APPENDIX I
SUMMARY OF CASE STUDIES

Supporting the Fitness Check of the EU Ambient Air Quality Directives (2008/50/EC, 2004/107/EC)
1 INTRODUCTION

The present appendix provides a brief summary of the emerging findings from the 7 case studies performed as part of the regulatory fitness check of the AAQ Directives.

The seven case studies have been carried out for the purpose of finding greater details for some of the evaluation questions. The main purpose of case studies is to examine, in more detail, the situation regarding the experience and lessons learnt in the implementation of the air quality legislation. The case studies include a more detailed review of implementation and integration successes and problems, the costs of implementation and of non-implementation of the legislation and the administrative burden of implementation and opportunities for improving implementation without compromising the integrity of the purpose of the Directives. As such, the case study complements the information gathered through other sources, such as desk review, targeted questionnaire, open public consultation, interviews, focus groups and stakeholder workshops.

The Member States for detailed case studies have been selected to cover a range of geographies, governance structures and sizes. This led to the selection of the following seven Member States: Bulgaria, Germany, Ireland, Italy, Slovakia, Spain and Sweden.

The seven case studies follow the same template and consistent methodology and questions. At the same time, each case study is unique and provides different insights into the country specific challenges and best practices in relation to the implementation of the AAQDs.

Each case study is focusing on the implementation of the AAQ Directives and then on a specific topic, in particular:

- **Bulgaria** with focus on air quality zone Plovdiv Agglomeration
- **Germany** with focus on Berlin Agglomeration
- **Ireland** with focus on public information provision
- **Italy** with focus on the Sicily region
- **Slovakia** with focus on Kosice region
- **Spain** with focus on Madrid
- **Sweden** with focus on rural environment and ecosystem impacts

The case studies relied on extensive desk research of relevant documents, 40 in-depth interviews with relevant national authorities (central, regional and local), representatives of businesses and business associations, representatives of NGOs, environmental and municipalities associations, research institution and health foundation.
### 2 KEY FINDINGS

The following sections present the key findings emerging from the case studies.

#### Table 2-1 Assessment of relevance of the AAQ Directives in the case studies

<table>
<thead>
<tr>
<th>Country</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>Air quality is considered to have deteriorated in the past 10 years by 59% of the respondents to Special Eurobarometer 468 (2017). The AAQ Directives are assessed to address the needs at national level (e.g. in terms of monitoring of air quality, provision of information and planning of measures). The AAQ Directives are considered to target relevant pollutants but the limit values do not sufficiently reflect specific local, climate or social conditions.</td>
</tr>
<tr>
<td>Germany</td>
<td>Air quality is considered to have deteriorated in the past 10 years by 29% of the respondents to Special Eurobarometer 468 (2017). The AAQ Directives are assessed to address the needs at national level and are considered to be essential (in particular the monitoring and assessment and the limit values). Pollutants regulated by AAQ Directives remain relevant and there is a need to further focus on pollutants with a high effect on human health (e.g. PM2.5, ultrafine particles).</td>
</tr>
<tr>
<td>Ireland</td>
<td>Air quality is positively regarded by citizens as only 17% of Irish citizens consider that air quality has deteriorated in the last 10 years, while 33% suggest that it has improved, according to Special Eurobarometer 468 (2017). The AAQ Directives provisions are considered to be relevant, in particular limit values; there is also evidence that the regulatory framework should be expanded to include PM1.</td>
</tr>
<tr>
<td>Italy</td>
<td>A majority of citizens responding to Special Eurobarometer 468 (2017) perceived air quality as having deteriorated in the past 10 years (61% of respondents). The AAQ Directives provisions have been and remain relevant, in particular in relation to air quality plans and limit values which are important to mitigate the negative effects of air pollution.</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Air quality is a source of concern for 43% of respondents to Special Eurobarometer 468 (2017) that consider air quality in Slovakia remained the same over the past 10 years and a similar amount considered it has deteriorated. The objectives of the AAQ Directives, in particular those related to the availability of information to the public and monitoring of long-term trends were considered to be relevant. There are different views amongst stakeholders in terms of the air quality standards and whether the existing air quality standards are too lenient.</td>
</tr>
<tr>
<td>Spain</td>
<td>Air quality is a concern for Spanish citizens, with 68% of respondents of Special Eurobarometer 468 (2017) considering air quality in the country to have deteriorated over the past 10 years. The current AAQ Directives provisions were considered to be relevant, but findings suggest that the AAQ Directives should be stricter with new pollutants added and stronger limits imposed.</td>
</tr>
<tr>
<td>Sweden</td>
<td>Air quality continues to be a concern in Sweden, as Special Eurobarometer 468 (2017) indicates that 46% of respondents perceived air quality stayed the same in the past 10 years and 24% that it has deteriorated. Air quality standards imposed by the AAQ Directives are relevant but the Swedish legislation goes beyond the values imposed in the AAQ Directives and a need to set a daily limit for PM2.5 was indicated.</td>
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The case study findings indicate that the selected Member States have monitoring and assessment networks that are generally in line with the requirements of the AAQ Directives.

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1 Based on case studies
Table 2-2  Air quality monitoring in the case studies²

<table>
<thead>
<tr>
<th>Country</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Bulgaria</td>
<td>Responsibility of the local authorities together with the ministry of environment: comprises 48 monitoring stations: 30 fixed automated measuring, 5 differential optical absorption spectroscopy, and 9 stations for manual sampling.</td>
</tr>
<tr>
<td>Germany</td>
<td>Responsibility of the German states and the Environment Agency (Umweltbundesamt): Air quality is measured in 650 monitoring station throughout Germany.</td>
</tr>
<tr>
<td>Ireland</td>
<td>Responsibility of EPA and local authorities; the monitoring network meets the requirements of the AAQ Directives but some rural and urban areas are left without assessment.</td>
</tr>
<tr>
<td>Italy</td>
<td>Responsibility of the regions and autonomous provinces (regional/local) and the Italian National Institute for Environmental Protection and Research – ISPRA (national). Improvements of the monitoring network were planned under Sicily’s Operational Programme.</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Responsibility of the Slovak Hydrometeorological Institute and local authorities. Monitoring network had 34 monitoring stations (2007). In 2016, the monitoring network had 38 stations. Some shortcomings in the monitoring in terms of number of sampling points.</td>
</tr>
<tr>
<td>Spain</td>
<td>Responsibility of the autonomous communities and municipalities: 600 fixed measurement stations at national level.</td>
</tr>
<tr>
<td>Sweden</td>
<td>Responsibility of the Swedish EPA (rural) and municipalities (urban). Each municipality monitors NOx, SO\textsubscript{2}, CO, PM\textsubscript{10}, PM\textsubscript{2.5}, benzene, BaP, As, Cd, Ni, Pb. Swedish EPA monitors PM\textsubscript{2.5}, NO\textsubscript{2}, SO\textsubscript{2}, O\textsubscript{3}.</td>
</tr>
</tbody>
</table>

Some Member States provide real-time data on air quality through a variety of tools but the quality of the information is of varying levels (see examples in the table below). This is supported also by the findings from the European Court of Auditors, which flagged some good practices in this regard and pointed out that the quality and availability of public information on air quality in the Member States was not always found to be clear or useful for the citizens regarding the health impacts and measures to take to mitigate risks.³ Also, the study found that Member States, regions and cities defined air quality indices differently, resulting in different assessments of the same air quality, somewhat compromising the credibility of the information provided.

Table 2-3  Information to the public in the case studies⁴

<table>
<thead>
<tr>
<th>Country</th>
<th>Description</th>
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</table>
| Bulgaria | Daily bulletin on exceedances on air quality  
Quarterly bulletins on air quality  
Common SMS system for exceedances and alert thresholds  
Information boards and information on websites of municipalities |
| Germany | Website of the German Environment Agency (UBA)  
Annual Report of the German Environment Agency (UBA)  
Dedicated websites of federal states |
| Ireland | Air Quality Index for Health (AQIH)  
Periodic Air Quality bulletins and reports  
Citizen engagement and citizen science  
Historical data on air quality publicly accessible |

² Based on case studies  
³ European Court of Auditors Special Report on Air Pollution.  
⁴ Based on case studies
The case studies also addressed the issue of costs of the implementation and the costs of non-implementation of the AAQ Directives in the Member States. Data on the costs of implementation and the costs of non-implementation of the AAQ Directives was difficult to find; this is primarily due to the limited number of studies at national level looking into these aspects.

Table 2-4  Costs of implementation in the case studies\(^5\)

<table>
<thead>
<tr>
<th>Country</th>
<th>Costs</th>
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</table>
| Bulgaria (national) | Monitoring (of environment): EUR 1.9 million  
Air quality plans: EUR 1.5 million (approx. EUR 50 000 per plan)  
Air quality measures: EUR 156.8 million |
| Germany | No data available                                                      |
| Ireland (Dublin) | Monitoring (infrastructure): EUR 160 000 (since 2008)  
EPA annual capital replacement cost: EUR 380 000 per year  
EPA annual staff cost for AAQ Directives: EUR 493 000 per year  
Dublin City Council monitoring infrastructure capital cost: EUR 160 000  
Dublin City Council monitoring infrastructure operating cost: EUR 15 000 per year  
Costs of time spent by the relevant persons involved in making measurements, calculations, predictions or estimations in Dublin: EUR 300 000 per year  
Total annual costs (EPA and Dublin Council): EUR 1 806 735 |
| Italy | Monitoring (varies across regions): between EUR 20 000 – EUR 32 000 per station (approx. EUR 5 million per year for all stations)  
Monitoring (maintenance): EUR 300 000 per year |
| Slovakia | Ministry of Environment: estimated in the range of EUR tens of millions per year  
Monitoring (operating): EUR 1.2 million per year |
| Spain | Plan AIRE implementation: EUR 600 000 |

\(^5\) Based on case studies
Monitoring network maintenance (national): variable according to area (between EUR 100 000 and over EUR 1 million)
Contracts with laboratories: EUR 30 000 per year.

EPA budget for AAQ: EUR 400 000 per year (approx. EUR 200 000 to EUR 300 000 for AAQ Directives).
Total estimated annual cost for all fixed measurements (EUR): EUR 1 859 490
Modelling (regional background concentrations of O3, NO2, SO2) annual cost: EUR 65 000
Reference laboratory quality check of data: EUR 50 000

**Table 2-5**  
**Costs of non-implementation in the case studies**

<table>
<thead>
<tr>
<th>Country</th>
<th>Costs of non-implementation</th>
</tr>
</thead>
</table>
| Bulgaria | Health related external costs: EUR 3 billion per year (2010)  
Premature deaths: 14,200 (PM), 640 (NO2), 350 (O3) (2015)  
Total costs (health and non/health) due to traffic pollution: EUR 612 to EUR 778 million (2016) |

<table>
<thead>
<tr>
<th>Germany</th>
<th>No data was available.</th>
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</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>No data was available.</td>
</tr>
<tr>
<td>Italy</td>
<td>No data was available.</td>
</tr>
</tbody>
</table>

| Slovakia | Health related external costs: EUR 3 billion per year (2010)  
Direct economic costs: 1.3 million workdays lost due to sickness, for healthcare of above EUR 10 million per year (income adjusted, 2010), and for agriculture (crop losses) of EUR 35 million per year (2010).  
Premature deaths: 5160 (2014) |

| Spain | Costs of road pollution (both health and non-health related): between EUR 3 916 million and EUR 4 836 million |

| Sweden | Health related external costs: EUR 3 billion per year (2010)  
Premature deaths: 7 600 (2015)  
Socio-economic costs: EUR 5.4 billion (2015) |

The majority of the selected Member States made use of EU funding to improve air quality to varying degrees.

**Table 2-6**  
**Use of EU funding to fund air quality improvements (examples from the case studies)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Use of EU funding</th>
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</table>
| Bulgaria | Cohesion policy funds: under OP Environment 2007-2013, adjacent measures (e.g. waste management, public transport) which also supported air quality objectives  
Cohesion policy funds: under OP Environment 2014-2020 specific objective Reducing ambient air pollution by lowering the quantities of PM10 and NOx (EUR 50 million) |

| Germany | ERDF: 6 programmes related to air quality 2014-2020 (EUR 92.3 million).  
LIFE: use of funding to finance 30 projects related to air quality. |

| Ireland | Horizon 2020: iSCAPE project  
LIFE Programme includes air quality and emissions as a thematic priority |

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6 Based on case studies  
7 Based on case studies
The allocation of responsibilities in relation to air quality is split between the national, regional and local level across selected Member States, as illustrated in the table below. Broadly speaking, the central governance (Ministry of Environment or Environmental Protection Agency) is responsible for the regulation and supervision of air quality.

Monitoring and assessment is devolved at regional and local level in all Member States with the oversight of the national authorities. Air quality plans are generally the responsibility of local and regional levels.

The case studies highlighted that, in some cases, difficulties in effective coordination amongst different levels of government within Member States can be noted. The issue of coordination seems to arise especially when different levels of governance are involved (e.g. local-central, local-regional). This is due to the fact that in some instances, air quality plans contain measures that fall in the remit of responsibility of other national or regional authorities. Such situations can lead to a decreased effectiveness and added value of air quality plans.

Table 2-7 Examples of instances of coordination (or lack of coordination) of air quality plans measures identified in the case studies

<table>
<thead>
<tr>
<th>Bulgaria</th>
<th>Italy</th>
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<tbody>
<tr>
<td><strong>Central level:</strong> Instances of good coordination between national authorities (ministries) were found (e.g. coordination of Ministry of Environment with Ministry of Labour, Ministry of Transport). However, further coordination can be sought in relation to energy (Ministry of Energy).</td>
<td><strong>Central level:</strong> Instances of good coordination between national authorities (ministries) were found (e.g. 2013 Action Plan). Coordination has also improved as a result of the work of a coordination body that prepared national guidelines to avoid regional fragmentation.</td>
</tr>
<tr>
<td><strong>Local/regional level:</strong> Coordination between local and central level is insufficient. For example, 25 Bulgarian municipalities have signed the Covenant of Mayors and prepared Sustainability Energy Action Plans. Of those, two have signed also the Mayors Adapt initiative and are expected to prepare Sustainable Energy and Climate Action Plans (SECAPs). Even though some of these municipalities also have air quality problems, links between the SEAPs/SECAPs and the municipal air quality plans are hardly found. In addition, the municipalities rarely update their SEAPs and thus do not take advantage of the available guidance on how to integrate different policy concerns in their SEAPs. Few municipalities in Bulgaria have a Sustainable Urban Mobility Plan (SUMPs) but in general air quality has not been a focus area of those plans. Air quality plans could also be integrated or linked with municipal/urban/regional level planning e.g. in the area of land use and spatial planning.</td>
<td><strong>Local/regional level:</strong> Coordination between local and central level is insufficient. For example, 25 Bulgarian municipalities have signed the Covenant of Mayors and prepared Sustainability Energy Action Plans. Of those, two have signed also the Mayors Adapt initiative and are expected to prepare Sustainable Energy and Climate Action Plans (SECAPs). Even though some of these municipalities also have air quality problems, links between the SEAPs/SECAPs and the municipal air quality plans are hardly found. In addition, the municipalities rarely update their SEAPs and thus do not take advantage of the available guidance on how to integrate different policy concerns in their SEAPs. Few municipalities in Bulgaria have a Sustainable Urban Mobility Plan (SUMPs) but in general air quality has not been a focus area of those plans. Air quality plans could also be integrated or linked with municipal/urban/regional level planning e.g. in the area of land use and spatial planning.</td>
</tr>
</tbody>
</table>

8 Based on case studies
**Ireland**

**Local/regional level:** Coordination on air quality plans at local level has improved and has spurred coordination with mobility plans, rural development and energy efficiency initiatives. The plans have strengthened coordination between regional and municipal levels and among municipal governments.

**Central level:** Coordination between authorities at central level is found. For example, coordination has taken place when it comes to the setup of the National Clean Air Strategy.

**Local/regional level:** Strong and productive culture of collaborative partnership working between the Irish authorities and institutions at subnational level. This has facilitated the integration of air quality objectives into a broad range of linked policy areas including urban planning and climate change, suggesting that the AAQ Directives have been cohesive with other areas of policy.

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**Spain**

**Central level:** Coordination between authorities has taken place but can be further improved in particular between authorities responsible for air quality and authorities responsible for transport measures.

**Local/regional level:** Coordination between authorities at local and regional level can be further improved. The coherence of the governance structure imposes difficulties when it comes to the implementation of measures to improve air quality that can fall in the remit of responsibility of authorities other than those at local level that are drafting the air quality measures.

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**Slovakia**

**Central level:** Coordination between the authorities at central level has taken place when it comes to the Strategy for the Improvement of Air Quality in Slovakia.

**Local/regional level:** Allocation of responsibilities and the somewhat limited coordination between different actors constituted a major barrier to the effective implementation of the AAQ Directives in Slovakia and in the Košice region. While, in principle, it is possible to elaborate effective measures for the air quality plans, it is not always possible to see them materialise. For example, the authorities in Slovakia may be well aware that a city bypass would likely improve air quality, but in practice it would be difficult to get such a bypass built because the district office, elaborating the measure, does not have the powers necessary to make the development decision.

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**Sweden**

**Central level:** The central authorities coordinate in the adoption of strategic framework.

**Local/regional level:** Coordination in terms of air quality plans between the local and central level can be further improved in some cases. In particular when it comes to the implementation of air quality plans certain measures that are included in the plans are in the remit of responsibilities of national authorities which makes it difficult to ensure their implementation. For example, air quality plans may require a reduction of pollutants in the proximity of national roads but the regulation of national roads is in the area of responsibility of the National Roads Administration. This imposed certain challenges in terms of translating measures into reality. In recent years cooperation has improved and the National Roads Administration has taken measures to secure air quality.