

Analysis of the Introduction of a Nationwide Low Smoke Zone in Ireland

Scenario and Policy Analysis Assessment

July 2017



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Reference

EnvEcon (2017), Nationwide Low Smoke Zone Analysis 2017, Dublin: EnvEcon Decision Support Series 2017/1

Acknowledgment

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Glossary

KTOE	Kiltonnes of oil equivalent
CSO	Central statistics office
EC	European Commission
EEA	European Environment Agency
EMEP	European Monitoring and Evaluation Programme
EPA	Environmental Protection Agency (Ireland)
EU	European Union
GJ	Gigajoule
HBS	Household Budget Survey (Ireland)
Ireland	Ireland in this report refers to the Republic of Ireland
kWh	Kilowatt hours
LSZ	Low Smoke Zone
NAEI	National Atmospheric Emission Inventory (UK)
PM	Particulate Matter
SAPS	Small Area Population Statistics (from Census of Ireland data)
SEAI	Sustainable Energy Authority of Ireland
SSF	Solid Smokeless Fuel
UNECE	United Nations Economic Commission for Europe
VAT	Value Added Tax



EXECUTIVE SUMMARY

- Residential combustion of solid fuels in Ireland is a significant source of PM_{2.5}, comprising in 2015 over 50% of all national PM_{2.5} emissions despite providing less than 5% of national primary energy requirements. PM_{2.5} has a direct impact on human health and the environment and is estimated to be responsible for 95% of the 1,600 premature deaths attributable to air pollution in Ireland (EEA, 2016a). There are also legally binding targets under EU legislation, namely, the National Emissions Ceiling Directive (2016/2284/EU) and Cleaner Air for Europe Directive (2008/50/EC).
- 2. Whilst air pollution and PM_{2.5} emission reductions will follow associated EU legislation, for example, real world driving emissions regulations in the wake of Dieselgate, there is an obligation on each Member State to devise its own nationally appropriate measures in line with its legal obligations. This analysis suggests that designating a nationwide Low Smoke Zone (LSZ) should be the next step in addressing the impacts from residential heating, in the context of building on the existing network of Low Smoke Zones, established originally in Dublin in 1990. An alternative approach might be an incremental stepwise increase in Low Smoke Zones to towns of say greater than 10,000 or 5,000 population. However, the analysis does not recommend this approach on the basis of the far lower expected benefits and potentially increased challenges to administrative effectiveness and enforcement. The greater benefits and emission reductions will arise where smoky coal use is addressed through a nationwide Low Smoke Zone.
- 3. The analysis has taken a conservative view with regard to the assessed benefits of a nationwide Low Smoke Zone. Specifically the analysis assumes that all existing bituminous coal use is substituted directly with low smoke coal. This assumption is made as low smoke coal is the most direct substitute for bituminous coal, requiring no change in technology, combustion method or behaviour. It is possible that users may shift instead towards comparatively cleaner fuels more quickly, and over time (e.g. gas, electrification) and such outcomes would further reduce estimated emissions and health impacts, and thereby increase benefits. Indeed this was the experience elsewhere when Low Smokes Zones were introduced, for example, in Dublin where the initiative contributed to a significant shift to natural gas.
- 4. A significant reduction in PM_{2.5} emissions of approximately 1.75kt per annum is estimated which would constitute a substantial element of *national* efforts to reduce emissions in line with EU obligations under the National Emissions Ceiling Directive (2016/2284/EU), corresponding to 11% and 15% of the 2020 and 2030 legal limit respectively. PM_{2.5} estimates are some of the most uncertain of all air pollutants, and given this known uncertainty, it is important that a conservative approach is taken to developing a national compliance strategy. It is important that there is an adequate compliance 'buffer', to ensure, with confidence, delivery of the requirement for overall national emissions not to exceed legal obligations.



- 5. The estimated annual health and environmental benefits of a nationwide Low Smoke Zone, conservatively assuming a complete switch to low-smoke coal, are in the region of €4.5 to €7.2m per annum. These annual benefits could be doubled up to €15m where the sulphur content of low smoke coal is reduced in line with the sulphur content regulations for bituminous coal, which were set in 2011 following notification and assessment by the European Commission under Directive 98/34/EC¹.
- 6. The introduction of the nationwide Low Smoke Zone would have an impact on existing fuel importers and distributors. However, supply of low smoke coal is not foreseen as an issue, and processing and distribution is expected to develop for low smoke fuels. The border with Northern Ireland presents challenges with illicit trade of solid fuels (and a range of other goods), driven by lower costs due, *inter alia*, to lower consumer taxes. A nationwide Low Smoke Zone should facilitate and promote improved monitoring and enforcement around illegal trade. A new legislative proposal, the draft bill on the sale of Illicit Goods 2017, would further strengthen local authorities enforcement powers to fine and prosecute those found purchasing smuggled solid fuel.
- 7. Impacts on fuel poverty are not expected to be substantial given that there is only a 2.5% 5.5% variation in estimated delivered energy cost between bituminous and low smoke coal. This cost variation, along with the price differential with the North, will be reduced or eliminated through relief from the carbon tax which is available for the biomass (non-fossil) element of blended coal products, provided they meet legal 'low smoke' criteria². These fuel options are currently available to the market and could represent a lower cost alternative to bituminous coal that delivers reduced levels of both climate and air emissions. Alternatively, or additionally, a reduced VAT rate that creates an adequate price differential to incentivise the shift towards cleaner fuels with limited disruption could also be considered.
- 8. The national Environmental Protection Agency has found that air pollution levels are relatively more elevated outside Low Smoke Zones in smaller urban areas³ and this is supported by EPA funded research. The EPA supports the introduction of nationwide Low Smoke Zone.

¹ Notification 2010-584-IRL under Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.

² Consistency with the Energy Taxation Directive (2003/96/EC) confirmed, following DG Taxud assessment, in correspondence (Ref. TAXUD.C.2(2015)4708811 VZ/sk) from European Commission, 14th October 2015.
³ <u>http://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20Report%202015.pdf</u>



1. Introduction

Exposure to air pollution has been shown to have clear detrimental impacts on human health, with PM_{2.5} exposure causing both morbidity and premature mortality (Dockery et al., 1993, Pope et al., 2009, Lim et al., 2012). The most recent comprehensive study based on the global burden of disease data finds that ambient PM2.5 is now the 5th ranked mortality risk factor globally, responsible for 4.2 million (95% uncertainty interval - range of 3.7 million to 4.8 million) deaths and 103.1 million (range of 90.8 million to 115.1 million) disability-adjusted life-years (DALYs) in 2015 (Cohen et al., April 2017). On a European scale there has been significant progress made with regard to improving ambient air quality as part of both EU (e.g. Cleaner Air for Europe Directive 2008/50/EC - National Emissions Ceiling Directive 2016/2284) and UNECE level agreements (Gothenburg Protocol). These international transboundary agreements have successfully stimulated member states and technology developers to work towards an objective of reduced levels of fine particles and other air pollutants so as to reduce associated health and environmental impacts. However, whilst progress has been made, and though air quality in Europe is not often as 'visible' as air pollution in less developed regions, there remain significant health impacts, and thus benefits to be gained from further reductions in air pollutants (EEA, 2015, Maas and Grennfelt, 2016). The EU Clean Air Policy package was finalised in 2016 as an updated response to the evidence on persistent impacts on health and the environment from air pollution⁴. The Clean Air Package was informed by two major synthesis studies led by the WHO – REVIHAAP (2013) and HRAPIE (2013) – which explicitly documented the persistent health risks still posed by air pollution specifically in a European context. A key outcome of this work on health impacts was a clear evidence base that there are no 'safe' levels of air pollution.

Ireland is developing a National Clean Air Strategy to reduce air pollution and the associated negative health and environmental impacts whilst also delivering progress on the targets set under the <u>European Union's Clean Air</u> <u>Policy Package</u>. The introduction of Low Smoke Zones which prohibit the marketing, sale, distribution and use of bituminous coal in specific urban areas in Ireland (traditionally known as <u>the 'smoky coal ban</u>') has often been highlighted⁵ as a successful public policy intervention that contributed to significant reductions in black smoke and fine particulate matter (PM_{2.5}) in those residential areas covered by the legislation. Indeed, this policy has been credited with significant positive effects for the local environments and human health outcomes (Clancy et al., 2002). Nonetheless, whilst the introduction of Low Smoke Zones in towns and urban areas with a population above 15,000 has been deemed a success, there remains a considerable amount of smoky coal use in Ireland for residential heating, and air pollution remains an important issue to be managed. Residential combustion of solid fuels is an increasingly significant national source of PM_{2.5}, comprising in 2015 over 50% of all national PM_{2.5} emissions despite providing less than 5% of national primary energy requirements. It is in this context that a nationwide Low Smoke Zone has been proposed. This brief sets out the potential for this measure and estimates the associated emission and impact outcomes that should follow the successful introduction and enforcement of a nationwide Low Smoke Zone.

⁴ <u>http://ec.europa.eu/environment/air/clean_air_policy.htm</u>

⁵ http://ec.europa.eu/ireland/news/key-eu-policy-areas/environment_en



2. Context

Residential Coal use in Ireland and residential PM_{2.5} emissions

The national energy balance, compiled annually by the Sustainable Energy Authority of Ireland (SEAI), provides a snapshot of overall fuel usage in Ireland. For 2015 SEAI estimated that total imports of coal were 1,481ktoe⁶. Of this sum, 1419ktoe was bituminous (smoky) coal, with the balance made up of anthracite, manufactured ovoids (defined jointly as low-smoke coal in this study) and lignite. Of the total bituminous coal imports about 80% is used for coal-fired power generation. However, some 126ktoe of bituminous coal, and 68ktoe of anthracite and manufactured ovoids are used for residential heating. Figure 1 below is based on Eurostat data and offers a broader European context on the residential energy mix shares across a number of European member states. It highlights the comparatively high use of coal and oil in the residential sector in Ireland as compared with some neighbouring and central European member states.



Figure 1 Residential energy mix shares in 2015 for selected EU member states

⁶ Sustainable Energy Authority of Ireland, <u>National Energy Balance</u> is accessible online. Data accessed for the year 2015 on the 18th of July 2017. Ktoes – kilotonnes of oil equivalent.



Figure 2 focuses in on the recent trends in residential fuel use in Ireland. Gas and Oil dominate, yet a notable portion of residential fuel use are solid fuels. Figure 3 presents the national inventory of total PM_{2.5} emissions and the current indicative estimates out to 2030. Uncertainty for future estimations are increased above those associated with inventory estimates. The inventory and indicative estimates out to 2030 for the residential and commercial sector are incorporated in this figure to make clear the significance of that sector in tackling national emissions of PM_{2.5} and associated impacts on health, environment and national progress on international air quality legislation. It is noted that these indicative estimate for the pathway to compliance with legal obligation under directive 2015/2284/EU. Even still, at present, inventory data show this sub-sector accounting for over 50% of total national emissions despite providing less than 5% of primary national energy requirements.



Figure 2 Residential Fuel Use Trends in Ireland





Figure 3 Total national and residential PM_{2.5} emissions to 2015, and indicative future estimates to 2030



Whilst this study is focused on bituminous coal use, it is recognised in this context of residential fuel use in Ireland, that the exploitation of Ireland's peatlands can result in a range of significant environmental impacts, including on ecosystems, biodiversity, climate, water and air pollution, and requires an integrated approach to its management, which in some cases is under the Natura 2000 ecological network. It is also noted that the estimate for residential peat use is somewhat uncertain as much of the fuel is 'harvested' using traditional systems and is not formally traded. The government has established a Peatlands Council and adopted a national Peatlands Strategy⁷ to provide the policy framework for an integrated approach to peatlands management, including action in relation to impacts on air. For example, a national scheme has been established to conduct deep energy retrofits⁸ to houses for certain households using peat, provided that they move to non-fossil fuel alternatives.

⁷ https://www.npws.ie/peatlands-and-turf-cutting/peatlands-council/national-peatlands-strategy

⁸ http://www.seai.ie/Grants/Deep-Retrofit-Programme/



3. Methodology

The broad approach in this analysis was to divide the towns in Ireland into different groupings, to allocate fuel use spatially at these different scales for our base scenario, and to run a Nationwide Low Smoke Zone scenario to estimate the emission and health impact outcomes. The primary focus of these analyses has been to conservatively estimate the approximate changes in health and emission outcomes where a national Low Smoke Zone is introduced. Therefore, the results from this methodology only present outcomes where the displaced fuel (i.e. smoky coal) is replaced by low-smoke coal. The rationale behind this choice is simply that low smoke coal is readily substitutable for bituminous coal, in so far as it requires no new infrastructure or investment on the part of the householder, who is already familiar with coal burning. Shifts towards other fuel use (e.g. gas or oil – the two dominant residential heating fuels in Ireland) may also occur and these outcomes would deliver further associated benefits and emission reductions. However, shifts to these fuels would be subject to a variety of other influencing factors (e.g. infrastructure availability for supply, information and awareness, access to finance). As such, whilst these types of shifts can be anticipated, and the expectation would be for higher benefit values, for this study a more conservative approach has been taken by simply assuming that smoky coal use would, as a minimum, be replaced by low-smoke coal use consistent with a national Low Smoke Zone.

The following datasets were used as part of the methodology for the estimation of spatially refined residential emissions in Ireland.

- Census 2011 SAPS household dataset⁹
- Household Budget Surveys¹⁰
- SEAI Energy Balance data 2015¹¹
- Domestic Fuel costs from SEAI
- Emissions Factors from the EEA, National Inventory Team of the EPA and UK NAEI12

The spatial refinement of these estimates presented a substantial methodological challenge, but was necessary to enable a more detailed impact assessment with regard to recognising the current Low Smoke Zones, and the changes that would occur under a National Low Smoke Zone. Data extraction and all calculations were done in the R statistical package through a specially developed script. Mapping and spatial analysis were done in ArcGIS 10.4. The following four subsections present the summary details of how the towns in Ireland were grouped to the various scales; how the baseline spatial fuel use distribution was determined; how emissions and emission reductions were estimated; and how the benefits associated with a given scenario of emission reductions were estimated.

⁹ Data can be sourced from <u>www.cso.ie</u>

¹⁰ Data sourced via the Irish Social Science Data Archive <u>www.issda.ie</u>

¹¹ Energy balance and domestic fuel costs sourced directly from <u>www.seai.ie</u>

¹² Corinair emission factors from <u>www.eea.eu</u>, national emission factors *mimeo*, UK emission factors <u>http://naei.beis.gov.uk/</u>



3.1 Grouping Towns for the Scenario Assessment

Towns have been divided into the categories outlined in Table 1. The number of towns corresponding to a given category of population are also indicated in this table and have been estimated using 2011 Census data from the Central Statistics Office (CSO). In all cases a town is a town only where it has legally defined boundaries – see note in Box 1. There are 85 such legally defined towns in the census data. All other areas are captured in this study under reference to all other small area population statistic (SAPS) areas. The reason for this approach is that legally defined towns lend themselves to legally enforced existing policy interventions (e.g. Low Smoke Zones), and furthermore, it was not feasible in the context of this study to review and redefine the national categorisations of town areas based on incremental settlement patterns.

Box 1 Legally defined town areas excerpt from the central statistics office (www.cso.ie)

Legal and Census Towns

For census purposes towns fall into two types, namely those with legally defined boundaries called "Legal Towns" and those without legally defined boundaries called "Census Towns".

Legal Towns

Towns with legally defined boundaries consist of:

- The five Cities Cork, Dublin, Galway, Limerick and Waterford
- Five Boroughs, Clonmel, Drogheda, Kilkenny, Sligo and Wexford
- 75 Towns

In the case of legally defined towns CSO compile population figures for the area within the legal town boundary. However, urban development in most of these legal towns has expanded beyond their legally defined boundaries. As a result large numbers of persons in the communities for which these towns are the nuclei would be excluded if the coverage of the town were confined strictly to legally defined boundaries. This problem tends to become more pronounced from one census to the next as urban areas extend further into the surrounding countryside. Revisions of the legally defined boundaries tend to lag behind urban development, as they are dependent on other factors besides the necessity of defining urban areas for Census of Population purposes.

Census geographic analysis is concerned with the overall size of population clusters and not simply with areas within legally defined boundaries. Consequently, where urban areas have extended beyond the legally defined town boundary, the CSO draws up new boundaries defining the suburban areas of Cities/Boroughs and environs of other legal towns for census purposes.

The categories of Table 1 and subsequent fuel allocation research are essential to this methodology as they allow a base assessment of health impacts from which the policy change outcomes may be assessed. Furthermore they enable an assessment of the relative merits of progressing to an extended Low Smoke Zone area policy (e.g. all towns above 10,000 population) rather than to the nationwide approach which would apply to all towns and all areas across Ireland.



Table 1 Towns in or outside of LSZs areas classified by their population size

Towns within or outside LSZ areas by population						
Area Level (by population)	Towns in LSZ	Towns out LSZ	Total			
Small towns <1000	0	2	2			
Small towns 1000-5000	1	35	36			
Small towns 5000-10000	4	16	20			
Urban Small (10000-15000)	3	4	7			
Urban Medium (15000-150000)	19	0	19			
Urban Large(Dublin)	1	0	1			
All Towns	28	57	85			

Source: CSO, Census 2011 and EnvEcon 2017

The spatial distribution of the towns and LSZs as assessed are mapped in Figure 4 for clarity. A nationwide LSZ would apply the current LSZ restrictions on bituminous coal throughout all areas of Ireland. Recognising fuel use spatially by different town populations is key for the impact assessment analyses, as the population in the area where the emissions occur has a direct influence on impacts, by virtue of the different levels of estimated exposure to the pollutants.

Figure 4 Map of existing Low Smoke Zones, towns within and outside, and all other small areas





3.2 Spatial Analysis of Fuel Use in the Residential Sector

The LSZ area boundaries and the town categories were used as part of the process to estimate fuel use by town type and small areas. A special ArcGIS Model was developed to use R script and small area level output. The estimated aggregate values for fuel use distribution are provided below in Table 2 and Table 3. In the case of Table 2, this presents the assumption in the 1st base scenario (described later in Section 4), where there is no smoky coal use at all within any LSZ areas.

Table 2 Fuel use (ktoe) in towns within Low Smoke Zones

Fuel use (ktoe) in towns within LSZ areas (estimated share of smoky coal is 0%)						
Area Level (by population)	All Coal	Low Smoke Coal (SSF)	Peat	Oil	Gas	Biomass
Small towns <1000	-	-	-	-	-	-
Small towns 1000-5000	0.15	0.15	0.26	0.65	0.64	0.03
Small towns 5000-10000	2.03	2.03	0.79	6.65	3.34	0.23
Urban Small (10000-15000)	1.12	1.12	0.07	6.96	6.44	0.26
Urban Medium (15000-150000)	32.19	32.19	3.05	100.57	102.42	4.49
Urban Large(Dublin)	3.74	3.74	0.42	19.41	132.72	4.08
All Towns	39.24	39.24	4.59	134.24	245.57	9.09

Table 3 Fuel use (ktoe) in towns outside Low Smoke Zones

Fuel use (ktoe) in towns outside LSZ areas (estimated share of smoky coal is 0.83%)							
Area Level (by population)	All Coal	Smoky Coal	Low Smoke Coal (SSF)	Peat	Oil	Gas	Biomass
Small towns <1000	0.17	0.14	0.03	0.01	0.42	0.01	0.01
Small towns 1000-5000	13.05	10.80	2.25	4.08	28.82	3.34	0.76
Small towns 5000-10000	9.29	7.69	1.60	3.93	32.17	8.49	0.88
Urban Small (10000-15000)	3.43	2.84	0.59	2.72	13.29	1.11	0.32
Urban Medium (15000-150000)	-	-	-	-	-	-	-
Urban Large(Dublin)	-	-	-	-	-	-	-
All towns	25.93	21.47	4.47	10.75	74.70	12.95	1.96
All other small areas	141.04	116.74	24.30	185.27	746.92	296.59	21.31



The approach for the spatial analysis involved extracting the regional variables used in the Census 2011 SAPS boundary shapefile and joining these to the SAPS household level data. The SAPS household regions were then mapped to the coding used in the Household Budget Survey (HBS) datasets. This allowed us to add proportions per region and dwelling type estimated from the HBS to the SAPS data. Then by applying those proportions to the number of apartments/houses within the individual small areas we have estimated coefficients for the number of apartments/houses using different secondary fuels in each small area. The regional average energy consumption by fuel and dwelling type estimated from HBS were then used to estimate the total energy consumption of secondary fuel per dwelling type for each small area. Primary fuel use coefficients for residential heating have been based on the available national statistics for heating in the census by small areas and households (see Figures 5 to 10). In all cases the amount of fuel distributed via the estimated shares of fuel use is capped to the level of a given residential fuel use reported by SEAI in their extended energy balance for 2015. Thus the methodology is focused on delivering a refined distribution of what is the official national energy balance data, with the distribution process utilising a number of data sets to estimate not only the primary heating fuel use, which is reasonably straight forward, but also the additional secondary fuel use in homes, which is more challenging to assess on available national data.







3.3 Estimating Emissions and Emission reductions

Emissions from fuel consumption in the residential sector are calculated with the following equation:

$$E_{ij} = C_{ij}F_j \tag{1}$$

E is the total emissions, C represents energy consumption and F represents the emission factors. Index i denotes the town category mentioned in section 3.1 and j represents fuel type. When fuel j is substituted by an alternative fuel k, the reduction of emissions R is estimated with:

$$R_{ij,k} = E_{ij} - E_{ik} \tag{2}$$

Table 4 sets out the variations in emission factors associated with smoky (bituminous) and low smoke (nonbituminous) coals. Table 4 is based upon the latest national application by the EPA inventory team of the 2016 EMEP/EEA Guidebook for emission factors, with the exception of the column relating to "coal (low smoke)". These 'low-smoke' coal emission factors are derived from the UK National Atmospheric Emissions Inventory¹³ where they are referred to under the code SSF. The reason for this is that, as of yet, the EMEP/EEA Guidebook does not provide separate emission factors for low-smoke coal.

Defined Emission Factors adapted from EPA Inventory and UK NAEI							
Pollutant	Unit	Coal	Coal (Low Smoke)	Peat	Other Liquid	Gas	Biomass
PM _{2.5}	g/GJ	398	98	398	1.9	0.2	740
NOx	g/GJ	110	110	110	51	42	80
NMVOC	g/GJ	484	484	484	0.69	1.8	600
NH ₃	g/GJ	0.3	0.3	0.3	0	0	70
SO _X	g/GJ	301.41	574.11	292	10.34	0.08	11
CO ₂	Tonne/GJ	94.6	98.3	104	72.35	56.9	112

Table 4 Emission factors from EMEP/EEA Guidebook 2016 section 1.A.4 and UK NAEI

3.4 Estimating Health Benefits Resulting from Emission Reductions

Marginal damage values are based on the methodology developed and applied for EnvEcon's marginal damage value guidebook (EnvEcon, 2015). These marginal damage values are detailed in Table 5. Damage values include damage to health (morbidity and mortality) and environment (Acidification, Eutrophication and loss of biomass). The underlying methodology is described in the marginal damage value guidebook.

¹³ http://naei.defra.gov.uk/ - UK terminology: SSF 'smokeless solid fuel'

Aggregate National Estimate of Marginal Damage Value per tonne per annum of Pollutant (€2010 prices)						
	NO _X	NH ₃	SO ₂	NMVOC	$\mathbf{PM}_{2.5}$	
	Incl. Secondary PM	Incl. Secondary PM	Incl. Secondary PM	Incl. Secondary PM & O ₃	Primary PM only	
Ireland All	€1,000	€825	€4,825	€875	€7,500	
Ireland Rural	€925	€650	€4,825	€850	€6,600	
Urban Large (Dublin)	€9,350	€13,175	€10,300	€2,675	€67,650	
Urban Medium (Pop > 15,000)	€1,550	€3,300	€4,750	€1,550	€22,825	
Urban Small (Pop 10,000-15,000)	€1,375	€1,500	€5,275	€1,350	€14,800	
Small Towns (Pop < 10,000)	€1,150	€1,050	€4,725	€1,025	€9,650	

Table 5 Marginal damage values for cities/towns of different sizes

Source: EnvEcon, Air Pollutant Marginal Damage Values Guidebook for Ireland 2015.

In summary, the benefits B from the emission reductions are calculated with the following equation:

$$B_{ij,k} = R_{ij,k} D_{ij} \tag{3}$$

Where D is the appropriate damage value from Table 5, and i, j and k are the same as in Equation (2) and (1).

4. Assessment Scenarios

In carrying out this ex-ante assessment we have defined two scenarios representing different presumed levels of adherence to the current Low Smoke Zones, and compared these with the introduction of a nationwide Low Smoke Zone. The base scenarios illustrate this potential variation in adherence to the current Low Smoke Zones, due to the availability and sale of smoky coal either online or within close proximity of the LSZ areas. These alternate base scenarios highlight the impacts of burning smoky coal in the current Low Smoke Zones i.e. areas with larger populations and higher population density. The assumptions on the base scenario are relevant when considering the overall air quality, health impacts and related savings of a nationwide Low Smoke Zone scenario where all smoky coal use shifts, at a minimum, to low smoke coal.



Base Scenario 1: No smoky coal used in Low Smoke Zones.

The current Low Smoke Zones apply to large towns and urban areas with a population of over 15,000, as well as some 'opt-in' areas. In this base scenario, we assume that all coal used in these current Low Smoke Zones is low smoke, and consequently that all smoky coal used nationally is used outside of these areas, i.e. in areas with lower population density.

Base Scenario 2: 30% of coal used in Low Smoke Zones is smoky coal

This scenario is a variation on the base scenario 1 and assumes that 30% of smoky coal used nationally is in fact burned within current Low Smoke Zones. The remaining balance of smoky coal is then burned outside the Low Smoke Zones. This scenario provides a sensitivity analysis, assuming 70% compliance with the current regulations, and reflects reports from stakeholders that the availability online and in nearby areas of smoky coal, leads to continued use even within the LSZ areas.

Scenario Nationwide Low Smoke Zone: All coal burned nationally is low smoke

This scenario represents a nationwide Low Smoke Zone and assumes that all coal burned nationwide will be low smoke. Specifically, all bituminous coal currently used in the residential sector is now assumed to be low-smoke coal. In reality it is probable that householders may be stimulated to modernise their heating systems by moving to cleaner heating systems (e.g. electricity, renewables, gas), however, to provide a conservative assessment of the benefits, it is simply assumed that low smoke coal will replace bituminous 'smoky' coal. This is an important point as by assuming a switch only from smoky to low smoke coal, the upper range of benefits where 'cleaner' swaps occur is not captured in this study.

4.1 Summary Results of Scenarios

Base Scenario 1 versus Nationwide Low Smoke Zone

The results of Base Scenario 1 versus a nationwide Low Smoke Zone show that there would be a net health benefit of approximately \notin 4.5m per annum in emissions reductions. In addition, there is a reduction in PM_{2.5} of almost 1.75kt, which is a substantial amount in the context of our national emission ceiling in 2030 of 11.40kt. There is a small estimated increase in sulphur emissions of almost 1.6kt. Additional complementary measures could be introduced to offset these increases. These could yield more substantial impact benefits in the region of \notin 8m per annum, however, these complementary measures are not assessed in detail as part of this study. See table 6 for summary results of the Base Scenario 1 vs. nationwide Low Smoke Zone.



Table 6 Differentials between Base Scenario 1 and the Nationwide Low Smoke Zone

Differentials - Base Scenario 1 vs. Nationwide Le	Differentials - Base Scenario 1 vs. Nationwide Low Smoke Zone					
Scenario Emissions - Values in kt	PM _{2.5}	NO _X	NMVOC	$\rm NH_3$	SO ₂	CO_2
Small towns <1000	0.0	0.0	0.0	0.0	0.0	0.0
Small towns 1000-5000	-0.1	0.0	0.0	0.0	0.1	1.7
Small towns 5000-10000	-0.1	0.0	0.0	0.0	0.1	1.2
Urban Small (10000-15000)	0.0	0.0	0.0	0.0	0.0	0.4
Urban Medium (15000-150000)	0.0	0.0	0.0	0.0	0.0	0.0
Urban Large(Dublin)	0.0	0.0	0.0	0.0	0.0	0.0
All Towns	-0.3	0.0	0.0	0.0	0.2	3.3
All other SAPS	-1.5	0.0	0.0	0.0	1.3	18.1
Total - All Country	-1.74	0.00	0.00	0.00	1.58	21.41
Scenario Emissions - by Fuel Type	PM _{2.5}	NO _X	NMVOC	NH ₃	SO ₂	CO_2
Smoky Coal	-2.3	-0.6	-2.8	0.0	-1.7	-547.4
Coal (Low Smoke)	0.6	0.6	2.8	0.0	3.3	568.8
Peat	0.0	0.0	0.0	0.0	0.0	0.0
Other Liquid	0.0	0.0	0.0	0.0	0.0	0.0
Gas	0.0	0.0	0.0	0.0	0.0	0.0
Biomass	0.0	0.0	0.0	0.0	0.0	0.0
Total - All Fuels	-1.74	0.00	0.00	0.00	1.58	21.41
Scenario Impacts - Values in Euro Note that savings are negative and costs are positive	PM _{2.5}	NO _X	NMVOC	NH ₃	SO ₂	CO ₂
Small Towns (<10,000)	-€2.26m	€0	€0	€0	€1.00m	€0.06m
Urban Small (10,000 to 15,000)	-€0.53m	€0	€0	€0	€0.17m	€0.01m
Urban Medium (>15,000)	€0	€0	€0	€0	€0	€0
Urban Large (Dublin)	€0	€0	€0	€0	€0	€0
Ireland Rural - All Other SAPS	-€9.68m	€0	€0	€0	€6.43m	€0.36m
Total - All Country	-€ 12.46m	€0	€0	€0	€7.61m	€0.43m

Table 6 (and Table 7) also highlight that the changes in emissions are dominated by changes outside of the legally defined town groupings, and occur principally within the 'All Other SAPS' areas. This is important as it suggests that an incremental change in the current Low Smoke Zones to include towns of say greater than 10,0000 or greater than 5,000 persons would yield only a very small change in emissions of $PM_{2.5}$ and would capture the more significant benefits of a nationwide approach. That is not to say that there may not be localised ambient air quality benefits arising. However, these would need to be assessed via a localised monitoring approach.

Base Scenario 2 versus Nationwide Low Smoke Zone

Under Base Scenario 2 we assumed that 30% of smoky coal used nationally is burned within current Low Smoke Zones. In comparing this scenario to the Base Scenario 1 we see that while the same volume of smoky coal is consumed nationally, there are higher costs associated with it being burned in the higher population LSZ areas. Our results show that the net benefits of a nationwide Low Smoke Zone from Base Scenario 2 are approximately €7.2m per annum, which is in the region of €2.85m per annum greater than on Base Scenario 1 in which no smoky coal is burned in the current Low Smoke Zones.



Aggregate emissions reductions are obviously the same across Base Scenarios 1 and 2 with a reduction in $PM_{2.5}$ of approximately 1.75kt. Again complementary measures such as sulphur content regulations and/or higher biomass content for CO_2 reductions could bring the estimated benefits to over \pounds 15m per annum. See Table 7 for summary details of Scenario 2 vs. nationwide Low Smoke Zone.

Differentials - Base 2 30% in LSZ vs. Nationwide Low Smoke Zone						
Scenario Emissions - Values in kt	$PM_{2.5}$	NO _X	NMVOC	\mathbf{NH}_3	SO_2	CO ₂
Small towns <1000	0.00	0.00	0.00	0.00	0.00	0.02
Small towns 1000-5000	-0.12	0.00	0.00	0.00	0.11	1.54
Small towns 5000-10000	-0.10	0.00	0.00	0.00	0.09	1.18
Urban Small (10000-15000)	-0.04	0.00	0.00	0.00	0.03	0.45
Urban Medium (15000-150000)	-0.12	0.00	0.00	0.00	0.11	1.50
Urban Large(Dublin)	-0.01	0.00	0.00	0.00	0.01	0.17
All Towns	-0.39	0.00	0.00	0.00	0.36	4.87
All other SAPS	-1.34	0.00	0.00	0.00	1.22	16.54
Total - All Country	-1.74	0.00	0.00	0.00	1.58	21.41
Scenario Emissions - by Fuel Type	PM _{2.5}	NO _X	NMVOC	NH ₃	SO ₂	CO ₂
Smoky Coal	-2.30	-0.64	-2.80	0.00	-1.74	-547.38
Coal (Low Smoke)	0.57	0.64	2.80	0.00	3.32	568.79
Peat	0.00	0.00	0.00	0.00	0.00	0.00
Other Liquid	0.00	0.00	0.00	0.00	0.00	0.00
Gas	0.00	0.00	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	0.00	0.00	0.00	0.00
Total - All Fuels	-1.74	0.00	0.00	0.00	1.58	21.41
Scenario Impacts - Values in Euro Note that savings are negative and costs are positive	PM _{2.5}	NO _X	NMVOC	NH ₃	SO ₂	CO_2
Small Towns (<10,000)	-€2.14m	€0.00	€0.00	€0.00	€0.95m	€0.05m
Urban Small (10,000 to 15,000)	-€0.55m	€0.00	€0.00	€0.00	€0.18m	€0.01m
Urban Medium (>15,000)	-€2.77m	€0.00	€0.00	€0.00	€0.52m	€0.03m
Urban Large (Dublin)	-€0.95m	€0.00	€0.00	€0.00	€0.13m	€0.00m
Ireland Rural - All Other SAPS	-€8.85m	€0.00	€0.00	€0.00	€5.88m	€0.33m
Total - All Country	-€ 15.27m	€0.00	€0.00	€0.00	€7.67m	€0.43m

Table 7 Differentials between Base Scenario 2 and the nationwide Low Smoke Zone

5. Policy Design

The potential reduction in PM_{2.5} emissions of 1.75kt represents a strongly positive outcome in the context of managing performance with regard to National Emission Ceiling obligations. Also, as outlined in section 4, there are benefits associated with the proposed nationwide Low Smoke Zone in terms of health and environmental impacts, that are conservatively estimated at up to \notin 7.2m per annum. These may rise to \notin 15m per annum where sulphur controls are considered. However, it is also important to consider the wider costs and benefits of such a



policy in the design phase. Issues such as fuel poverty and economic impacts warrant consideration. The practical implications of a national Low Smoke Zone must also be considered, particularly in light of having supply in Northern Ireland available online and varied tax treatment of fuels for residential heating north and south. Enforcement will also be a key consideration.

Nonetheless, considerable work has been done with the authorities in Northern Ireland to develop strategies to combat air pollution from residential solid fuels. A recent report under the auspices of the North South Ministerial Council recommended that each respective jurisdiction, North and South should extend their regulations in relation to residential solid fuels. The proposed nationwide Low Smoke Zone is proposed to give effect to these recommendations, and it is understood that consideration is being given to these matters in Northern Ireland. However, with Brexit, and the absence of a regional administration, implementation of the recommendation will likely be on a longer time frame. These and other concerns are explored below. Section 5.1 introduces this section by offering a synthesis of public consultation responses to the national Clean Air Strategy, and specifically the proposed nationwide Low Smoke Zone approach.

5.1 Synthesis of Public Consultation Responses on nationwide Low Smoke Zone

As part of the national clean air strategy there were a number of submissions from stakeholders in relation to the proposal for a nationwide Low Smoke Zone in Ireland. These included submissions from Michael Fitzmaurice TD, Renewable Gas Forum Ireland (RGFI), Bord na Móna (BnM), Asthma Society of Ireland (ASI), Argina Fuels, Galtee Fuels, CPL Industries, the Solid Fuel Trade Group (SFTG) as well as Limerick, Dublin, Fingal and Cavan county councils. In this section, the main points are synthesised for consideration in advance of the policy design discussion.

Development of a new national Clear Air Strategy for Ireland was welcomed by all stakeholders in the context of what some described as outdated and irregular legislation that currently aims to regulate air quality. However, there was a mixture of views amongst stakeholders for a nationwide Low Smoke Zone, generally reflecting their interest in the sector. Some recommended that action by policymakers should be wide in scope to target multiple fuels used in a variety of sectors. As part of this, some stakeholders suggested that complementary information campaigns are generally encouraged as an effective strategy to promote good practices and should be conducted in order to educate the public about the harmful effects of air pollution and ways the public can help to reduce emissions.

In relation to the existing and proposed regulations to promote air quality improvements, it was broadly agreed that the current regulations are not operating as effectively as they might. There were suggestions that new regulations



should aim to consolidate and close important gaps in current legislation, and that authorities face challenges to enforce regulations sufficiently, and must address this challenge if new regulations are to be successful. It was noted by several respondents, particularly local authorities, responsible for implementation of the legislation, that a nationwide Low Smoke Zone would greatly facilitate enforcement by providing for the same regulatory regimes in all geographical areas.

Specifically, in the case of the solid fuel regulations, some stakeholders supported an expansion of the existing regulation towards a nationwide Low Smoke Zone while others highlighted concerns. Some welcomed the LSZ as a progressive step towards achieving better air quality in Ireland. Whilst others believed that the LSZ would adversely affect consumers, could result in undesired consumer behaviour and lead to increased activity in the grey and black solid fuel markets. There were several key challenges raised through this consultation process including issues around cross-border trade, concerns over negative impacts on fuel poverty, and the uncertainties of Brexit. There was some suggestion made in the direction of increasing the number of grants made available for retrofit schemes and incentives for homeowners to install more efficient boilers. There were also suggestions for the introduction of an early introduction of Ecodesign standards (EU/2015/1185) as well as an accreditation system for installers of solid fuel stoves.

In so far as natural gas is concerned, the stakeholders generally agreed that it is a cleaner burning alternative to solid fuels. Although the primary issue for Ireland it was argued, was that many households in rural areas, the midlands and the North-West are not connected to the gas grid. As such it was suggested that they require solid fuels for heating as they do not have alternatives or substitutes to choose from, however, this is not the case, as there are alternatives outside of gas.

The monitoring of air pollution was also raised as an issue and there was general consensus that the current air quality monitoring and modelling system is inadequate. The EPA's plan to expand the monitoring and analytical capacity is broadly welcomed and should include a wider range of pollutants to be monitored. There was also strong emphasis placed on the importance of collaborating with universities and research groups in order to conduct indepth analysis of air data.

One important area of consensus among stakeholders was the need for modernisation of legislation in relation to air pollution as current legislation dates from 1987. Stakeholders were also all in agreement that educating the public on the problems associated with emissions and ways in which they can reduce them, is an important element, and one that would support greater progress on a nationwide Low Smoke Zone.



5.2 Issues to be addressed with regard to nationwide Low Smoke Zone

Energy poverty

Fuel poverty is described as the inability to adequately heat a home and is generally assessed as a function of household income, fuel prices and the energy efficiency of a home. The National Strategy to Combat Energy Poverty¹⁴ defines fuel poverty as households spending over 10% of household income on fuel. The proposed nationwide Low Smoke Zone has potential relevance to fuel poverty due to its potential impact on the availability of a fuel, and the prevalence of coal usage among households who are at risk of fuel poverty. For example, the CSO/SEAI Building Energy Rating data shows that no household which relies on coal as a main space heating fuel has a BER rating above C3, with over 77% of households which use coal as their main space heating fuel achieving BER ratings of E, F or G.

It is estimated that up to one in ten households in Ireland are at risk of fuel poverty which has important social, economic and health impacts. Living in continuous thermal discomfort and persistent cold strain can lead to a range of health problems and impacts on the physiological system. These issues are particularly prevalent amongst more vulnerable groups in society including the elderly. The impacts can also exacerbate existing health problems related to the cardiovascular and respiratory systems, can diminish resistance to infections, and can increase mortality in particular excess winter mortality among fuel poor households.¹⁵ Use of high emission solid fuels for heating likely adds to the overall health burden of those in fuel poverty when compared to the use of cleaner, low emission alternatives.

To address the issue of fuel poverty it is important first of all to consider the factors which influence residential choices in relation to fuel, such as, price, availability, access and infrastructure, home heating design, familiarity and cultural preferences. Where it may be the case that alternative fuel choices are limited due to lack of access to fuel sources then we can consider these cases as being structurally locked-in unless they have other options or substitutes to consider. An example of structural lock-in occurs in parts of rural Ireland where small towns in the midlands and North-Western parts of the country lack gas connections and therefore do not have natural gas as an alternative solution or replacement fuel.

We must also consider the influencing factors behind a resistance to change in cases where there is an alternative, often more efficient, fuel supply available. There is an association between high levels of fuel poverty and high levels

¹⁴ http://www.dccae.gov.ie/en-ie/energy/topics/Energy-Efficiency/energy-costs/Pages/Energy-Poverty-Strategy.aspx

¹⁵ National Strategy to Combat Energy Poverty Report



of resistance to change (Fu et al, 2014). The most important factors influencing fuel choices are levels of energy demand or need, available income and fuel price. It is important to note that price sensitive households may be inclined to opt for lower priced fuel, being more influenced by available income and fuel price but not fully factoring in the energy content or fuel quality (North South Ministerial Council, 2016). The national energy poverty strategy¹⁶ recognises that '*potentially large bi-monthly gas bills are more difficult for households to deal with than regular weekly purchases of solid fuels even though these larger, less frequent, payments could be less costly over time*'.

Figure 11 presents delivered energy cost estimates using the technology/fuel combination efficiency values set out in Table 8 below. These generally represent mid-points of the presented ranges from the SEAI work that underpins these values. Interestingly it is apparent that coal (both bituminous and anthracite) are comparatively expensive where used in an open fire context. Thus in such cases residential users would perhaps be better off seeking an alternative. The Government scheme for Better Energy Warmer Homes¹⁶ provides grants for those in fuel poverty to make homes warmer and more comfortable to live in at *no cost* to the homeowner. This scheme, administered by SEAI, funds energy efficiency improvements in the homes of the elderly and vulnerable, making the homes more comfortable, healthier and more cost effective to run.

When we examine the delivered energy cost for the use of bituminous and low-smoke coal from SEAI, we find that as of 2015 there is only a small cost differential, with low-smoke coal in the region of just 2.5 to 5.5% more expensive. This modest variation suggests that the impact on fuel poverty may be small, and furthermore, that alternative price incentives (e.g. adjusted VAT rates) or product innovations (e.g. blending low smoke coal with biomass to secure reduced tax on carbon content) may adequately address this potential concern.

Energy Efficiency	% Efficiency
Standard coal (Open fire)	25%
Standard coal (Stove)	70%
Anthracite (Open fire)	25%
Anthracite (Stove)	70%
Oil (Oil fired boiler)	65%
Gas (Gas fired boiler)	65%
Gas (Condensing boiler)	91%

Table 8 Energy efficiency values applied for specific technologies in estimating delivered energy cost

Source: SEAI

¹⁶ <u>http://www.seai.ie/Grants/Warmer Homes Scheme/</u>







Source: SEAI

Brexit

The future relationship between the UK and the EU is yet to be determined in the wake of the Brexit vote. How these negotiations and the agreed terms of trade will affect Ireland is also unknown. This brings considerable uncertainty to any issue related to the border between Ireland and Northern Ireland, be it in terms of trade, travel or border control. The UK remains Ireland's largest trading partner with an average €1.2bn in trade every week, but the impact of Brexit could decrease trade by 20% or more according to IIEA, 2016¹⁷. Brexit could also result in reestablishing customs posts and the introductions of tariffs on goods thereby driving higher prices for Irish consumers, though generally coal imports are made via national ports. In the context of importing smoky coal in

¹⁷ https://tinyurl.com/IIEABrexit2016



the wake of a nationwide Low Smoke Zone approach, this may be positive. At present coal in Northern Ireland is priced with a lower VAT rate of 5%, and is not subject to any carbon tax, thus it enjoys a comparative price advantage in this case. The presence of trade tariffs into the future would change the scenario somewhat. Furthermore, any firming of the border between Northern Ireland and Ireland would be relevant, but may be positive where it reduces illicit trade and smuggling.

Fuel Switching - Complementary Measures

Other issues of concern are the impacts of a nationwide Low Smoke Zone and the consequent switching to lowsmoke coal, on both carbon and sulphur emissions. A number of potential policies could be introduced to complement the nationwide Low Smoke Zone and to reduce any negative impacts of switching. These include introducing fiscal incentives, regulations to limit the sulphur content of low smoke coal, and/or increasing the biomass content in blended coal in order to reduce the fossil carbon content. In these cases there may however be cost implications for fuel production, and/or implications for the delivered energy cost.

Space heating systems are often embedded infrastructures within a household, as result the demand for coal is likely to be relatively inelastic in the short term. For that reason, the conservative assumption is that fuel switching will largely be from smoky to low smoke coal in the event of a nationwide Low Smoke Zone. The marginally higher price of low smoke coal may encourage some fuel switching but given the relative cost of alternative fuels and the presence of existing coal burning space heating infrastructure this should not be considered a certainty. In order to encourage switching from low efficiency coal burning to higher efficiency options, government could consider offering a favourable VAT rate for low smoke fuels such that the differential between current smoky coal prices and low smoke coal in the Ireland is adequately addressed, whilst also curtailing any added incentive for illegal trade from Northern Ireland. Alternatively, or indeed additionally, products such as low smoke coal blended with biomass, which take advantage of carbon tax relief in Ireland could be further developed and marketed at a lower price point to compete in the bituminous coal market. In addition a programme of information and strengthening the links with existing grant programmes to combat fuel poverty would be beneficial.

Enforcement

As highlighted above, the ease of enforcing a LSZ will also be influenced by the coverage, for example, extended to additional small towns or adopting a nationwide LSZ approach. Certainly the introduction of an extended LSZ to include additional small towns only, would offer limited value in terms of expected emission reductions and impacts, and would leave in place a system that is particularly challenging to regulate and enforce. In essence users could simply continue to order deliveries from providers outside of LSZ areas. Our estimations suggest that the bulk of the remaining smoky coal use is found in areas outside of legally defined town areas, and as a result a nationwide approach would address issues of online sale and purchase from within Ireland, and yield greater emission and health impact benefits, where illegal trade and imports are adequately addressed.



5.4 Instruments to support transition towards nationwide Low Smoke Zone

There are policy instruments that could help with a transition to a nationwide Low Smoke Zone and promote the uptake of cleaner and lower carbon fuels. In summary these include:

- A VAT price differential to shift use towards cleaner alternatives including low smoke coals.
- Information campaigns on fuel efficiency and delivered energy cost to encourage alternative choices.
- Strengthening links with existing energy efficiency/fuel poverty programmes.
- Product innovation and production at lower price point (e.g. low smoke coal with biomass blended).

6. Conclusions

This brief estimates the potential emission reductions and associated air pollution impact outcomes from the replacement of smoky coal use in the residential sector in Ireland by low-smoke coal. Notable emissions and damage reductions are found for the nationwide Low Smoke Zone scenario. The move would be expected to support progress on PM_{2.5} targets (e.g. Directive 2016/2284) and would deliver health and environmental benefits within Ireland. Shifts towards cleaner fuels such as clean renewables and natural gas would have even greater positive impacts on climate (Decision No. 406/2009/EC) and air emission targets, however, there are infrastructural and investment considerations. On the basis of the Clean Air consultation, it is clear that a national clean air strategy would be broadly welcomed by stakeholders, in particular as many view the existing regulation as outdated and irregular. With specific regard to the proposal for a nationwide approach to Low Smoke Zones, there are a range of views with much support, though some concerns and challenges raised. Under bullet points below we outline our perspective in relation to the principal considerations and challenges.

1. On the rationale of perhaps moving to an extended set of small towns for the existing 'Low Smoke Zones' our assessment suggests this would make little sense. Extending the LSZ legislation on sale and marketing to legally defined small towns of say 5000 persons or more, would yield little in terms of either emission reductions or health impacts. This is due to the limited number of legally defined small towns, and the estimation that the majority of the remainder of smoky coal use is occurring nationwide across small areas that are not easily defined or regulated. Furthermore, any extension of the restrictions on sale and marketing would still leave users in all areas the opportunity to order from suppliers outside of the Low Smoke Zone area. Given that such products are well suited for bulk order and delivery, this facility would likely continue to undermine the effectiveness of the overall ambitions of the national clean air strategy.



- 2. With regard to the argument that users in many cases have no alternative, this is clearly not the case. Bituminous coal is one of the more polluting and inefficient fuels for home heating, and ultimately higher tier technologies and alternative fuels (e.g. electrified heating via heat pump technology, gas) will deliver greater heating performance and reduced impacts over the long-term. However, in the interim low smoke coal can serve as a direct substitute for bituminous coal, and represents a step up the value chain with minimal market disruption. It is also important to note that with regard to home heating using a simple comparison of a bag of coal versus another type of bag of coal is not the best approach. Instead it is preferable to focus on delivered energy cost in cents per kWh. This represents a function of the average price per unit of fuel, the gross calorific value of the fuel and the efficiency of the combustion technology (e.g. open fire). For an open fire low smoke ovoids are marginally more expensive, but the difference in delivered energy cost between low smoke ovoids and either standard or premium coal is in the range of 2.5 to 5.5% depending on whether it is a bulk or bag purchase (SEAI, Domestic Fuel Costs Comparison April 2017).
- 3. In terms of the availability of low smoke coals to substitute bituminous coal, industry estimates suggest that capacity to produce low smoke coal would be approximately 360kt pa in 2018, with a UK import option of approximately 125kt. Based on a current legal market of just over 300kt for all residential coal products (based on SEAI 2015 inventory), and an assumption of between 70-90kt of illegally imported fuel, it would appear that the smoky coal market could be displaced and serviced by the planned capacities in the short-term.
- 4. With respect to the issue of illegal and illicit trade of fuels from Northern Ireland, this is an issue that must be addressed. There is a strong economic incentive at present to purchase fuel illegally imported from Northern Ireland. This is due to the absence of a carbon tax on the fuels in Northern Ireland, and the lower applicable VAT rate of 5%. Whilst these issues have been raised by many stakeholders, the application of a nationwide LSZ approach, coupled with the draft bill on the Sale of Illicit Goods 2017 should actually support authorities in identifying and regulating illegal trade. The latter bill would make it an offence to purchase smuggled solid fuel, and with a nationwide Low Smoke Zone in place there would be reduced scope to argue the source or origin of any such illegally smuggled fuel. Coal importing and distribution is a bulk trade and as such it should be possible to identify, regulate and manage persistent offenders over time. This is also one of the areas where the outcomes of Brexit with regard to trade agreements and a potential firming of the border may actually offer some benefit.
- 5. Coal products are generally imported and distributed in Ireland. Whilst economic and employment impacts are of great importance, the simplest shift for existing consumers of bituminous coal would be to low smoke coal. In this circumstance no substantive change in overall distribution requirements would arise, and potentially the pressure for low smoke coal would stimulate greater indigenous industry around



processing of these fuels. A more developed market for low smoke coal should stimulate further investment and innovation in production and there is some evidence of industry anticipating the potential opportunity, for example both Bord na Móna and CPL Industries flagged substantial capacity investments in low smoke coal production as part of their response to the clean air strategy consultation.

- 6. The higher sulphur content of low smoke fuel is a further issue that can be addressed, but which will likely incur some further cost on fuel production. The higher assumed emission factor for sulphur where bituminous coal is substituted with low smoke coal reduces the level of potential benefits estimated from the switch. As such it would be beneficial for industry to investigate opportunities as part of their processing and product innovation to address this issue as part of the shift towards cleaner fuels and to ultimately apply the same sulphur content standard as applies to bituminous coal to the future low smoke coal products.
- 7. The risk of energy poverty is an important issue to be recognised when intervening in the residential heating market. However, as there is a ready substitute available for smoky coal, that requires no additional technology investment, the challenge is principally to address any increased financial burden that may add pressure to energy poverty levels. This issue is also connected to the issue of illegal trade and the more favourable price conditions in Northern Ireland. As the current delivered energy cost difference is considered reasonably low, one strategy to support the transition to a nationwide Low Smoke Zone, could be to offer a favourable VAT rate for low smoke fuels such that the differential between current smoky coal prices and low smoke coal in the Ireland is adequately addressed, whilst also curtailing any added incentive for illegal trade from Northern Ireland. Alternatively, or indeed additionally, products such as low smoke coal blended with biomass, which take advantage of carbon tax relief in the Ireland could be further developed and marketed at a lower price point to compete in the bituminous coal market.
- 8. Education is an area where all stakeholders and analysts are agreed with regard to the need for both early education interventions in schools to ensure the next generations understand fuel use choices and ambitions and motivations of actions such as the clean air strategy. Similarly there is merit in clearly communicating the ambition of the clean air strategy, and explaining the motivation and options available to consumers at the new decision point where a nationwide Low Smoke Zone is introduced.
- 9. Whilst the focus of this piece has been on coal, the development of a complementary strategies to further support clean air by further promoting clean fuels is also important.
- 10. Monitoring and analytical capacity also continues to be an under-resourced area, and it should be remembered by all stakeholders and policy makers that this is critical for managing and measuring progress, and targeting effective actions with respect to the national strategy for cleaning our air.



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