing air quality matters generally will be best served by the publication of the National Clean Air Strategy, and this strategy should incorporate reference to the most recent World Health Organization air quality guideline values for an enhanced level of public health protection.
3. It is recommended that the incorporation of “10/15 minute neighbourhoods” (or similar) concept in City and County Development Plans be considered given the overall benefit that will accrue in terms of air quality generally and nitrogen dioxide levels in particular. **The Five Cites Demand Management Study** identifies the introduction of this concept as the No. 1 overall ranked intervention to address demand management, decarbonisation, air quality, and urban development.
4. It is recommended that future public, residential and commercial parking controls be considered with specific reference to their impact on ambient nitrogen dioxide levels.
5. It is recommended that an appraisal be carried out to consider the legislative basis and feasibility of introducing low emission zones.
6. It is recommended that the Local Authorities Electrical Vehicle (EV) Charging Strategy, which is currently being elaborated, be completed to support the growth of EVs to at least

800,000 by 2030 and set a target for the supply of infrastructure to stay sufficiently ahead of demand.

7. Citizen engagement is a key element in improving air quality. As well as the initiatives currently underway it is recommended that Dublin local authorities to explore with other stakeholders such as An Taisce, the Asthma Society and others as relevant, on the establishment of a public consultative process or forum on air quality.
8. It is recommended that local authorities in the Dublin Region intensify their collaboration with the EPA to expand real time air quality monitoring in the region and also to develop air quality modelling and forecasting capacity.
9. It is recommended that the local authorities be engaged as partners and/or advisers in air quality research being funded by the EPA on projects in the Dublin region.
10. This plan demonstrates the wide variety of policies, strategies and initiatives that address ambient nitrogen dioxide levels. Continued delivery of the objectives of these policies and strategies needs to be maintained. It is recognised that government policy seeks to include environmental criteria in initiatives such as the National Development Plan 2021-2030. It is recommended that the development of air quality and other criteria needs to include input from a wide range of stakeholders including the public and local authorities.

Appendix A - Air Quality Monitoring Data/Graphs

Annual Mean – Dublin Stations (ug/m3)



Appendix B - Public Consultation Report and Analysis

Appendix B1 – Consultation Hub Responses Summary Report

Air Quality Plan to improve levels of nitrogen dioxide (NO₂) in ambient air

<https://consultation.dublincity.ie/environment/air-quality-plan-to-improve-levels-of-nitrogen-dio>

This report was created on Tuesday 16 November 2021 at 09:28

The activity ran from 18/10/2021 to 15/11/2021

Responses to this survey: **208**

1: What is your name?

Name

There were 202 responses to this part of the question.

2: What is your email address?

Email

There were 165 responses to this part of the question.

3: What is your organisation? (if applicable)

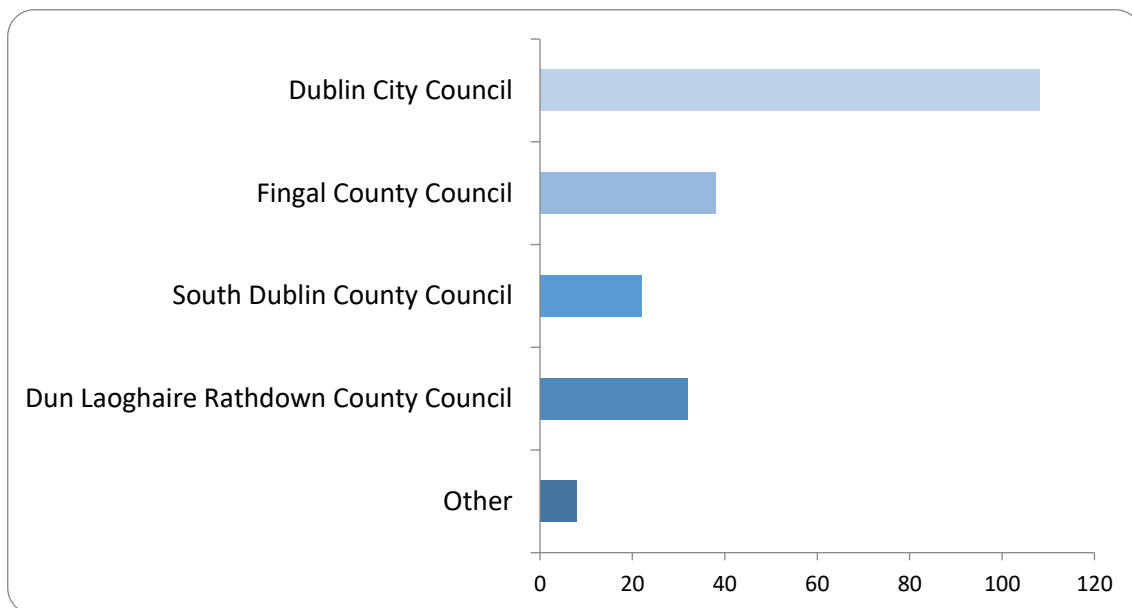
Organisation

There were 29 responses to this part of the question.

4: In which Local Authority area do you reside?

Local Authority

There were 208 responses to this part of the question.



Option	Total	Percent
Dublin City Council	108	51.92%
Fingal County Council	38	18.27%
South Dublin County Council	22	10.58%
Dun Laoghaire Rathdown County Council	32	15.38%
Other	8	3.85%
Not Answered	0	0.00%

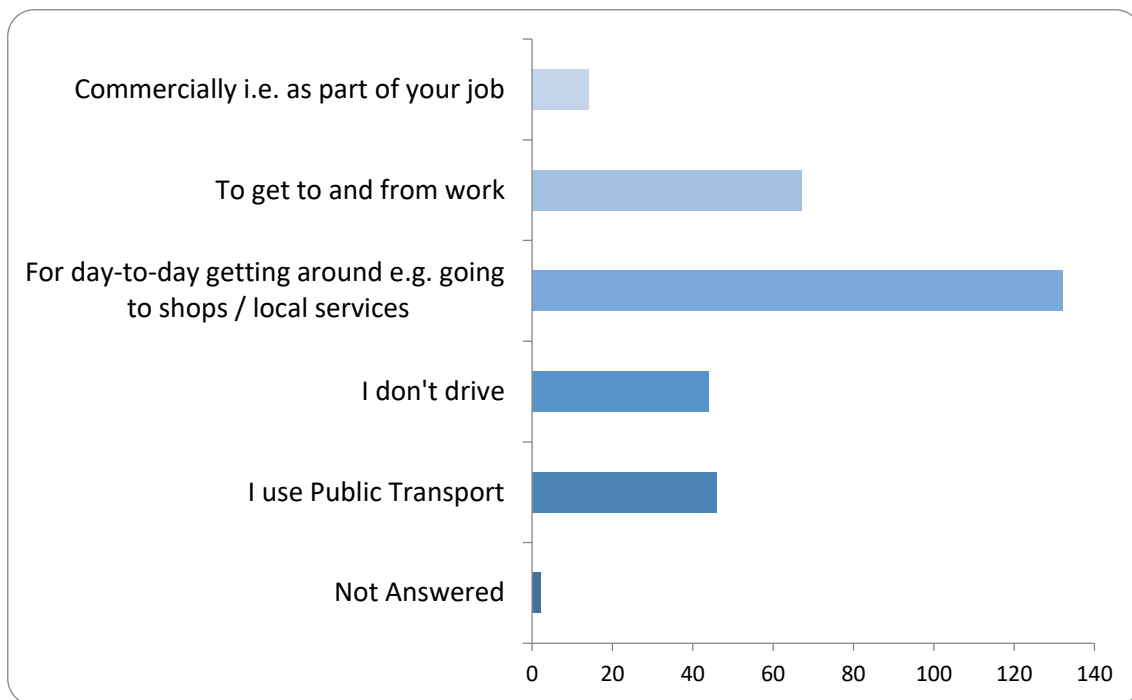
Other Local Authority

There were 8 responses to this part of the question.

5: What are the main reasons you drive a vehicle in your local area / in Dublin generally?
Please select as many as apply to you.

Reasons for Driving

There were 206 responses to this part of the question.

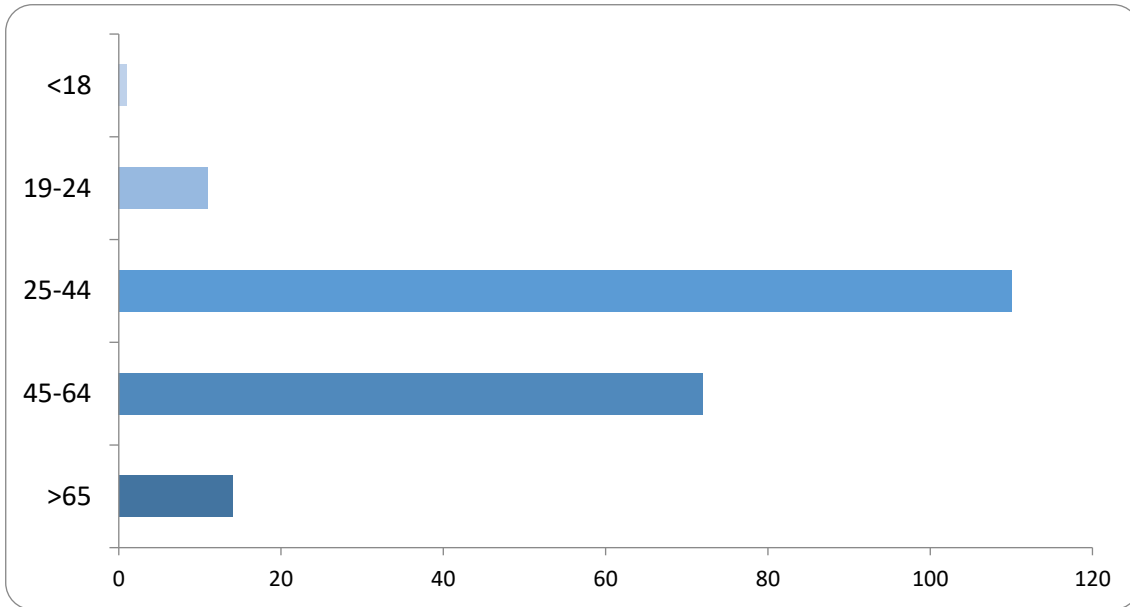


Option	Total	Percent
Commercially i.e. as part of your job	14	6.73%
To get to and from work	67	32.21%
For day-to-day getting around e.g. going to shops / local services	132	63.46%
I don't drive	44	21.15%
I use Public Transport	46	22.12%
Not Answered	2	0.96%

6: Which age bracket do you fall into?

Age Profile

There were 208 responses to this part of the question.

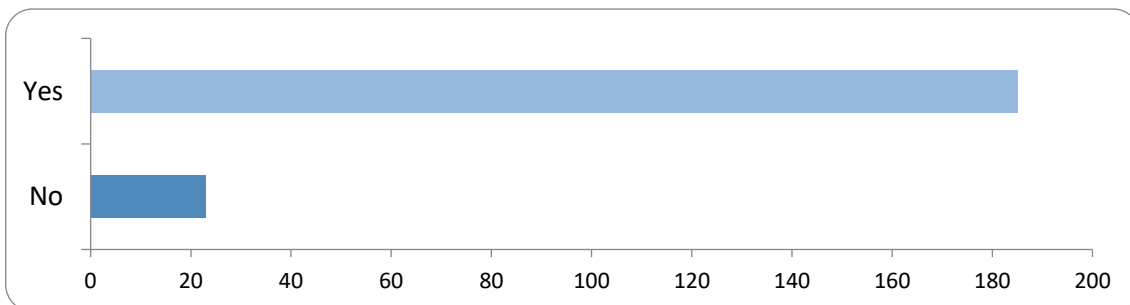


Option	Total	Percent
<18	1	0.48%
19-24	11	5.29%
25-44	110	52.88%
45-64	72	34.62%
>65	14	6.73%
Not Answered	0	0.00%

7: Do you have an understanding of the health impacts of elevated NO₂ levels?

Understand health impacts of high NO₂

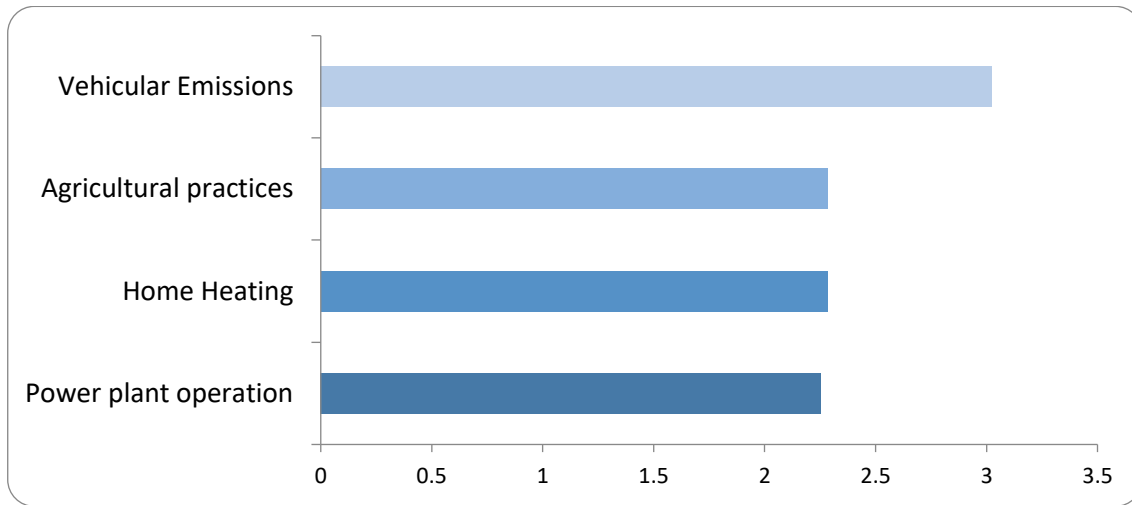
There were 208 responses to this part of the question.



Option	Total	Percent
Yes	185	88.94%
No	23	11.06%
Not Answered	0	0.00%

8: Rank each of the following contributors to elevated NO2 levels (with 1 being the highest contributor).

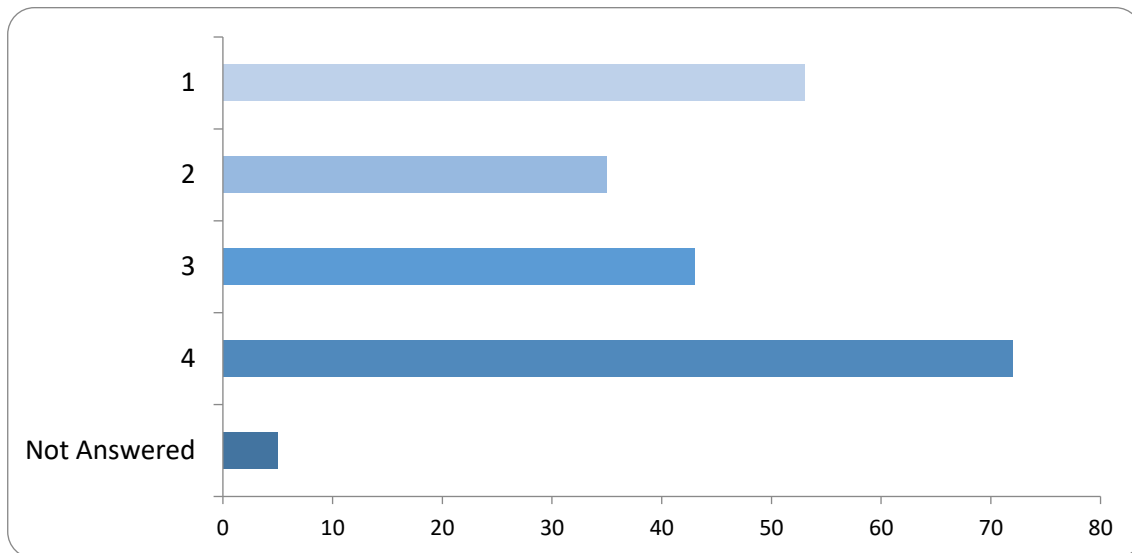
Ranking of 'Ranking of contributions to NO2 levels'



Item	Ranking
Vehicular Emissions	3.02
Agricultural practices	2.28
Home Heating	2.28
Power plant operation	2.25

Ranking of contributions to NO2 levels - Agricultural practices

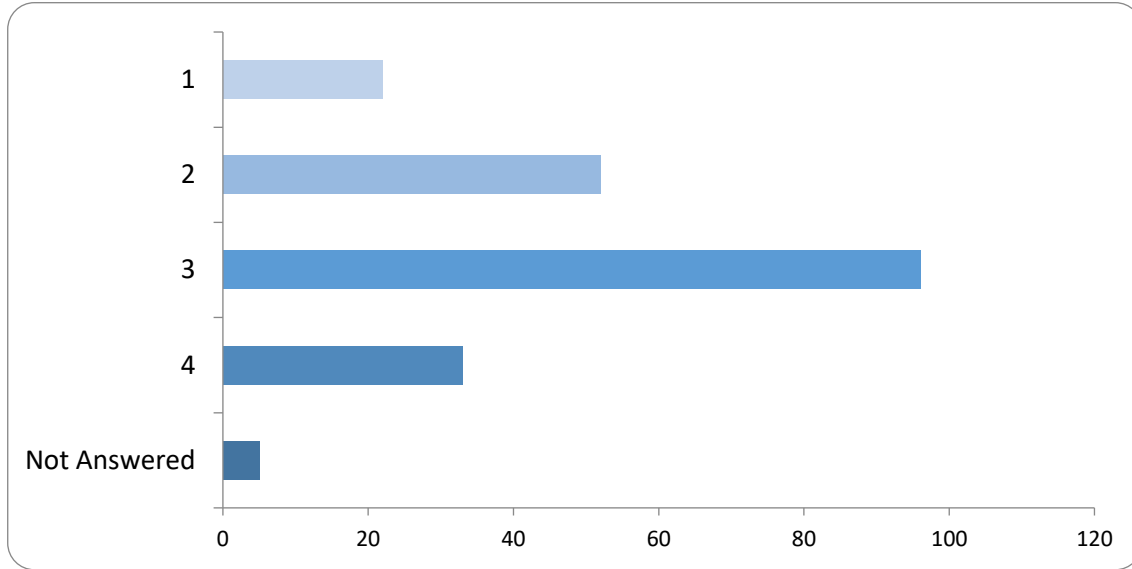
There were 203 responses to this part of the question.



Option	Total	Percent
1	53	25.48%
2	35	16.83%
3	43	20.67%
4	72	34.62%
Not Answered	5	2.40%

Ranking of contributions to NO2 levels - Power plant operation

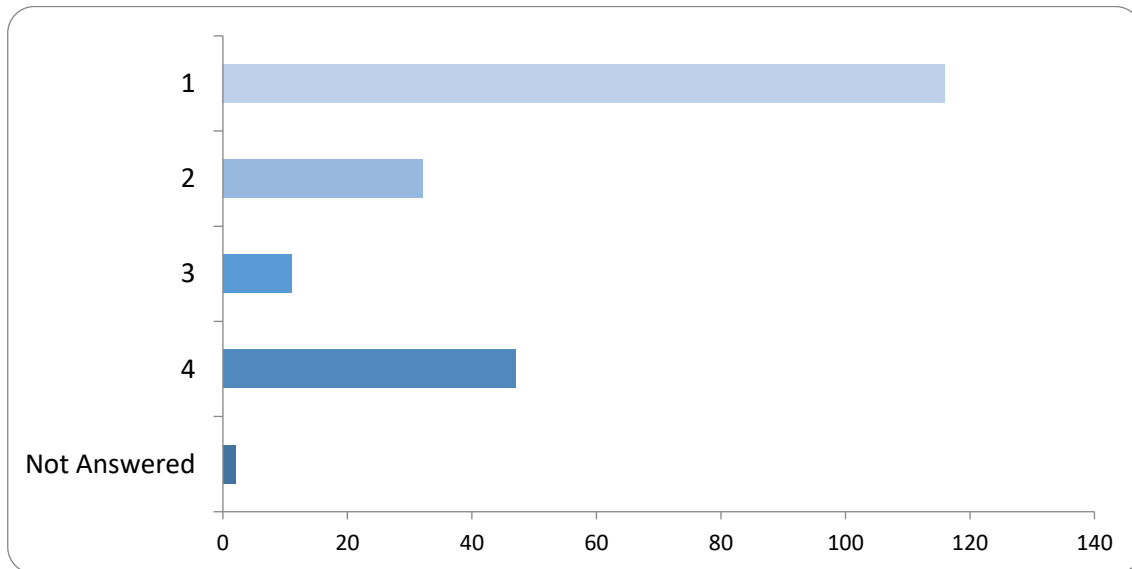
There were 203 responses to this part of the question.



Option	Total	Percent
1	22	10.58%
2	52	25.00%
3	96	46.15%
4	33	15.87%
Not Answered	5	2.40%

Ranking of contributions to NO2 levels - Vehicular Emissions

There were 206 responses to this part of the question.

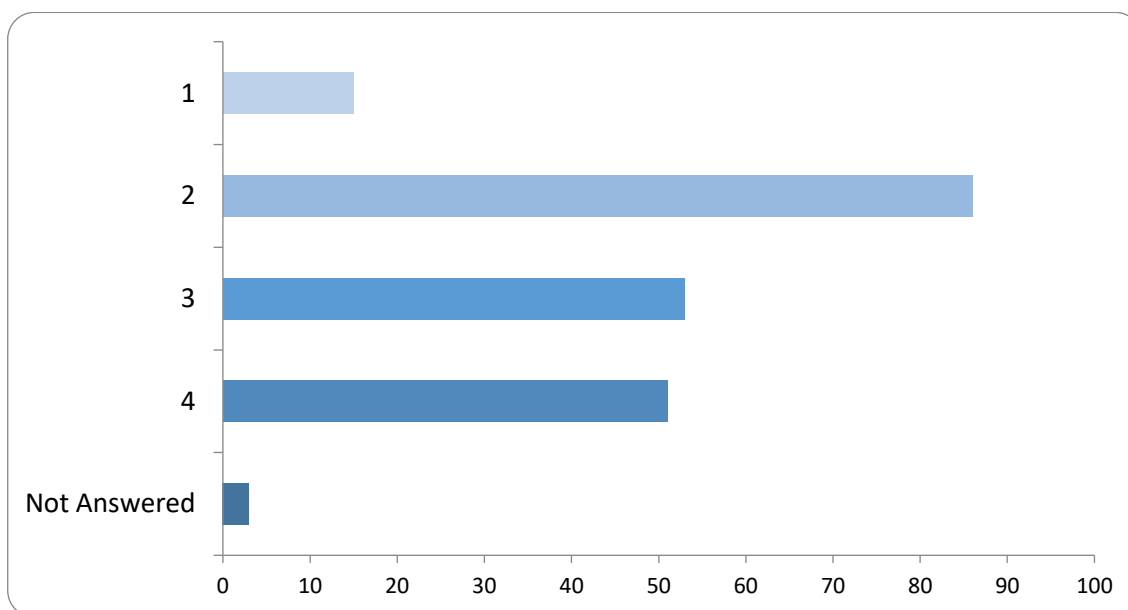


Option	Total	Percent
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1	116	55.77%
2	32	15.38%
3	11	5.29%
4	47	22.60%
Not Answered	2	0.96%

Ranking of contributions to NO2 levels - Home Heating

There were 205 responses to this part of the question.

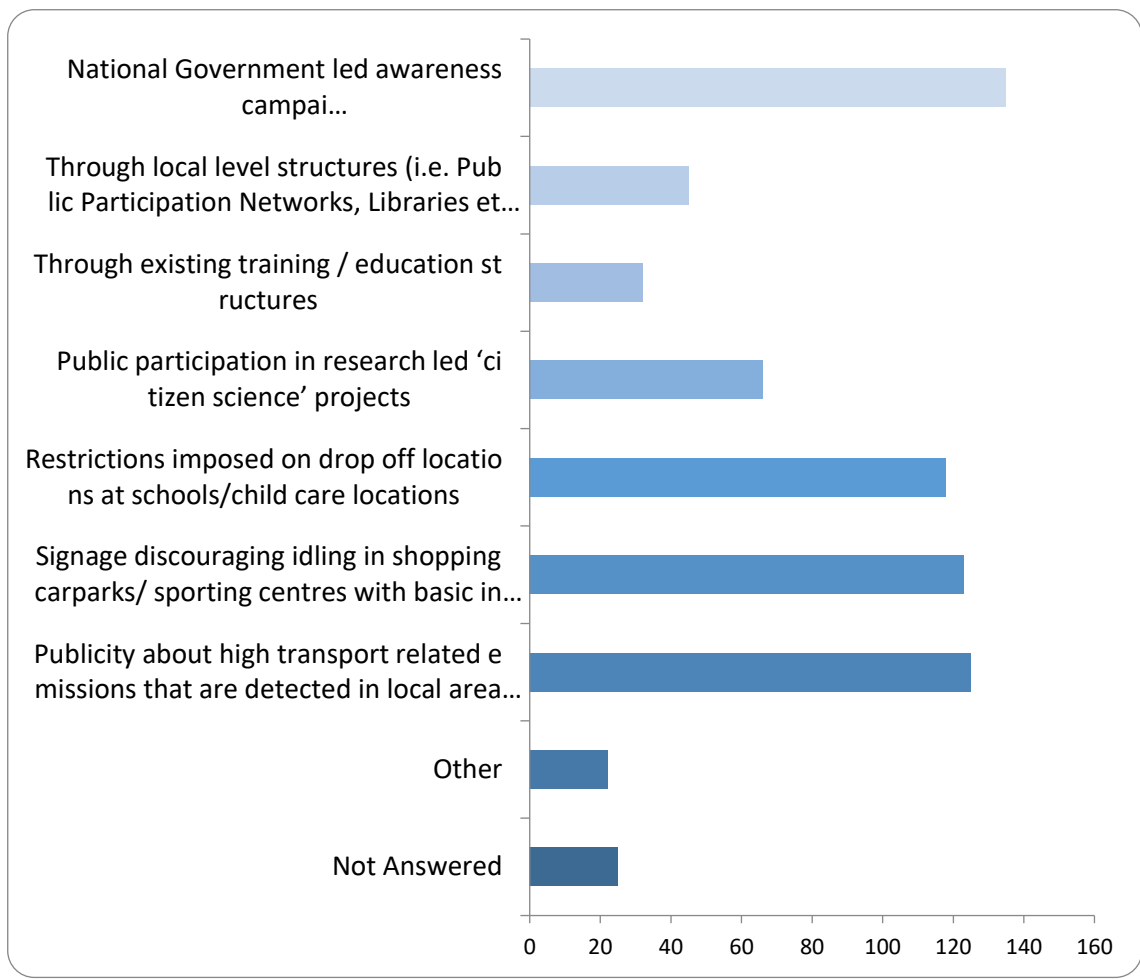


Option	Total	Percent
1	15	7.21%
2	86	41.35%
3	53	25.48%
4	51	24.52%
Not Answered	3	1.44%

9: How can the general public be best made more aware of the health impacts of air pollution (specifically NO2)?

How to make people aware of health impacts of NO2

There were 183 responses to this part of the question.



Option	Total	Percent
National Government led awareness campaigns	135	64.90%
Through local level structures (i.e. Public Participation Networks, Libraries etc)	45	21.63%
Through existing training / education structures	32	15.38%
Public participation in research led 'citizen science' projects	66	31.73%
Restrictions imposed on drop off locations at schools/child care locations	118	56.73%
Signage discouraging idling in shopping carparks/ sporting centres with basic info about harmful emissions from petrol/diesel vehicles	123	59.13%
Publicity about high transport related emissions that are detected in local areas	125	60.10%
Other	22	10.58%

Not Answered	25	12.02%
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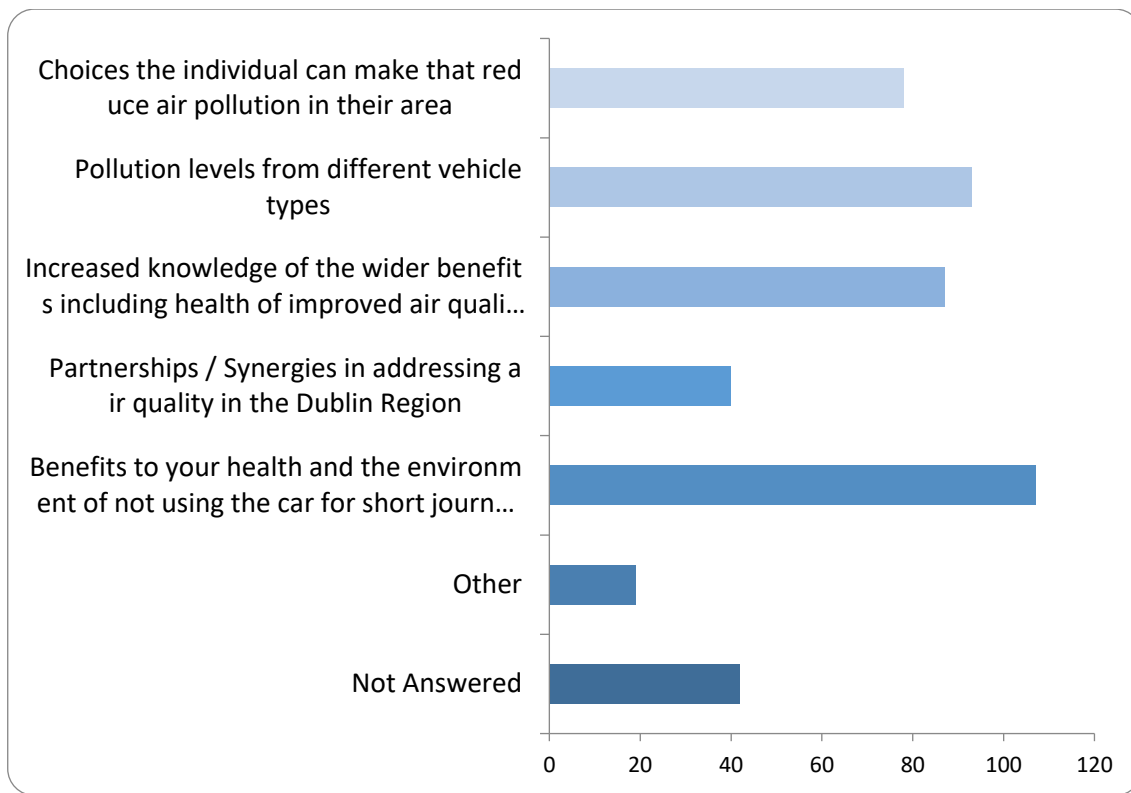
Other

There were 58 responses to this part of the question.

10: Are there particular transport related air pollution issues in your area that would benefit from an awareness raising campaign?

What awareness campaigns needed

There were 166 responses to this part of the question.



Option	Total	Percent
Choices the individual can make that reduce air pollution in their area	78	37.50%
Pollution levels from different vehicle types	93	44.71%
Increased knowledge of the wider benefits including health of improved air quality	87	41.83%
Partnerships / Synergies in addressing air quality in the Dublin Region	40	19.23%

Benefits to your health and the environment of not using the car for short journeys/ leaving the car at home for a number of days per week”	107	51.44%
Other	19	9.13%
Not Answered	42	20.19%

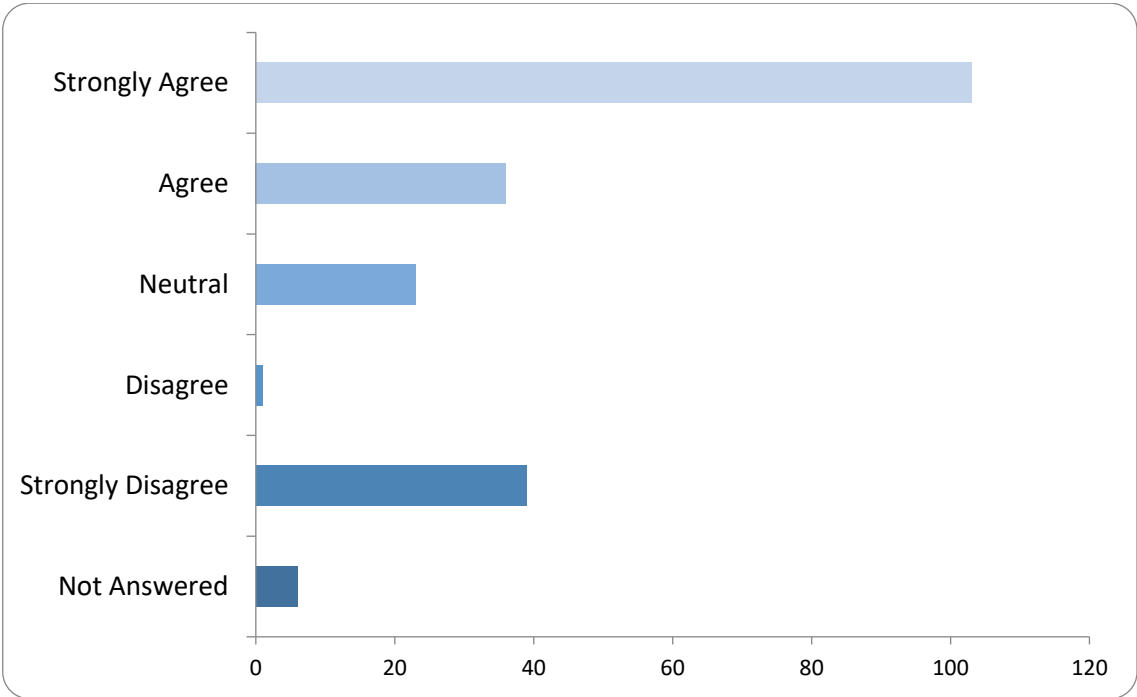
Other

There were 52 responses to this part of the question.

11: Do you agree with the recommendations of the Citizens' Assembly in relation to the climate actions that impact on air quality?

Recommendations of Citizen Assembly

There were 202 responses to this part of the question.

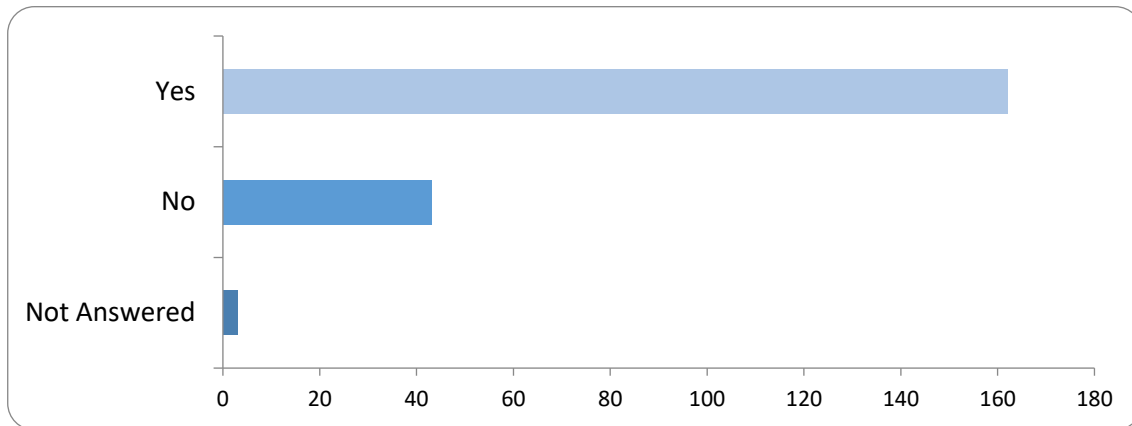


Option	Total	Percent
Strongly Agree	103	49.52%
Agree	36	17.31%
Neutral	23	11.06%
Disagree	1	0.48%
Strongly Disagree	39	18.75%
Not Answered	6	2.88%

12: Is there a need for review and strengthening Local Authority and Environmental Protection Agency EPA powers in relation to dealing with Air pollution, and in particular NO2 levels?

Need to review and strengthen powers to deal with Air Pollution

There were 205 responses to this part of the question.

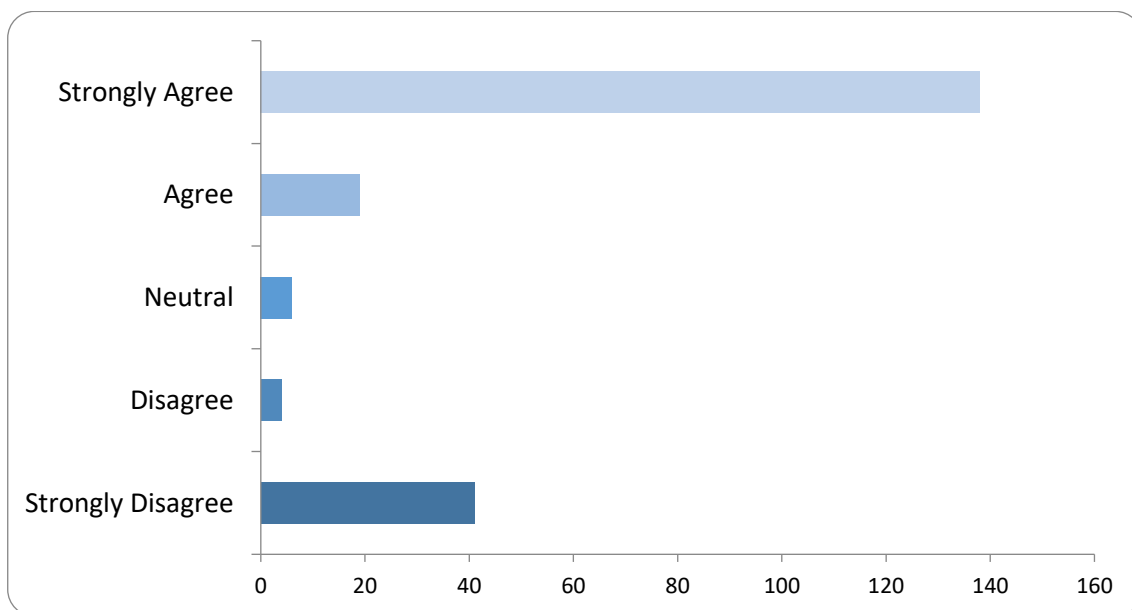


Option	Total	Percent
Yes	162	77.88%
No	43	20.67%
Not Answered	3	1.44%

13: Consideration should be given to the introduction of Low Emission Zones in urban areas.

Low Emission Zones

There were 208 responses to this part of the question.



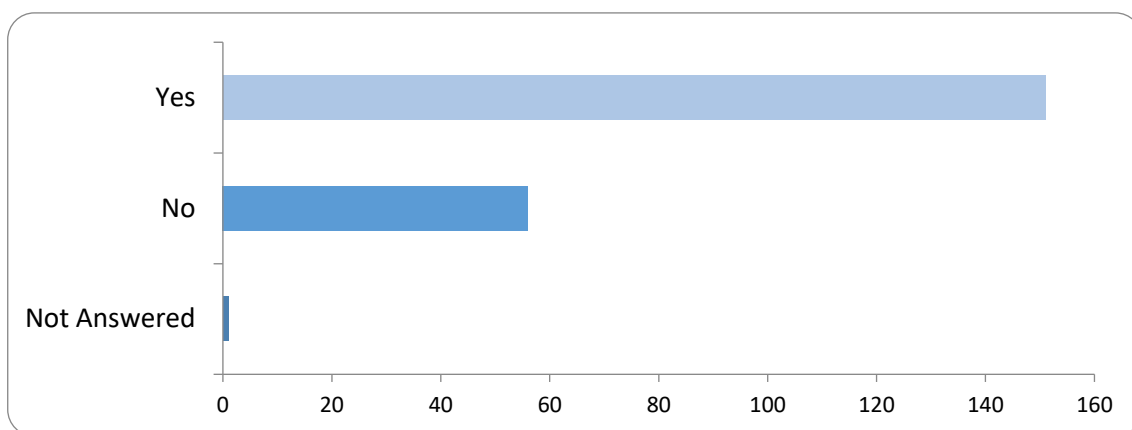
Option	Total	Percent
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Strongly Agree	138	66.35%
Agree	19	9.13%
Neutral	6	2.88%
Disagree	4	1.92%
Strongly Disagree	41	19.71%
Not Answered	0	0.00%

14: A Low Emission Zone may involve a charge being levied on those with polluting vehicles. Is this a measure you would support?

Support Low Emission Zone Charge

There were 207 responses to this part of the question.

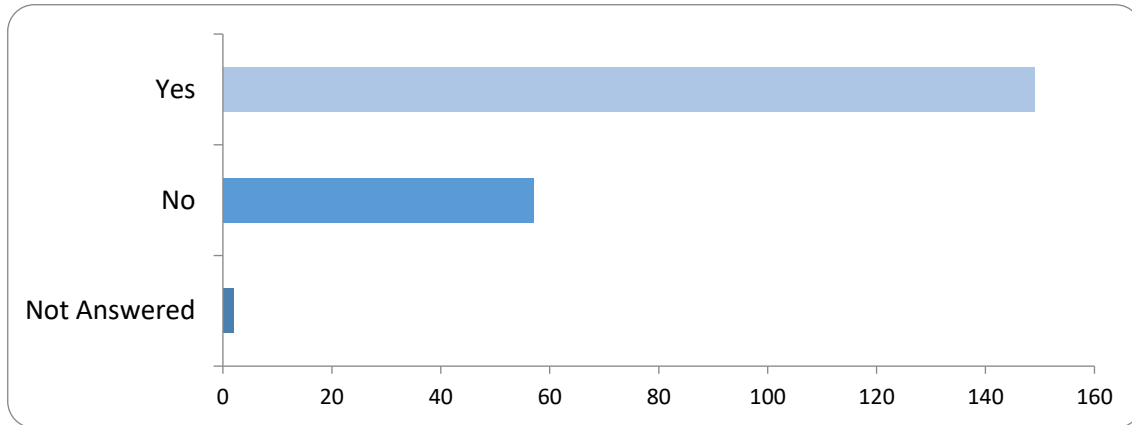


Option	Total	Percent
Yes	151	72.60%
No	56	26.92%
Not Answered	1	0.48%

15: Would you support the Government amending existing legislation to delegate powers to the Local Authorities to introduce Low Emission Zones?

Low Emission Zones

There were 206 responses to this part of the question.

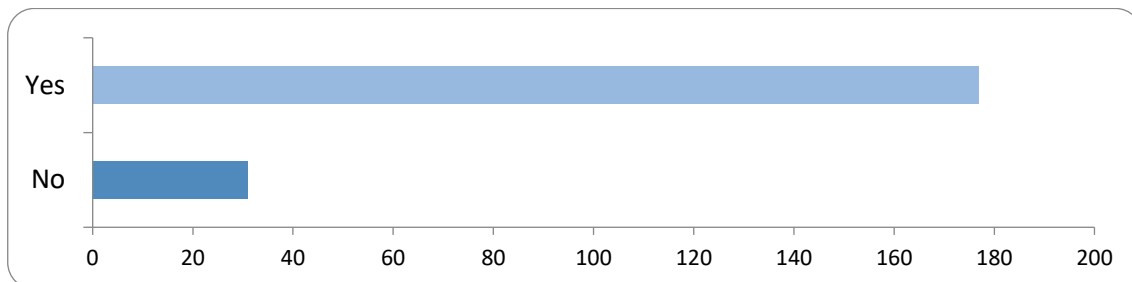


Option	Total	Percent
Yes	149	71.63%
No	57	27.40%
Not Answered	2	0.96%

16: Are you familiar with the concept of 10/15 minute neighbourhoods?

Familiar with 10-15 min neighbourhoods

There were 208 responses to this part of the question.

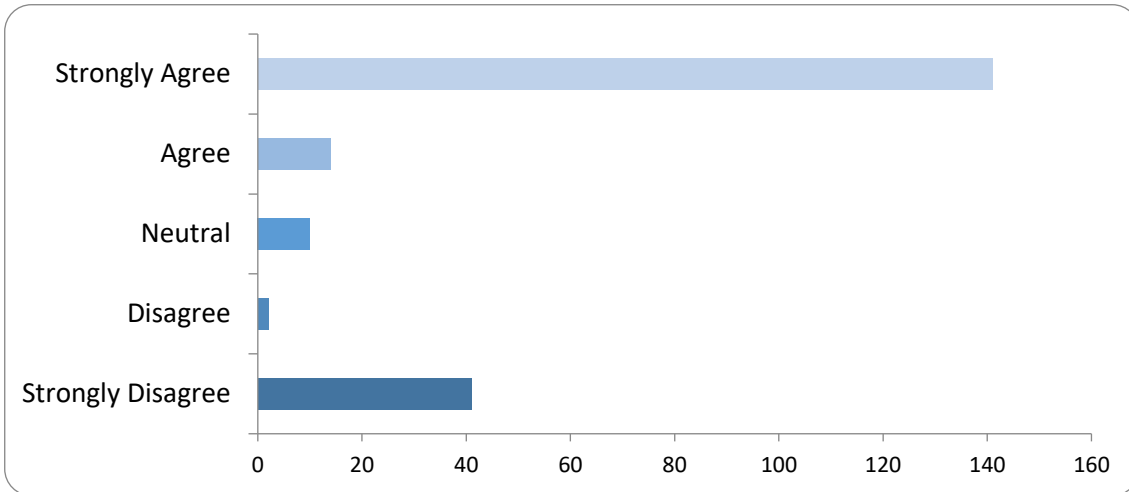


Option	Total	Percent
Yes	177	85.10%
No	31	14.90%
Not Answered	0	0.00%

17: The concept of a 10/15 minute neighbourhood, or similar, should be examined by all local authorities.

10/15 minute neighbourhoods should be examined

There were 208 responses to this part of the question.

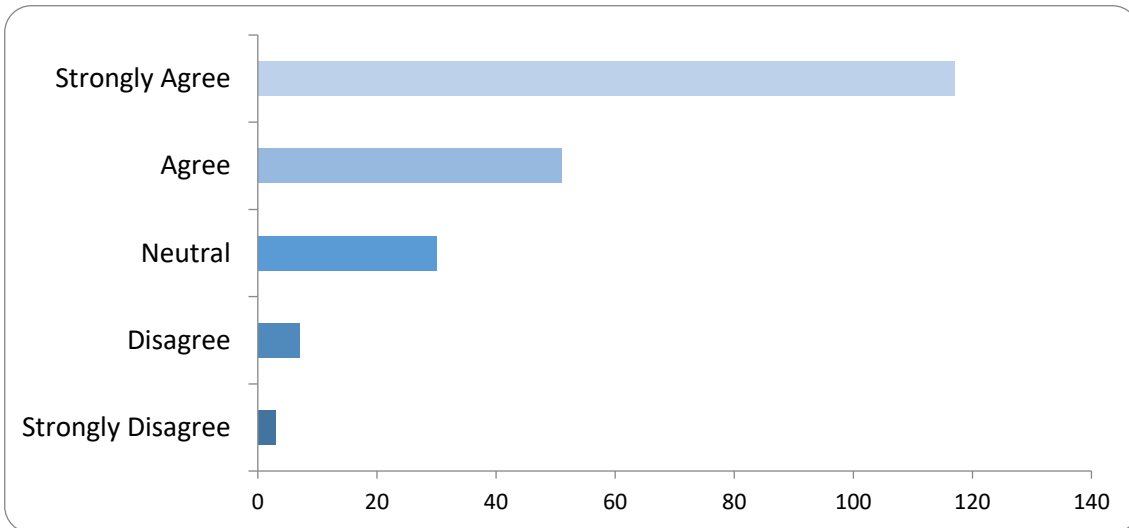


Option	Total	Percent
Strongly Agree	141	67.79%
Agree	14	6.73%
Neutral	10	4.81%
Disagree	2	0.96%
Strongly Disagree	41	19.71%
Not Answered	0	0.00%

18: An extensive electrical vehicle-charging network should be developed in Dublin.

Electrical Vehicle-charging

There were 208 responses to this part of the question.

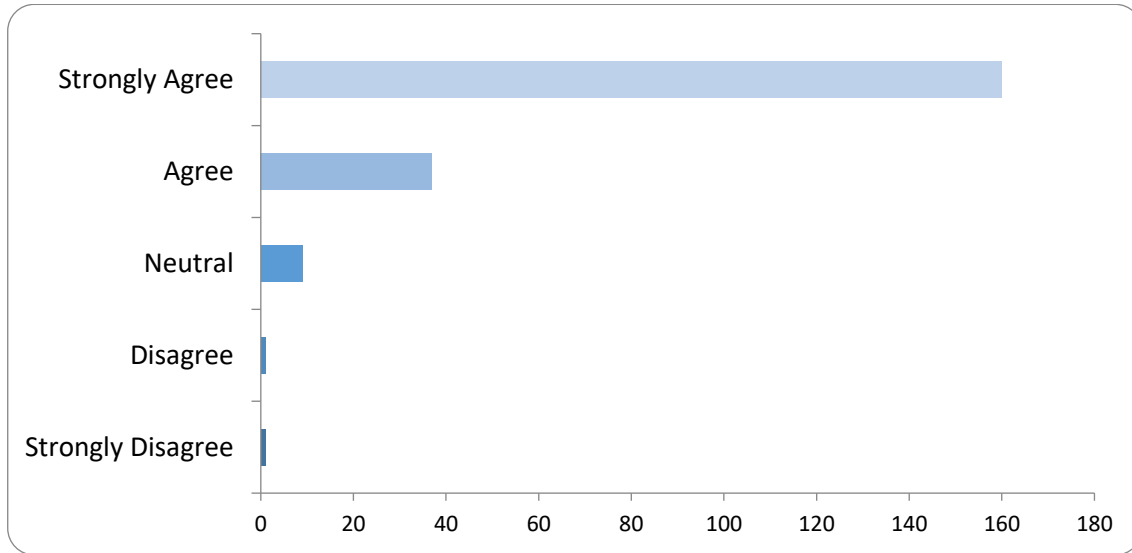


Option	Total	Percent
Strongly Agree	117	56.25%
Agree	51	24.52%
Neutral	30	14.42%
Disagree	7	3.37%
Strongly Disagree	3	1.44%
Not Answered	0	0.00%

19: The Irish workforce should be provided with the option of remote working, for a portion of the week, to reduce NO2 emissions.

Remote Working

There were 208 responses to this part of the question.

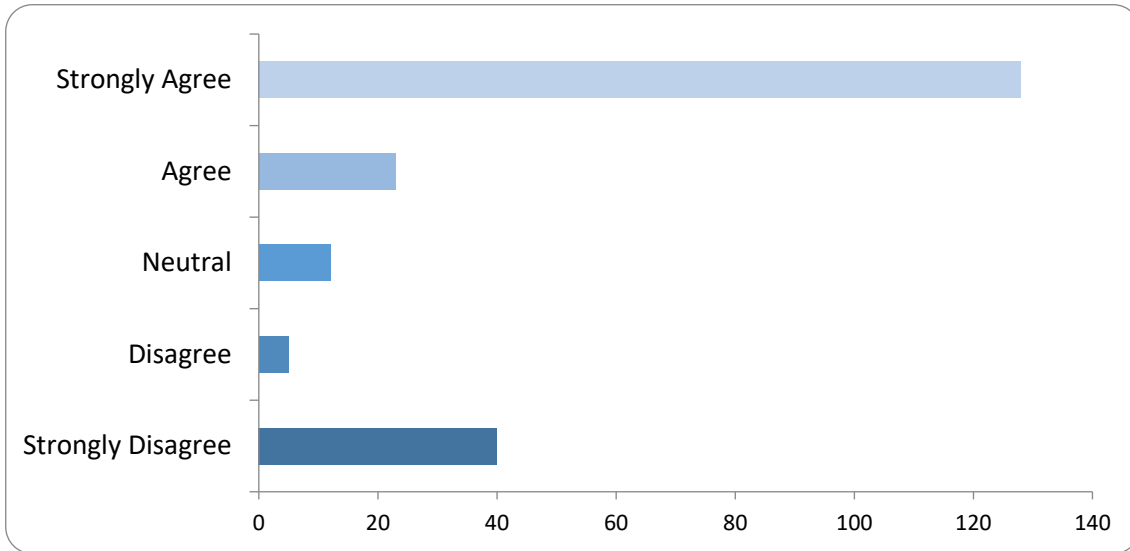


Option	Total	Percent
Strongly Agree	160	76.92%
Agree	37	17.79%
Neutral	9	4.33%
Disagree	1	0.48%
Strongly Disagree	1	0.48%
Not Answered	0	0.00%

20: Consideration should be given to incorporating air quality considerations into vehicle taxation.

Air Quality in vehicle tax

There were 208 responses to this part of the question.

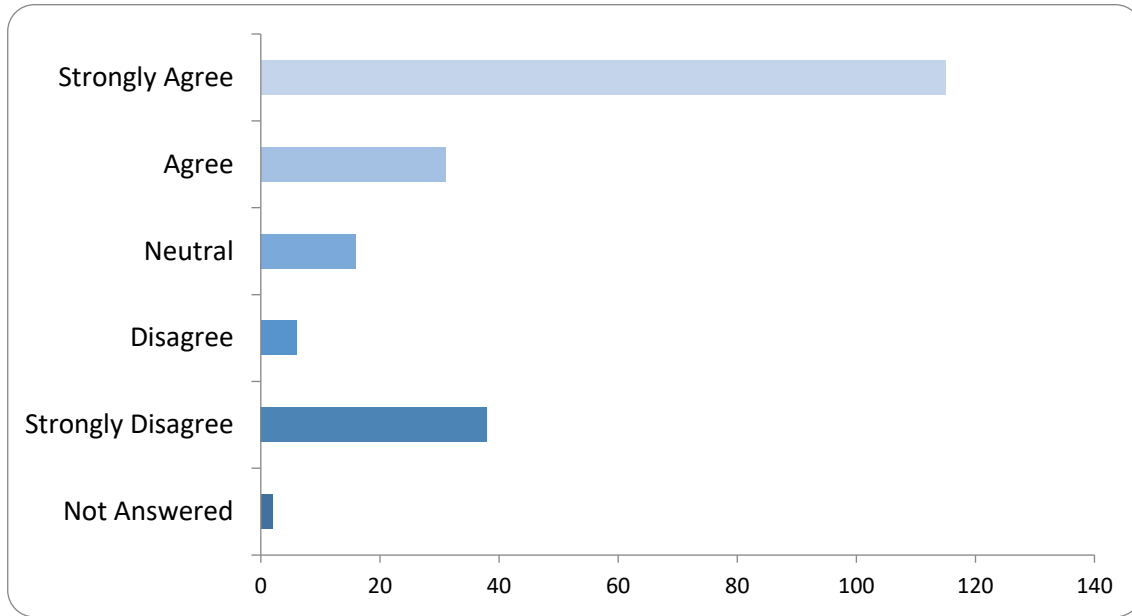


Option	Total	Percent
Strongly Agree	128	61.54%
Agree	23	11.06%
Neutral	12	5.77%
Disagree	5	2.40%
Strongly Disagree	40	19.23%
Not Answered	0	0.00%

21: The NCT emissions testing should have a role in periodic assessment of air pollution emissions, to inform better regulation of 'in use' vehicle emissions.

NCT role in assessment of air pollution

There were 206 responses to this part of the question.

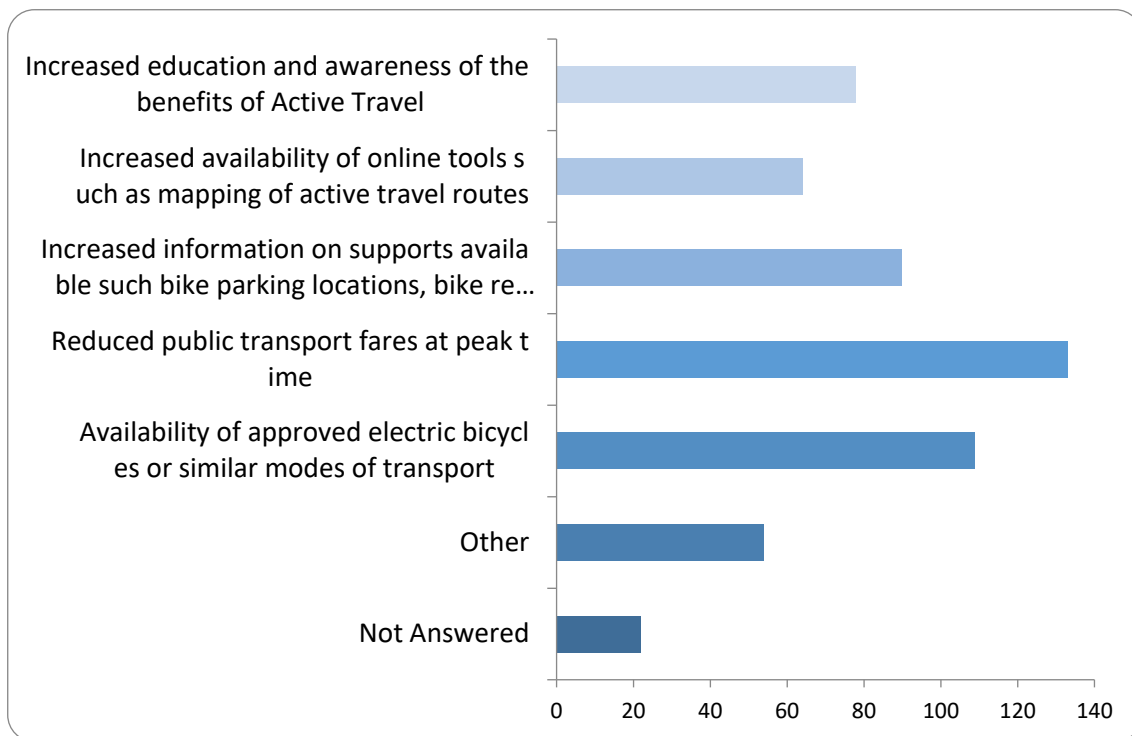


Option	Total	Percent
Strongly Agree	115	55.29%
Agree	31	14.90%
Neutral	16	7.69%
Disagree	6	2.88%
Strongly Disagree	38	18.27%
Not Answered	2	0.96%

22: What other measures would encourage and support the continued modal shift to Active Travel and Public Transport?

Measures to shift to Active Travel

There were 186 responses to this part of the question.



Option	Total	Percent
Increased education and awareness of the benefits of Active Travel	78	37.50%
Increased availability of online tools such as mapping of active travel routes	64	30.77%
Increased information on supports available such as bike parking locations, bike repair outlets etc	90	43.27%
Reduced public transport fares at peak time	133	63.94%
Availability of approved electric bicycles or similar modes of transport	109	52.40%
Other	54	25.96%
Not Answered	22	10.58%

Other

There were 93 responses to this part of the question.

23: What are the important current and emerging air quality transport related air pollution issues in Ireland that require research?

Emerging air quality issues

There were 94 responses to this part of the question.

24: How can the national research capacity that exists in Universities/educational

institutions on air quality issues be best used to achieve the reduced NO₂?

Use of Research Capacity in Universities

There were 67 responses to this part of the question.

25: Do you have any additional comments / observations on the Draft Plan?

Milestone

There were 108 responses to this part of the question.

Appendix B2 – Organisations listed in Consultation Responses

Organisations which were listed by respondents:

- Aeravai Autonomous Electric Road and Air Vehicle Association of Ireland
- AHAA - All Hallows Area Association
- Biodiverse Balbriggan
- Fingal bikes
- Naul Community Council
- Nuaworks
- Wood Fuel Quality Assurance Scheme
- HES Ltd.
- UCD

Emailed Response were received from

- HSE Public Health
- HSE Environmental Health
- An Taisce
- Ciaran Cuffe MEP (Green Party)
- DAA
- Dublin Friends of the Earth
- Fingal Active Travel Group
- Ger O'Halloran
- Green Party West
- Irish Doctors for the Environment
- Met Eireann

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan		
Theme	Response	Action
<p>Matters raised that do not come within the remit of this Plan</p> <p>A number of respondents queried why this plan dealt solely with nitrogen dioxide and did not address other issues including:</p> <ul style="list-style-type: none"> • Particulates (PM10 and PM2.5,) • Emissions from vehicle brake and tyre wear. • Solid fuel burning • Emissions from the Dublin Waste to Energy Plant • Noise • Reorientation of public sector and civil service mileage expenses to discourage the use of vehicles and encourage active travel and public transport • Repurposing of public sector car parking. 	<p>Particulates (PM10 and PM2.5,) – including emissions from vehicle brake and tyre wear The legal obligation imposed by Section 22 of the Air Quality Standards Regulations 2011 is to produce a plan for nitrogen dioxide as there was a reported exceedance in 2019. There has not been a reported exceedance for any other air pollutants at any point.</p> <p>Solid fuel burning The Department of the Environment, Climate and Communications will introduce legislation in 2022 for a national ban on bituminous coal and setting standards for wood fuel.</p> <p>Emissions from the Dublin Waste to Energy Plant This facility is subject to EPA licensing – and the emissions data indicates nitrous oxide emissions are significantly below stipulated EPA limit values</p> <p>Noise The Dublin local authorities have commenced work on the preparation of noise maps and will be preparing a noise action plan in 2022 in accordance with the EU Environmental Noise Directive. The preparation of the noise action plan will involve a public consultation process</p> <p>Public sector and civil service mileage expenses and parking This is a matter for national government policy</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>10/15/20 Minute Cities approach</p> <p>There was general (though not universal) support for the adaption of the 10/15/20 Minute Cities approach</p> <p>The points raised included the need to :</p> <ul style="list-style-type: none"> Transform cities and towns to make it less likely to need cars. Increase efforts to populate the city between the canals. Reduce amount of derelict land and empty properties that could provide accommodation. One suggestion addressed the adoption of superblocks as a form of urban development, whereby residential blocks are larger than those traditionally built. These developments also give priority to pedestrians and cyclists. Such developments are taking place in other European cities, including Barcelona. 	<p>The 15 minute neighbourhood concept is addressed in Measure 1 of the Draft Plan. This concept has been addressed in both the Five Cities Demand Management Study and the Eastern and Midland Regional Assembly - Regional Spatial and Economic Strategy (RSES). This concept of mixed-use development envisages a range of community facilities and services being accessible in short walking/ cycling timeframes from homes or accessible by high quality public transport in larger settlements. This concept is also being considered in the preparation of new City / County Development Plans.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Parking Controls and Standards</p> <p>Enforcement of parking and traffic laws</p> <p>A number of respondents highlighted their dissatisfaction with the level of enforcement of current speeding and parking laws by enforcement bodies and their desire for further measures in this respect including the establishment of a new enforcement body. A smaller number of respondents indicated they did not wish to see any further speed limits imposed. Other submissions suggested that parking charges be used as a deterrent to car usage.</p>	<p>Measures 2 to 4 in the Plan deal with Parking Controls and Standards.</p> <p>Enforcement of traffic and parking legislation violations including access to cycle lanes, bus lanes and footpaths is a matter for the Gardaí and Traffic Wardens and is outside the scope of this report.</p> <p>The Draft Greater Dublin Area Transport Strategy 2022-2042 provides for comprehensive enforcement of road traffic laws in order to protect investments in transport infrastructure. It also addresses car parking standards and a move to reduce the number of spaces available in Dublin city and elsewhere.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Active Travel</p> <p>A number of submissions raised issues that included the need for increased active travel choices, access for all and addressing disability in active travel, improve public transport and the need to reduce / ban the use of the private car.</p>	<p>These issues are addressed under Measure 5 - Continued Delivery of the Active Travel Programme, of the Draft Plan.</p> <p>The Dublin Local Authorities, supported by Government, the National Transport Authority and other stakeholders, continue to develop and implement a range of active travel projects, in particular enhancing local walking and cycling networks. In particular, the Dublin local authorities were some of the first in Ireland, to introduce significant mobility and public realm measures, in order to respond to the COVID- 19 pandemic.</p> <p>In February 2021, the National Transport Authority announced a total of €240m to support sustainable transport projects across the country. The NTA will be tasked with overseeing and supporting the development of the high-quality mobility infrastructure across all projects. The state agency will also ensure that projects are accessible, age- friendly and maximise comfort to people of all ages and abilities.</p> <p>In November 2021, the NTA launched public consultation on the Draft Greater Dublin Area Transport Strategy 2022 - 2042, which sets out the framework for investment in transport infrastructure and services over the next two decades to 2042, including transport schemes and measures needed:</p> <ul style="list-style-type: none"> • to tackle climate change; • to reduce the impact of congestion; • to deliver a safe and attractive cycling environment; and • to develop sustainable communities across Dublin City and region. 	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

<p>Active Travel – Continued</p> <p>Improved Cycling Infrastructure</p> <p>A consistent theme in the majority of responses was the desire to see significant improvement in cycling infrastructure including protected cycle ways, improved cycle facilities and overall promotion and prioritisation of active travel relative to car usage. Specific suggestions included: extending the Bike to Work Scheme to include cargo bikes to facilitate crèche and school drop offs. Create more convenient exits routes from cul-de-sacs for cyclists Improve bike parking- safe and sheltered, bike lockers for example</p> <p>Public Transport/ Vehicles</p> <p>It was suggested that trialing free transport during off peak hours and free public transport for under 18 year olds on public transport be introduced.</p> <ul style="list-style-type: none"> - More park and ride facilities. - Reduce national Speed limits - Prohibit Diesel vehicles from entering city centre. <p>A number of respondents indicated they would wish to see an increase in the number and frequently of buses including more school buses with segregated routes for public transport</p>	<p>These matters are substantively addressed in Measure 5 in the draft plan retain to active travel and are also addressed in Draft Transport Strategy for the Greater Dublin Area 2022-2042 which is currently undergoing public consultation</p> <p>At a local level the City and County Development Plans 2022 – 2028 set out the land use framework to guide future development within the city and county with a focus on the places we live and work and how we interact and move between these places while protecting our environment</p> <p>These matters are substantively addressed in Measure 5 in the draft plan retain to active travel and are also addressed in Draft Transport Strategy for the Greater Dublin Area 2022-2042 which is currently undergoing public consultation</p> <p>The issue of public transport charging does not come within the scope of this Plan.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p> <p>No amendment to the Dublin Regional Air Quality Plan required</p>
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Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Electric Vehicles and EV charging Infrastructure</p> <p>Suggestions submitted included electrifying public and private buses; promoting taxi scrappage scheme to encourage greater uptake and more support for promoting EV for commercial vehicles.</p> <p>Other submissions were also received that suggest that EVs should be regarded as secondary and supplementary to active travel and public transport strategies</p> <p>There was broad support for expanding the EV charging infrastructure and a suggestion that new house builds should have charging points incorporated where possible.</p>	<p>The Draft Transport Strategy for the Greater Dublin Area 2022-2042 deals extensively with these issues.</p> <p>The ongoing development of the EV Charging Strategy is addressed in Measure 6 in the Plan.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Clean air zones/ low emission zones/congestion charging</p> <p>There were a wide range of diametrically opposed opinions received in respect of the potential introduction of clean air zones/ low emission zones/congestion charging. These ranged from the point of view that air quality was satisfactory, that no interventions were required and any move to introduce any charges was a stealth tax on motorists to those who held that immediate action was required to exclude all non EV private cars from the city centre entirely.</p> <p>In planning terms the following views were expressed; consider location of schools relative to main roads. Plant trees. Don't plan new schools within 10 metres</p>	<p>The implications of measures in respect of the potential introduction of clean air zones/ low emission zones/congestion charging merit careful consideration in advance of any legislation by the relevant stakeholders.</p> <p>Measure 9 of the Plan to be amended to include an action as follows; The UTRAP Working Group, which includes the Dublin Local Authorities, should commit to further investigations into the feasibility of Low Emissions Zones in Dublin.</p>	<p>Measure 9 of Dublin Regional Air Quality Plan amended</p>
<p>Remote working</p> <p>Remote working as a choice for those who are in a position to avail of it was favoured by most respondents. Amongst the suggestions received were to stagger work start and finish times and promoting commuter belt workspaces/ hubs</p>	<p>The ongoing development of the National Remote Working Strategy is addressed in Measure 10 of the Plan</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Increased air quality monitoring</p> <p>There was a number of calls for increasing the number air quality monitoring stations in the Dublin region and the deployment of low cost sensors.</p> <p>There were suggestions on the need for roadside testing and improved real-time NO₂ monitoring across Dublin.</p> <p>One suggestion received addressed lining traffic data collected more closely with air quality monitoring data</p>	<p>These issues are addressed under Measure 11 - Enhanced Air Quality Monitoring and Modelling, of the Draft Plan.</p> <p>The Five Cities Demand Management Study suggests that increased air quality monitoring will lead to earlier action on air quality limit exceedances, which will contribute to driving a switch in the fleet away from older, more polluting vehicles. The Study further suggests this measure could contribute to a decrease of 48% in nitrogen dioxide levels as a result of driving this switch.</p> <p>It is planned to establish a further multipollutant (including nitrogen dioxide) monitoring station in the Dublin north inner city area, and ongoing indicative monitoring is being carried out to establish further suitable sites.</p> <p>As set out in the Draft Plan, the Dublin local authorities will work with the EPA to establish additional monitoring stations in the Dublin region as required. The Dublin local authorities will investigate in conjunction with the EPA, the feasibility of establishing regional air quality modelling capacity within the local authorities.</p> <p>In July 2021, the European Commission adopted a package of proposals to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. With these proposals, the Commission is presenting the legislative tools to deliver on the targets agreed in the European</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

<p>Increased air quality monitoring (continued)</p>	<p>Climate Law and fundamentally transform the EU economy and society for a fair, green and prosperous future. The consideration of costs, taxation and regulation / enforcement related to air quality is a national issue and as such requires a cross Government and cross sectoral approach. The Department of the Environment, Climate and Communications is currently working to finalise Ireland's first National Clean Air Strategy. The Strategy will identify and promote the integrated measures and actions across Government, that are required to reduce air pollution and promote cleaner air, while delivering on wider national objectives. Accordingly, specific measures and actions on costs, taxation and regulation / enforcement are beyond the scope of this Plan.</p> <p>The need for the deployment of low cost sensors is acknowledged and as well as the projects such as the Clean Air Together described in Measure 12 listed in this Plan, a number of other university led projects are currently working in the area of citizen science and sensor deployment. This currently includes the UCD European funded, WeCount project. This project will carry out five different pilot projects across a number of European cities, Dublin, Cardiff, Leuven, Madrid, Barcelona and Ljubljana. The aim is to quantify local road transport, produce scientific knowledge in the field of mobility and environmental pollution, and devise informed solutions to tackle various road transport challenges.</p>	
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Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Citizen Engagement</p> <p>The submissions received encompassed a very comprehensive range of issues and suggestions including: Research the best ways to engage and inform the public; Empower community and citizen change and action; Economically nudge people and organisations to lower emissions; Get younger citizens and students involved;</p> <p>Enhancing political and public awareness;</p> <p>Consideration of Citizens Assembly findings; Provide air quality signage and real-time displays;</p> <p>Use easily understood data,</p> <p>Use robust and well-tested messaging,</p> <p>Communication of local active travel projects that displace car parking etc.</p> <p>On the other hand, The effectiveness of awareness campaigns in changing public behaviour was queried by a number of respondents</p> <p>Smart Cities link up There were a number of queries as to there were linkages between Smart Cities initiatives and air quality monitoring activities</p>	<p>Citizen engagement is crucial in strengthening climate action and lowering all greenhouse gas emissions, including nitrogen dioxide, in the Dublin Region. These issues are addressed under Measure 12 - Air Quality - Citizen Engagement and Measure 14 - Behavioural Change Campaigns to cleaner fleets, of the Draft Plan.</p> <p>In terms of building and strengthening public engagement in improving air quality in Dublin, it is vital to build on the high levels of support for continued roll out of air quality monitoring stations and citizen engagement programmes. The Five Cities Demand Management Study reported that stakeholders noted these measures could contribute to better quality of life, place making, improved air quality and the Smart City concept. There was also a suggestion that engagement programmes should emphasise and promote active travel as a solution to air quality issues.</p> <p>The Five Cities Demand Management Study also identifies the measure of targeted behavioural change campaigns to encourage low emission vehicle purchase, as being highly effective – estimating that a 57% reduction in nitrogen oxides emissions is achievable. Stakeholder feedback to the study highlighted COVID-19 as creating an opportunity for change in behaviour. The results from the modelling carried in the preparation of this plan also indicate that the graduated move towards cleaner vehicles, will have a significant influence on nitrogen dioxide levels in the</p>	<p>Measure 12 to be modified to reflect Smart Cities engagement</p>

<p>Citizen Engagement (continued)</p>	<p>Dublin region during the remainder of this decade.</p> <p>Citizen engagement is also a key action area of the Government's Climate Action Plan 2021 – Securing Our Future, published in November 2021. A National Climate Stakeholder Forum (NCSF) will be established by the Department of the Environment, Climate and Communications, to function as a consultative forum on climate issues, with administrative support being provided by the Environmental Protection Agency.</p> <p>The participants will include a broad range of stakeholders from across society including elected politicians; government departments and local authorities; state agencies and national organisations; academics; representative bodies; community, local and voluntary groups; and representatives of stakeholders and communities most at risk from the impacts of climate change or the transition to a carbon neutral society. It will inform stakeholders of the latest scientific and policy developments and will act as a core mechanism to facilitate inputs into the Climate Action Plan and sectoral policies relating to climate change.</p> <p>The Airview project cited in measure 12 was established through the Dublin City Smarts Cities team, and other similar air quality projects are at commission stage</p>	
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Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
<p>Research</p> <p>Role of Universities in Air Quality and Transport Research</p> <p>Detailed submissions on these issues included: Highlighting the exemplar role of universities in air quality research and leading by example; Need for dedicated PhD funding;, data collection and analysis;, lessons learned from on-site / campus projects; Importance of STEM degrees (Science, Technology, Engineering, and Mathematics); the need for research grants, bursaries, placement programmes, linking with European ERASMUS programmes and international best practice, and graduate employment opportunities.</p> <p>With regard to transport research, the issues raised included engaging expertise in the areas of sustainable transport/smart cities to devise action plans and transport modelling and emissions from heavy rail.</p> <p>With regard to Air Quality and Health Impact the issues raised included the need for compelling research on the effect of air quality on health/quality of life; research on urban planting, research into NO₂ removal and the public dissemination of health research findings</p>	<p>The role of universities, third level institutions and other education institutions are recognised as key enablers of air quality research in Ireland. These issues are addressed under Measure 13 – Air Quality and Health Research, in the Draft Plan. As part of its range of functions the Environmental Protection Agency manages an environmental research programme to deliver essential scientific support for environmental policy development, implementation and broader decision-making. EPA Research focuses on achieving environmental objectives, informing policy and bringing together researchers and research users.</p> <p>The Draft plan outlines a number of EPA funded research projects ongoing of particular interest, the findings of which will be of particular interest in informing and shaping public discourse and policy in relation to nitrogen dioxide levels nationally, and in particularity in the Dublin region.</p> <p>Local authorities have a range of professional and technical staff working in the areas of transport, active travel and capital project delivery. It is acknowledged that local authorities engage a broad range of external expertise and advice, including consultants and third level institutions, as needed.</p> <p>The current round of calls for EPA funded research include funding for a study on the contribution of rail sources in urban areas to ambient air quality - See section 6.2 of Plan</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
Other Issues Raised		
<p>Staffing & Resources</p> <p>Submissions raised issues including maximising existing resources within local authorities, creation of graduate posts and the supporting role of third level institutions to local authorities in addressing air quality matters.</p>	<p>This matter is highlighted in the Plan in the context of commitment in the current Programme for Government.</p> <p>Local authorities have a range of professional and technical staff working in the areas of air quality, transport, active travel and capital project delivery. It is acknowledged that local authorities engage a broad range of external expertise and advice, including consultants and third level institutions, as needed.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>
<p>Social inclusion</p> <p>A number of respondents urged that the needs of the elderly, those with disabilities and parents with young children be kept in mind, and raised the query to why a social inclusion assessment was not part of this plan.</p>	<p>The Draft Transport Strategy for the Greater Dublin Area 2022-2042 places emphasis on inclusion and equality and it will be subject to a full Equality Impact Assessment prior to finalisation.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan

Theme	Response	Action
Other Issues Raised		
<p>Taxation and fiscal measures to address air quality</p> <p>There was a very diverse range of views on these matters and many respondents were not in favour of any introduction of taxes or other similar measures. The point was made by many respondents that a lack of alternative modes of transport to their private car usage was a major impediment in making other choices</p> <p>A number of submissions raised issues around researching the costs incurred by reduced air quality by sector and vehicle type, and related vehicle taxation</p>	<p>In July 2021, the European Commission adopted a package of proposals to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. With these proposals, the Commission is presenting the legislative tools to deliver on the targets agreed in the European Climate Law and fundamentally transform the EU economy and society for a fair, green and prosperous future.</p> <p>The consideration of costs, taxation and regulation / enforcement related to air quality is a national issue and as such requires a cross Government and cross sectoral approach. The Department of the Environment, Climate and Communications is currently working to finalise Ireland's first National Clean Air Strategy. The Strategy will identify and promote the integrated measures and actions across Government, that are required to reduce air pollution and promote cleaner air, while delivering on wider national objectives. Accordingly, specific measures and actions on costs, taxation and regulation / enforcement are beyond the scope of this Plan.</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>
<p>Driver Behaviour: Vehicle idling and using “rat runs”</p> <p>A number of respondents raised the contribution of idling vehicle engines as a particular concern to overall pollution levels and use of minor roads through housing estates as shortcuts by some drivers to the detriment of low traffic neighbourhoods</p>	<p>The Clean Air Together project described in Measure 12 is specifically aimed at behaviour change and raising awareness of how individual actions contribute to improved air quality</p>	<p>No amendment to the Dublin Regional Air Quality Plan required</p>

Overview of the themes, responses and actions taken from the 219 submissions through the Public Consultation on the Draft Dublin Regional Air Quality Plan		
Theme	Response	Action
Other issues raised		
<p>Interaction with other Plans and Strategies</p> <p>A number of submissions raised concerns as to where this plan sits and interacts with other sectoral plans and strategies and the perception that this plan lacks clarity and/or urgency on a number of proposed measures and actions. Specifically the sectoral plans and strategies cited include:</p> <ul style="list-style-type: none"> • National Clean Air Strategy • UTRAP Working Group Final Report • City and County Development Plans • Transport Strategy for the Greater Dublin Area 	<p>The Dublin Regional Air Quality Plan has been prepared concurrently with a wide range of related plans and strategies. A number of these have in-built statutory public consultation which are ongoing at this point. It would be premature to include proposals from such plans and strategies currently undergoing public consultations as firm measures in this plan until those statutory processes have run their course. In respect of this plan, it should be noted that the EU Commission will require that it be subject to review and report to them, and as related measures in other sectoral plans and strategies emerge, this would be reflected in the report issued to the EU Commission. As there is a mandatory legal deadline set for the submission of this Plan, it is inevitable that not all of the related sectoral plans and strategies will align in terms of completion and publication.</p>	<p>No amendment to the Dublin Regional Air Quality Plan</p>
<p>WHO Air Quality Guidelines 2021</p> <p>In view of the recently published revised air quality guidelines by the World Health Organisation, the concern was raised as to whether the revised standards for nitrogen dioxide could be met by 2030.</p>	<p>The revised WHO Air Quality Guidelines 2021 are under active consideration by the EU. It is envisaged a revised air quality directive will be prepared which will set out revised mandatory limit values and a timescale for compliance for all Member States. It should be noted that the forecasted reduction in the levels of nitrogen dioxide in the Dublin region – as per the Draft Transport Strategy for the Greater Dublin Area 2022-2042 and the modelling carried out for this plan indicate substantive reduction current legal limit values. Any changes to those limit values will be addressed in the ongoing review of this plan.</p>	<p>No amendment to the Dublin Regional Air Quality Plan</p>

Appendix C – SEA and AA Determinations

SEA Determination

Strategic Environmental Assessment (SEA Screening Determination under: European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (Statutory Instrument Number (S.I. No. 435 of 2004), as amended by S.I. No. 200/2011 - European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011.

Dublin Region Air Quality Plan 2021

An SEA Screening determination as to whether the Dublin Region Air Quality Plan 2021 is likely to have significant effects on the environment is being made under the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (Statutory Instrument Number (S.I. No. 435 of 2004), as amended by S.I. No. 200/2011 - European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011.

The Dublin Region Air Quality Plan 2021 has been tested against the relevant criteria 'requirements to carry out environmental assessment'. The first relevant criteria 9 (1)(a) relates to plans 'which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications and tourism, and which set the framework for future development consent of projects listed in Annexes I and II to the Environmental Impact Assessment Directive.

The Dublin Region Air Quality Plan 2021 does not come under any of the sectors specifically listed namely 'agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications and tourism'. Although the Dublin Region Air Quality Plan 2021 may refer to other plans and projects in order to capture the current baseline position in each of the relevant local authorities, the Plan does not identify or provide the framework for the delivery of these plans and projects.

The projects as well as the proposed measures listed in the Dublin Region Air Quality Plan 2021 can only be delivered through inclusion of dedicated objectives in the relevant statutory plans which are subject to SEA in their own right. In some cases, measures also require the provision of enabling legislation. The Plan will therefore not 'set the framework for future development consent of projects' listed in Annexes I and II to the Environmental Impact Assessment Directive.

The Dublin Region Air Quality Plan 2021 is consistent with other key relevant higher-level plans and programmes and aligns with national environmental commitments. In this context, the relevant objectives and policy commitments of the National Planning Framework and the Eastern and Midlands Regional Spatial and Economic Strategy have been considered, as appropriate.

The second relevant criteria 9 (1)(b) relates to plans 'which are not directly connected with or necessary to the management of a European site but, either individually or in combination with other plans, are likely to have a significant effect on any such site.' The Dublin Region Air Quality Plan 2021 either individually or in combination with other plans, is not likely to have a significant effect on any European site for reasons outlined in the Appropriate Assessment (AA) Screening Report.

In making the determination, the information contained in the accompanying SEA Screening Report (including information provided by environmental authorities and an examination of the need to undertake SEA against relevant criteria set out in Schedule 2A 'Criteria for determining whether a plan is likely to have significant effects on the environment' of the above Regulations) has been taken into account. That information has been carefully considered and its reasoning and conclusion agreed with and adopted — allowing a determination to be made that the Dublin Region Air Quality Plan 2021 would not be likely to result in significant environmental effects.

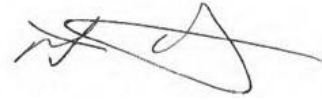
Taking into account all of the above, SEA is not required to be undertaken on the Dublin Region Air Quality Plan 2021.

Signatories:

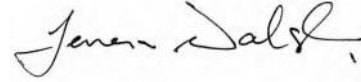
Liam Bergin
Executive Manager, Environment and Transport Department
Dublin City Council



Robert Burns
Director of Infrastructure and Climate Change
Dún Laoghaire-Rathdown County Council



Teresa Walsh
Director of Environment, Water & Climate Change
South Dublin County Council



David Storey
Director of Environment, Climate Action & Active Travel
Fingal County Council



Date: October 2021

**In the matter of Article 6(3) of the Habitats Directive and
S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011**

**Appropriate Assessment Determination
Dublin Region Air Quality Plan**

In accordance with Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) and Regulation 42(1) of the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, the Dublin local authorities (Dublin City Council, Fingal County Council, South Dublin County Council and Dún Laoghaire-Rathdown County Council) have undertaken Appropriate Assessment screening to assess, in view of best scientific knowledge and the conservation objectives of the European Sites, if the Dublin Region Air Quality Plan, individually or in combination with other plans or projects, is likely to have a significant effect on a European Site(s).

In order to comply with the requirements of Article 6(3) of the Habitats Directive and S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, as amended, the process of Screening for Appropriate Assessment was undertaken at an early stage in the drafting of the Dublin Region Air Quality Plan. The AA Screening assessed whether the plan was likely to have significant effects on any European Sites within the Natura 2000 network, either alone or in combination with other plans and projects.

As required under Regulation 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, the Dublin Local Authorities made a determination, following screening that an Appropriate Assessment is not required. The examination of the plan has found that the plan will have the potential to contribute to the conservation management of European Sites within and surrounding the plan area and will thus have positive implications for the conservation objectives of these European Sites. The following provides the reasoning for this determination:

European Sites and their associated qualifying features and associated conservation objectives are likely to be compromised by the plan, only where the actions of the plan have the potential to result in land-use activities that could result in damage or disturbance to qualifying habitat, qualifying species and or special conservation interests and the processes that they rely upon to maintain their favourable conservation status. The Plan will not result in the implementation of land use activities that will have the potential to result in negative impacts on European Sites and their conservation objectives. On the contrary, the overall aim and the measures of the plan have been identified as having the potential to result in positive implications for the environment and air quality, in particular and neutral to positive implications for European Sites and their conservation status.

The implementation of the Dublin Region Air Quality Plan will have the potential to enhance the air quality of the four local authorities. The measures outlined in the Dublin Region Air Quality Plan that aim to effectively tackle the NO_x emissions, will also have the potential to contribute to the conservation management of the other European Sites that occur within the wider area surrounding the Dublin Region. The implementation of these measures will also ensure that a deleterious trajectory in air quality in the Dublin Region is avoided. This in turn will contribute to the conservation status of European Sites and particularly any qualifying interests of European Sites that are sensitive to poor air quality and nitrogen deposition, such as the dune habitats of the North Dublin Bay SAC and the sensitive bryophyte communities they support, which includes the Annex 2 qualifying species Petalwort and the petrifying spring habitats and their associated indicator bryophyte communities of the Glenasmole Valley SAC and Knocksink Wood SAC in the south of the region.

The Dublin local authorities, having carefully considered all of the foregoing, and in particular, the

Appropriate Assessment Conclusion Statement and agrees with and adopts the reasoning and conclusion as set out in the said Appropriate Assessment Conclusion Statement.

The Council's hereby **DETERMINE** pursuant to of Article 6(3) of the Habitats Directive and S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, that the adoption and publication of the Dublin Region Air Quality Plan, will not either individually or in combination with any other plan or project, adversely affect the integrity of any European Site(s) as defined.

REASONS FOR DETERMINATION

The reasons for the said determination are set out in the Appropriate Assessment Conclusion Statement, the reasoning and conclusions of which have been adopted in full by the Dublin Region Local Authorities. The said Appropriate Assessment Conclusion Statement is to be published together with this Determination.

Signatories:

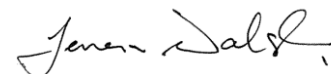
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Date: November 2021

Appendix D – Air Quality Modelling

Dublin Air Quality Plan EPA modelling report September 2021



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SUMMARY

In 2019 one of the air quality monitoring stations in the EPA managed National network, St. John's Road West, measured an exceedance of the annual nitrogen dioxide level ($43.4\mu\text{g}/\text{m}^3$ versus the EU limit value of $40\mu\text{g}/\text{m}^3$). Under the EU CAFE Directive there is a requirement to produce an Air Quality Plan (AQP) to address the exceedance. The Dublin Local Authorities are producing the Air Quality Plan (AQP) and the EPA are supporting them by specifically modelling nitrogen dioxide levels for a number of scenarios.

Five modelling scenarios (2019 basecase and four future scenarios) were chosen by the four Dublin Local Authorities. The EPA has modelled the five scenarios using the ADMS-Urban model and the outputs have been evaluated and verified by the EU DELTA tool in conjunction with the model developers own model evaluation tool kit.

All four modelled future scenarios show a significant reduction in nitrogen dioxide concentrations. It is predicted that there will be reductions of 19.7% to 25.6% in nitrogen dioxide concentrations in the modelled area by 2030.

INTRODUCTION

The EPA have a wide range of responsibilities as the competent authority for the implementation of ambient air legislation in Ireland. The air quality monitoring network has 96 monitoring stations strategically located across the country. Information from the network is available at www.airquality.ie.

One of these monitoring stations, St. John's Road West in Dublin City Centre (Figure 1), measured an annual nitrogen dioxide (NO₂) level in 2019 of 43.4µg/m³. The measured level is an exceedance of the EU limit value of 40µg/m³.

There is a requirement under Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (CAFE Directive) to produce an Air Quality Plan (AQP) to address the exceedance at St. John's Road West. The Dublin Local Authorities are producing the AQP and the EPA are supporting them by modelling nitrogen dioxide levels for a number of scenarios.



Figure 1 - St. John's Road West Monitoring Station Location

ASSESSMENT TECHNIQUES:

To inform the AQP, the EPA assessed monitoring and modelling data to get a wider understanding of the current and future air quality situation around the local area of the measured exceedance. Figure 2 displays the area of assessment within the vicinity of St Johns Road West. The EPA is progressing wider modelling of Dublin, which will be published in 2022.



Figure 2 – Area of assessment outlined in bold

Monitored data

Monitored data from St. John's Road West monitoring station (Figure 1) for the year 2019 was examined using Programme Application R and analysis package Openair (Carslaw et al., 2012). Openair allowed a more critical assessment of the data to take place such as combining with meteorological data. This gives additional information that may be of importance in understanding the overall impacts on local air quality e.g. information on pollutant sources.

Modelled data

The EPA have used the urban scale model ADMS-Urban to carry out modelling in the area of the exceedance (Figure 1). The model uses detailed input data such as weather information, data on emissions from industry and transport, street and building layout information, and background regional air quality information to calculate nitrogen dioxide levels across the defined assessment area.

The EPA were requested by the 4 Dublin Local Authorities to provide a 2019 basecase and 4 future year scenarios. These are detailed as follows

- 2019 Basecase scenario
- 2028 Business as Usual scenario
- 2028 Intervention scenario
- 2030 Business as Usual scenario
- 2030 Intervention scenario

In the context of this report, the term ‘Business as Usual’ refers to the estimation of future traffic trips in the National Transport Authority (NTA) Regional Modelling System based on the available planning data and other growth assumptions for Dublin and the rest of Ireland. The ‘intervention’ scenarios include the business as usual projected data plus the additional measures as received from the 4 Dublin Local Authorities.

The measures included in the ‘intervention’ scenarios are:

- 50% electrification of the taxi fleet
- 50% electrification of the bus fleet
- 20% electrification of the passenger car fleet

Table 1 outlines the five scenarios modelled by ADMS-Urban along with the providers of the traffic data.

Scenario	Year	Description	Traffic Data Providers
1	2019	Basecase year	National Transport Authority
2	2028	Business as usual	National Transport Authority
3	2028	Intervention ¹	National Transport Authority, Dublin Local Authorities
4	2030	Business as usual	National Transport Authority
5	2030	Intervention ²	National Transport Authority, Dublin Local Authorities

Table 1 – Scenario’s modelled

Each of the scenarios were compared to the 2019 basecase situation for a number of locations in the vicinity of the measured exceedance. This allowed a percentage change in concentration to be calculated.

The EPA have worked closely with model developers, Cambridge Environmental Research Consultants (CERC), to ensure that the model was applied appropriately in the area being assessed. Verification of the model data has been completed using the EU DELTA tool for assessment. The DELTA tool was developed by the Forum for Air quality Modelling (FAIRMODE)³. Additional verification statistics from CERC’s Model Evaluation toolkit have also been applied.

RESULTS

Assessment of Monitoring Data

Figure 3 displays the variation of nitrogen dioxide concentrations at the St. John’s Road West monitoring station on an hourly, daily, weekly and monthly basis for 2019. A double peak coinciding with peak time traffic in the morning and evening is measured on weekdays. This is due to normal weekday commuting patterns. The double peak is significantly reduced for Saturday and Sunday.

¹ 2028 Intervention – NTA ‘business as usual’ traffic projections plus 4 Dublin LA’s interventions - proposed fleet changes

² 2030 Intervention – NTA ‘business as usual’ traffic projections plus 4 Dublin LA’s interventions - proposed fleet changes

³ FAIRMODE - joint response initiative of the European Environment Agency (EEA) and the European Commission Joint Research Centre (JRC)

Highest average monthly concentrations are measured during winter, while concentrations associated with the summer months are lowest. This reflects the impact meteorological conditions, particularly temperature, have on the station.

Figure 4 displays a wind rose of the wind speed and associated wind direction at Casement Aerodrome. The overall mean windspeed for 2019 was 5.34 metres per second. The highest frequency of wind directions occurs to the South West, which is typical in Ireland.

Figure 5 displays a polar plot of oxides of nitrogen (NO_x) associated with wind direction and wind speed. As a traffic classified station, the plot reveals the highest concentrations associated with winds from the north, i.e. from the closest road, St. John's Road West. A secondary contribution associated with winds from the north east is also evident in the plot. This is most likely NO_x contributions from the uncovered section of the railway station to the north of the road.

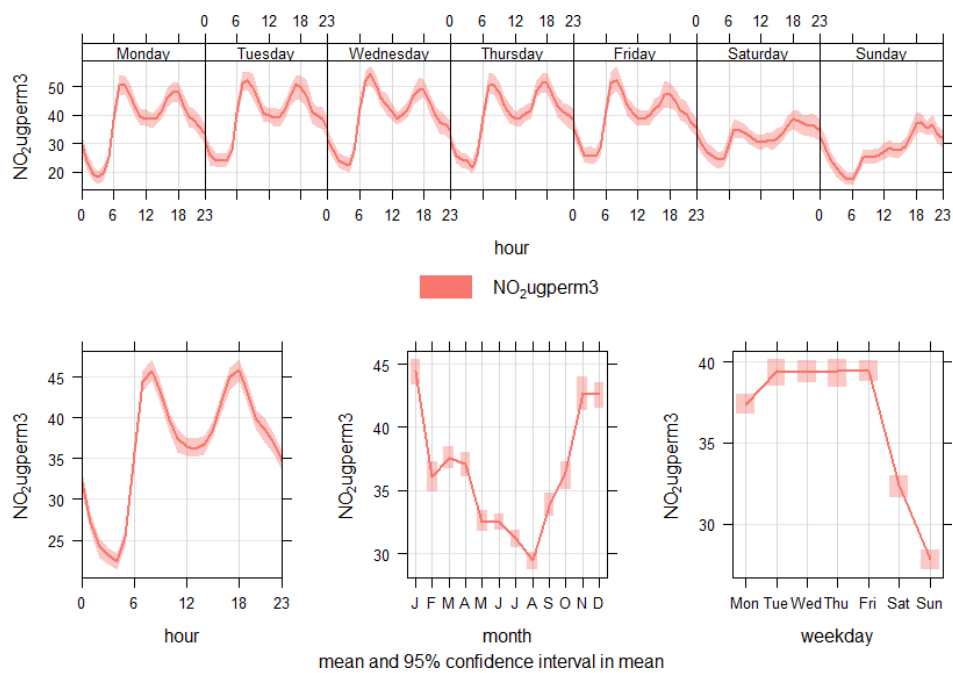
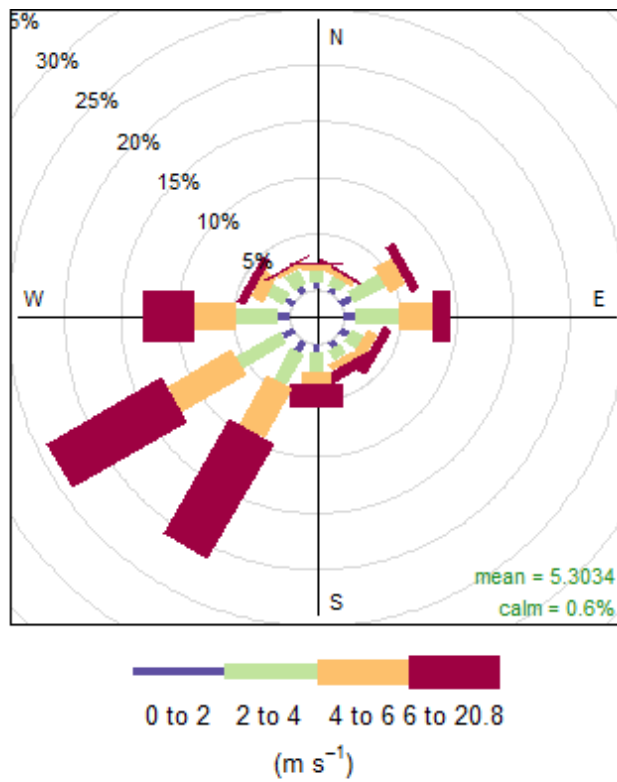


Figure 3 – Hourly, Daily, Weekly and Monthly Measured Nitrogen Dioxide Profiles at St. John's Road West



Frequency of counts by wind direction (%)

Figure 4 - Wind Rose for Casement Aerodrome 2019

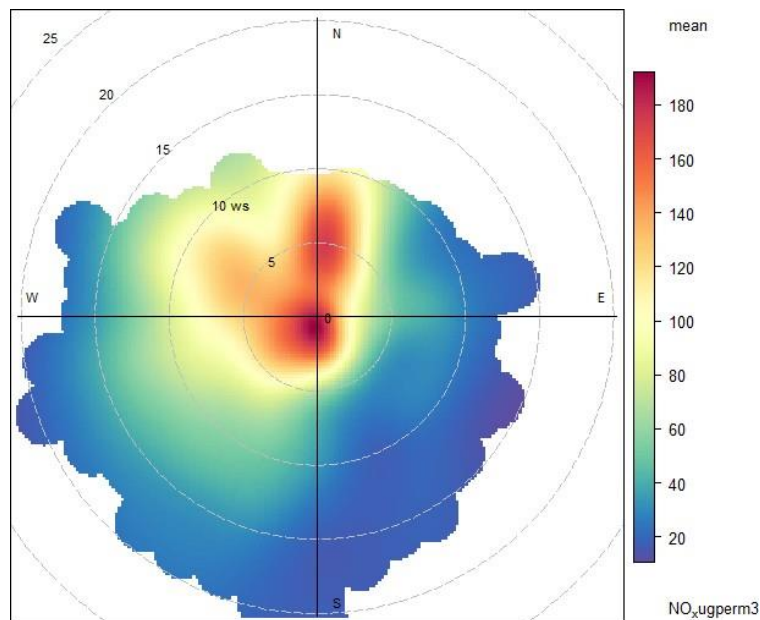


Figure 5 - Polar Plot of NO_x Concentrations at St. John's Road West 2019

Model Verification and Evaluation

To evaluate the performance of the model, the predicted concentration for the 2019 basecase was compared to the measured concentration at St Johns Road West station. The evaluation involves using recognised statistical tests and is a necessary step as it provides confidence that the model is fit for the intended purpose.

To achieve this, two modelling evaluation packages were used – the DELTA tool and the Model Evaluation toolkit. The overall result from the DELTA tool for the model quality indicator for both the hourly and annual model dataset are <1, which deems the model suitable for assessment purposes. The result from the Model Evaluation toolkit confirmed that the model passed a number of key modelling statistical indicators. Detailed results for the Model Verification and Evaluation process are outlined in Appendix 1

Assessment of ADMS-Urban Model Outputs:

Please note that this report addresses nitrogen dioxide concentrations only. Assumptions for future concentrations of other pollutants e.g. particulate matter, should not be drawn from this report.

- Scenario 1 – 2019 Basecase

Table 2 details the annual modelled and measured nitrogen dioxide concentration at the St. John's Road West station. The annual average limit value of 40 $\mu\text{g}/\text{m}^3$ was exceeded at the St. John's Road West monitoring station in 2019. The modelled annual concentration was 39 $\mu\text{g}/\text{m}^3$. The modelled result, approaching the limit value, would suggest a significant potential for exceedance in the area. This has been verified by the actual measured exceedance.

Monitoring Station	Annual Modelled NO2 ($\mu\text{g}/\text{m}^3$)	Annual Measured NO2 ($\mu\text{g}/\text{m}^3$)	Modelled Percentage
St. John's Road West	39	43.4	90

Table 2 - Annual Modelled and Measured NO2 at St. John's Road West 2019

Figure 6 details a contour plot of nitrogen dioxide concentrations for the 2019 basecase for the modelled area. The model predicts elevated annual average concentrations of nitrogen dioxide along St. John's Road West, at Frank Sherwin Bridge and on sections of Conyngham Road. The maximum modelled annual average concentration of 56 $\mu\text{g}/\text{m}^3$ nitrogen dioxide occurred along St. John's Road West.

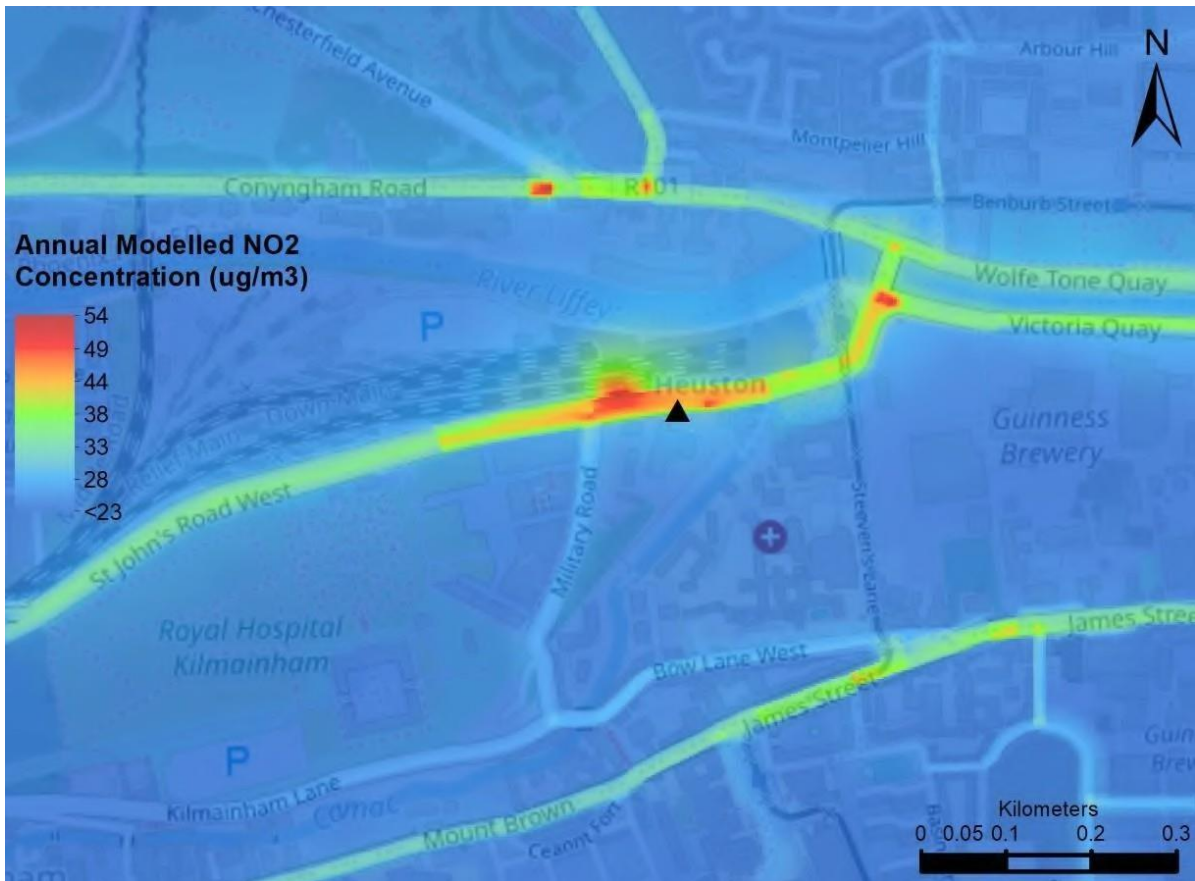


Figure 6 - Modelled Annual Average Nitrogen Dioxide Concentrations, $\mu\text{g}/\text{m}^3$, in 2019

- Scenario 2 to 5 –2028, 2030 Business as Usual and interventions

The following section details the modelled results for the future year scenarios of 2028 and 2030 at the St Johns Road West monitoring station.

In the context of this report, the term ‘Business as Usual’ refers to the estimation of future traffic trips in the National Transport Authority (NTA) Regional Modelling System based on the available planning data and other growth assumptions for Dublin and the rest of Ireland. The ‘intervention’ scenarios include the business as usual projected data plus the additional measures as received from the 4 Dublin Local Authorities. Table 4 details the annual average nitrogen dioxide concentrations at St Johns Road West for each of the modelled scenarios.

The predicted nitrogen dioxide concentrations for all four scenarios are less than the 2019 basecase modelled concentration. The largest decreases are seen for the intervention scenarios in 2028 and 2030, with a 24.6% to 25.6% reduction in nitrogen dioxide concentrations relative to the 2019 basecase modelled concentration. The business as usual scenarios show a reduction of 19.7% to 21.5% relative to the 2019 basecase modelled concentration.

The scenarios which included the ‘interventions’, electrification of the passenger fleet, taxi’s and buses, are projected to yield an additional $1.6 - 1.9\ \mu\text{g}/\text{m}^3$ reduction of nitrogen dioxide at the St. John’s Road West monitoring station. Overall, the largest reductions in concentrations of nitrogen dioxide are attributed to the reduced nitrogen dioxide emissions for the future projected traffic fleet.

Scenario	Modelled NO ₂ St. John's Road Receptor (µg/m ³)	Absolute NO ₂ concentration attributable to intervention (µg/m ³)	Absolute NO ₂ concentration reduction (µg/m ³)	Percentage NO ₂ reduction from 2019 Basecase scenario (%)
2019 Basecase	39.0	-	-	-
2028 Business as usual	31.3	-	7.7	19.7
2028 Intervention	29.4	1.9	9.6	24.6
2030 Business as usual	30.6	-	8.4	21.5
2030 Intervention	29.0	1.6	10.0	25.6

Table 4 - Modelled NO₂ concentration, µg/m³, for each scenario

CONCLUSIONS

As part of the Dublin Air Quality plan, the EPA completed a detailed modelling study of nitrogen dioxide concentrations around the area of the 2019 exceedance at St Johns Road West.

All four future scenarios are showing a significant reduction in nitrogen dioxide concentrations compared to the 2019 basecase scenario. It is predicted that there will be reductions of between 19.7% to 25.6% in nitrogen dioxide concentrations at the St Johns Road West station for the future scenarios modelled.

Business as usual scenarios for 2028 and 2030 are projected to result in 7.7 – 8.4 µg/m³ reduction in concentrations relative to the modelled 2019 basecase (19.7% – 21.5% reduction). The additional interventions on the traffic fleet, as proposed by the 4 Dublin Local Authorities, are projected to yield an additional 1.6 – 1.9µg/m³ nitrogen dioxide reduction by 2030. The 2030 scenario with additional interventions as proposed by the 4 Dublin local authorities gave the highest reduction in concentrations relative to the modelled 2019 basecase of 10.0 µg/m³ or a 25.6% reduction.

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Appendix 1

Model Verification and Evaluation

DELTA Tool

The DELTA tool (V6.0) is an application developed by the Joint Research Commission (JRC) within the FAIRMODE community. It is aimed at model users in the context of model assessment against Directive 2008/5-/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (CAFE Directive). The tool calculates a cumulative statistical indicator known as the Model Quality Indicator, which is then assessed against the Model Quality Objective value to see if it is fit for purpose. The application also includes several additional statistics, including Root Mean Square Error, Correlation Coefficient, Normalised Mean Bias and Normalised Mean Standard Deviation.

Model Evaluation Toolkit:

The model evaluation toolkit, developed by CERC, uses the programme application R, to carry out statistical assessments on the modelled and measured data.

A range of statistics are calculated which include:

- the number of valid observations;
- the measured and modelled mean concentrations;
- the normalised mean square error (NMSE), a positive number for which a value closest to zero is best;
- the correlation coefficient (R), which varies between 0 (worst) and 1 (best);
- the fraction of modelled values within a factor of two of the measured (Fac2), which varies between 0 (worst) and 1 (best);
- the fractional bias (Fb), which can be either positive or negative, with zero being the best value.

Figure 1a displays the output from the DELTA tool. It consists of a target plot and summary statistics. The model quality indicator for both the hourly and annual model dataset are <1, which deems the model suitable for assessment purposes. The model achieves the 4-time related indicators also.

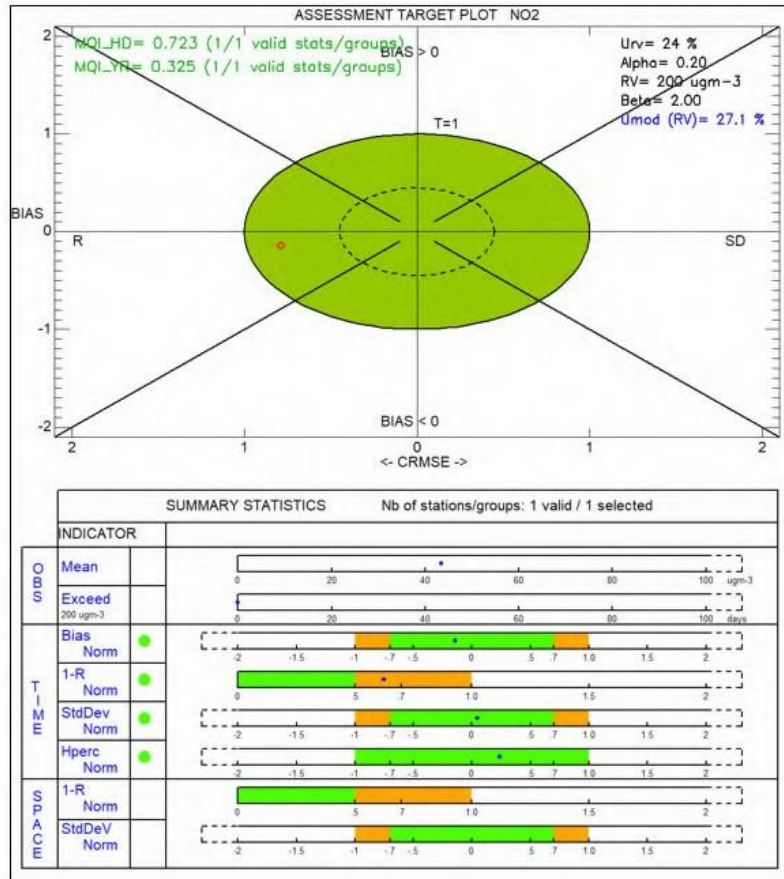


Figure 1a - DELTA Tool Output

Figure 2a displays the Model Evaluation toolkit Quantile – Quantile plot of modelled and measured hourly concentration. This plot compares the modelled and measured concentrations ordered independently from lowest to highest concentration. The dotted lines represent the factor of 2. There is good agreement between points.

Quantile-Quantile Plot: SJRW 2019 BASECASE
SJRW, ALL STATIONS, HOURLY MEAN NO₂ (µg m⁻³)

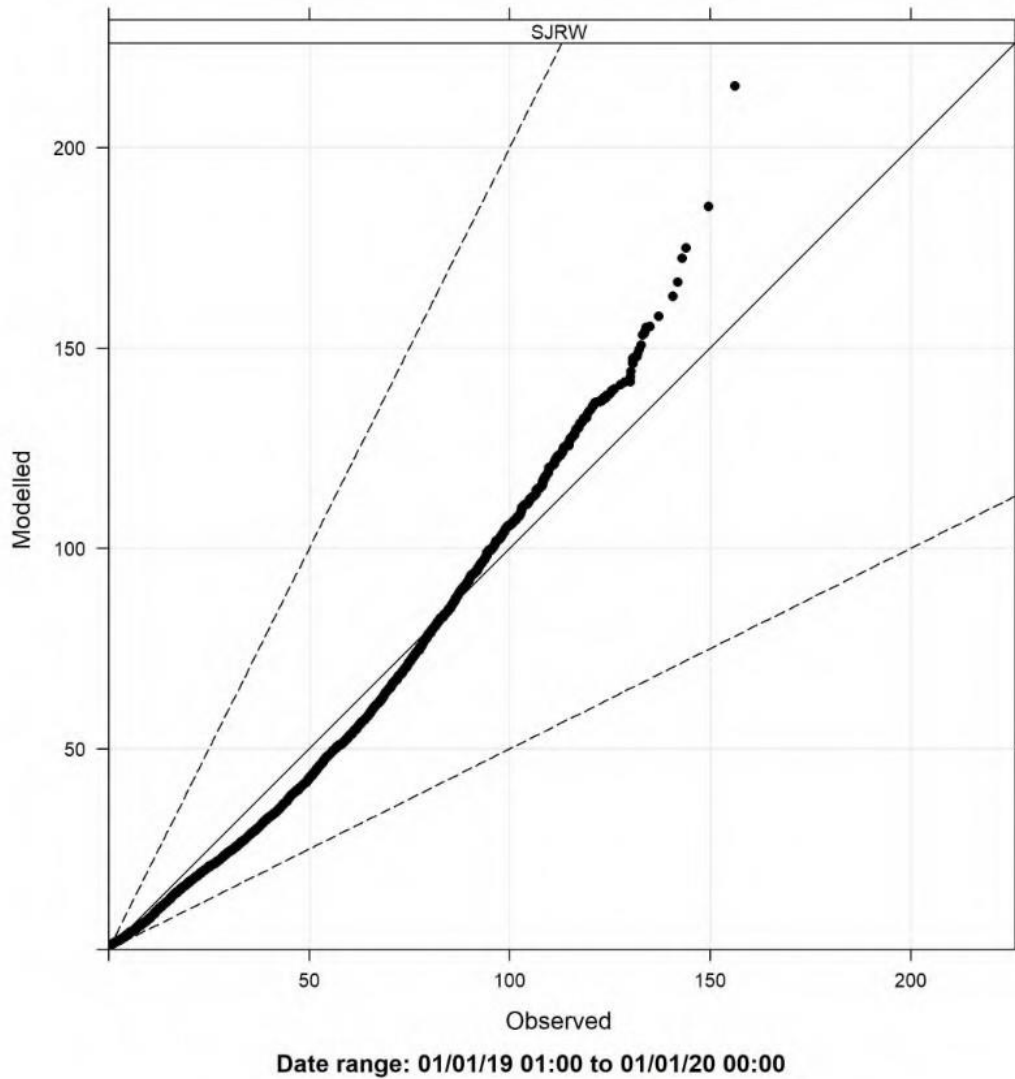


Figure 2a - Quantile Plot of Measured and Modelled Concentrations at St. John's Road West Monitoring Station

Figure 3a displays the Model Evaluation toolkit overlay of the measured and modelled concentration for 2019. Overall the model follows similar patterns to the measured concentration. One obvious deviation is for the month of June, where measured concentrations reduced dramatically.

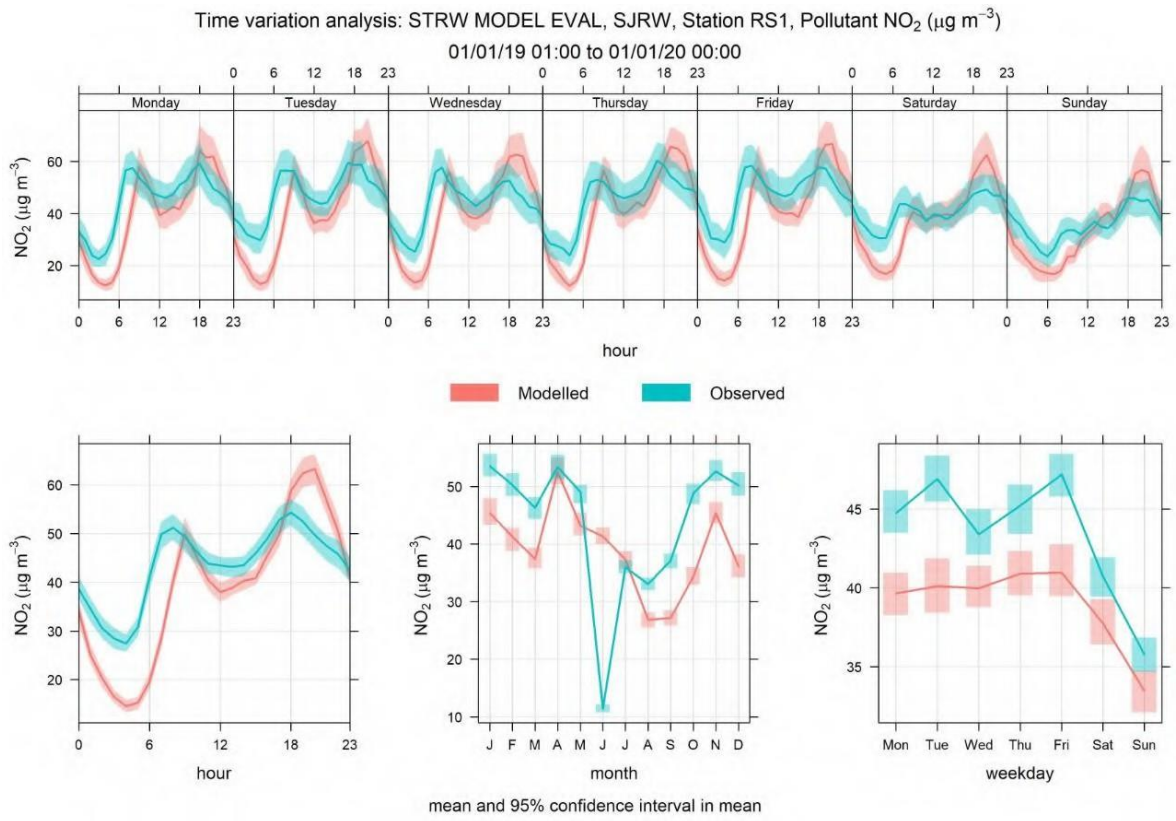


Figure 3a - Model Evaluation Toolkit Plot, Modelled and Measured, St. John's Road West 2019

Appendix E - Responsible persons for the development and implementation of improvement plan

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