

Recommendations for an update of the **Implementing Provisions for Reporting (IPR)** in connection with the revision of the Ambient Air Quality Directives



Authors:

Leonor Tarrasón and Cristina Guerreiro (NILU)



Cover design: EEA
Cover image © COLOURBOX30187410
Layout: EEA / ETC HE

Publication Date: November 2022

ISBN 978-82-93970-04-0

Legal notice

Preparation of this report has been co-funded by the European Environment Agency as part of a grant with the European Topic Centre on Human Health and the Environment (ETC HE) and expresses the views of the authors. The contents of this publication does not necessarily reflect the position or opinion of the European Commission or other institutions of the European Union. Neither the European Environment Agency nor the European Topic Centre on Human Health and the Environment is liable for any consequences stemming from the reuse of the information contained in this publication.

How to cite this report:

Tarrasón, L. & Guerreiro, C. (2022). *Recommendations for an update of the Implementing Provisions for Reporting (IPR) in connection with the revision of the Ambient Air Quality Directives*. (Eionet Report – ETC HE 2022/7). European Topic Centre on Human Health and the Environment.

The report is available from <https://www.eionet.europa.eu/etcs/all-etc-reports> and <https://zenodo.org/communities/eea-etc/?page=1&size=20>.

ETC HE coordinator: NILU - Stiftelsen Norsk institutt for luftforskning (NILU - Norwegian Institute for Air Research)

ETC HE consortium partners: Federal Environment Agency/Umweltbundesamt (UBA), Aether Limited, Czech Hydrometeorological Institute (CHMI), Institut National de l'Environnement Industriel et des Risques (INERIS), Swiss Tropical and Public Health Institute (Swiss TPH), Universitat Autònoma de Barcelona (UAB), Vlaamse Instelling voor Technologisch Onderzoek (VITO), 4sfera Innova S.L.U., klarFAKTe.U

Copyright notice

© European Topic Centre on Human Health and the Environment, 2022

Reproduction is authorized provided the source is acknowledged. [Creative Commons Attribution 4.0 (International)]

More information on the European Union is available on the Internet (<http://europa.eu>).

European Topic Centre on
Human Health and the Environment (ETC HE)
<https://www.eionet.europa.eu/etcs/etc-he>

Table of Contents

Table of Contents	3
Acknowledgements	4
Summary.....	5
1 Introduction.....	9
1.1 Context.....	9
1.2 Structure and purpose of the report	11
2 Main principles for enhancing the usefulness of e-reporting	12
3 Revisions concerning reporting of representative area	15
3.1 Current reporting obligations on representative area (dataflow D)	15
3.2 Experience on use of reported information on representative area.....	15
3.3 Recommendations for the revision of e-reporting representative area (dataflow D)	15
4 Revisions concerning reporting of exceedance indicators using modelling results.....	17
4.1 Current reporting obligations on exceedance indicators (dataflow G)	17
4.2 Recommendations for reporting exceedance situations using modelling data	17
5 Reporting modelling results with MQO in dataflow D	19
6 Reporting air quality plans	21
6.1 Current reporting obligations for air quality plans (dataflows H- K)	21
6.2 Experience on use of reported information air quality plans (dataflows H-K).....	21
6.3 Recommended revision to the IPR dataflows H-K on air quality plans	26
7 Reporting emissions information under the AAQDs.....	34
7.1 Current obligations for reporting emissions.....	34
7.2 Experience on use of reported information on emissions from dataflows D and J	35
7.3 Recommended revision of the e-reporting emissions requirements (dataflows D, H-K).....	36
8 Conclusions and summary of recommendations.....	40
List of abbreviations	46
References.....	47

Acknowledgements

The ETC task manager was Leonor Tarrasón (NILU). The other co-author was Cristina Guerreiro (NILU). The EEA project manager was Alberto González Ortiz (EEA).

The co-authors are very thankful to the comments and feedback provided by Laure Malherbe and Alicia Gressent (INERIS) as internal reviewers. We are also very thankful to Philippe Thunis, as external reviewer, who helped us improve the clarity of the nomenclature proposed for source-apportionment in accordance with FAIRMODE recommendations.

Summary

This report was prepared to support the 2022 revision of the Ambient Air Quality Directives. It provides a series of recommendations specifically on the reciprocal exchange of information and reporting of ambient air quality following the Commission Implementing Decision (2011/850/EU) reporting. The recommendations aim to further enhance, in a future review, the efficiency and usefulness of the current e-reporting to allow for a general strengthening of the monitoring, modelling and air quality plans information compiled under the AAQDs in order to achieve cleaner air quality.

Based on the experience and lessons-learned from experts involved in e-reporting working with implementing provisions for reporting (IPR) under the Ambient Air Quality Directives at EEA and its European Topic Center for Health and the Environment, we have identified eight (8) basic principles to guide any possible update of the Implementing Provisions for Reporting (IPR). These are as follows:

- ***Data and information required for e-reporting need to be transparent***
- ***Data and information need to be comparable for different periods and from one place to another***
- ***Data and information need to be provided in such a form that it is easy to be assessed in terms of completeness***
- ***Data/parameters need to be quantifiable***
- ***Information documenting the reported data (metadata) needs to be reported, preferably following a checklist approach***
- ***Both data and metadata information need to be provided in established common repositories***
- ***The required data and information need to be usable and useful to trace progress in the implementation of the Air Quality directives***
- ***The mandatory, conditional, or voluntary status of the required data and information needs to be clearly specified, avoiding statements such as “when available” that give rise to confusion and misunderstandings.***

These principles have already been used as basis for current e-reporting. The first six have been included to a certain extent already in the IPR Decision and have guided its implementation in the last decade. However, in our experience these need to be strengthened to ensure a meaningful assessment of the reported data across Europe. We propose that metadata and information is reported following a “checklist approach” compiled in common repositories, instead of the wordy reports, lengthy documents, or links to a pile of documentation in webpages currently delivered to the system, especially with regards to air quality planning information. The checklist approach has also the advantage of allowing better comparability of data and methods reported and has a valuable competence-building dimension because it helps listing and categorization of the information to be compiled by identifying the necessary methodological steps. The last two principles added to the list are based on the recognition that the reported data and information needs to enable an assessment of progress in the implementation of the Air Quality directives and be provided in a form that allows its use for such type of “progress to target” assessment activities. In our experience, a significant number of parameters and information requested by e-reporting are not currently used for further assessments nor are they used for compliance checking. Therefore, it is recommended to revise the information required at present by the IPR in order to prioritize reporting of what is actually useful information. In many cases, there is a need to simplify the requirements and avoid unnecessary reporting burden for the Member States. A prioritization of the requirements for reporting information based on the capability of the data to be used in air quality management, compliance and assessment applications could have the additional advantage of reducing the administrative reporting burden in Member States.

We have followed these principles to review the parts of the information required by the IPR Decision Annex II, specifically under dataflows D, G, H, I, J and K. These are the requirements that are directly linked

to the on-going revision of the Air Quality directives on its aim to strengthen monitoring, modelling, and air quality planning. The review has resulted in four main recommendations as follows:

1. *Revise the reporting requirements of representative area of fixed measurements (dataflow D)*

The availability of new mature methods, based on modelling, sensors, satellite data, to assess the spatial and temporal distribution of air pollutants can support the evaluation of the representative area of fixed measurements in an unprecedented manner. The determination of the “representative area of fixed measurements” has implications for network design. It also has implications for the determination of the area in exceedance of limit and target values per assessment zone and thus it has significant compliance implications related to the determination of the exceedance situation indicators. Given the importance of this parameter for both monitoring network design and for the determination of exceedance situations, we propose to revise the reporting requirements currently specified under data flow D.

The spatial extent of the representative area for fixed measurements may be tentatively reported as a polygon or a series of polygons. Further guidance and interaction with the Forum for Air quality Modeling (FAIRMODE) is recommended to identify best ways to report the representative area for fixed measurements, especially for discontinuous situations. Guidance on the determination of spatial representativeness is currently available in FAIRMODE and may help increase the number of reports of representative area.

The current obligations to report “representative area” are specified under dataflow D “Information on the assessment methods” for fixed measurements, but it is only mandatory “where available” hampering in practice the reporting of this type of information. We propose to make reporting of this information mandatory due to its relevance for attainment of environmental objectives. In addition, we recommend adopting a checklist approach to report the methodology used for the representative area estimation. Such checklist would inform on the tiered level of the methodology used (Tier 1 to 4). We also recommend establishing a common repository for documentation on methodology used and to add to the checklist a specific yes/no question on whether or not the methodology follows FAIRMODE recommendation guidance on station representativeness.

2. *Enhance cooperation with FAIRMODE for reporting of exceedance and exposure indicators and reporting of modelling results with Modelling Quality Objectives (MQO)*

It can be expected that given the enhanced maturity and availability of modelling results, higher tiered approaches relying on modelling results may be adopted to estimate both exceedance and exposure situations by Member States in the future. Indeed, FAIRMODE recommends an enhanced use of models to facilitate the assessment of exceedance and exposure indicators. FAIRMODE is currently developing new guidance to support the use of models for exceedance calculations. However, the guidance is not yet mature and needs further testing within FAIRMODE. Further discussion in cooperation with FAIRMODE would be necessary in order to identify how modelling results can contribute to reporting of exceedance situation indicators and what are the necessary revisions to facilitate e-reporting of exceedance situation using modelling results.

The same applies to reporting modelling information under the IPR Decision, that has taken place under dataflow D1b. A process to identify what type of information and detailed metadata could be provided when modelling is used for air quality assessment purposes and reported under dataflow D1b may be put in place to secure better harmonization of the modelling data formats, map projections and metadata to be reported.

Our main recommendation is to put in place a cross-cutting activity of cooperation between EEA and FAIRMODE that identifies necessary changes in e-reporting to accommodate for an enhanced role of modelling to support air quality assessment purposes.

3. Simplify the e-reporting system for air quality plans (dataflows H-K)

The current requirements for reporting air quality plans in the AAQDs and their implementation in e-reporting dataflows H to K have proven demanding, unclear, and with several shortcomings both in terms of structure and content to allow for a good assessment and use of the reported data. Our recommendations aim to identify efficiency gains in e-reporting of air quality planning and increase the quality and usefulness of the reported data.

The main recommendation is to streamline the requirements for reporting in dataflows H to K enhancing its usability to trace progress in the implementation of the Air Quality Directives. The e-reporting approach that we propose here aims to correct the main limitations of the current e-reporting system in dataflows H to K, namely 1) the challenging interconnections between the different dataflows, 2) the lack of reference to modelling results, 3) the reference to the non-appropriate “increment method” for source-apportionment and 4) the unrealistic expectation that each measure can be associated to a quantifiable reduction in emissions. We endorse FAIRMODE’s recommendation to use modelling tools to provide air quality plans and to determine the impact of control measures in the air concentration levels and other associated indicators. Our recommendation is then that the modelling results to be reported under the air quality plans are to be provided in a form that is easily quantifiable and comparable across Member States.

The proposal is to **merge the dataflows H-K in one single dataflow**, using modelling as the basis for the air quality planning. We propose also to use a unified nomenclature to describe the air quality planning and to follow FAIRMODE guidance for the description of source-apportionment to guide the elaboration of scenarios. Our proposal is to keep the different H-K dataflows as blocks in the single streamlined air quality plans reporting dataflow with the following differences:

(H) the new proposed block H would characterize the air quality plan in a specific identified receptor area that is linked to the air quality zone where exceedances occur. It keeps most of the administrative information necessary to identify the air quality plan and as such serves as basis for reference and interaction with blocks I, J and K. The main difference with current e-reporting situation is that the new dataflow H would identify and characterize the base year (baseline year) both in terms of emissions and of air quality indicators. Modelling is proposed to be made mandatory for the evaluation of the impacts of control measures in elaboration of air quality plans (following FAIRMODE recommendation). Documentation of the model used for the elaboration of air quality plans is required. Modelled results are proposed to be reported in block H for the base year (not in dataflow J as previously required) using three different indicators (for annual averages and for high values, including values to identify hot spots).

(I) the requirement to report source-apportionment information is in the new proposal linked to the same main sources and areas as identified in H. Our main recommendation is to revise the current requirements from dataflow I, avoiding the reference to the increment method, simplifying the request for information, and linking it better to the actual air quality plans in the air quality zone with exceedances. We propose to use a unified approach to the documentation of the source-apportionment method used and to use the GNFR classification for the sector emissions. We also suggest providing information in the form of a simple multiple-choice (checklist approach) that ensures that the information is transparent, quantifiable, and comparable across Member States.

(J) The main difference with current e-reporting situation is that the new proposed block J would identify and characterize only the projection year, the year of the proposed scenario. Information on the scenario

for the attainment year would be identified both in terms of sector emissions, of identified measures and of air pollution indicators. The base year information would be provided in dataflow H (baseline year) and not here in block J, simplifying reporting. Some of the current required fields in dataflow J would not be required in the new proposal for block J to avoid duplication of efforts in reporting and to secure that information in H to K are conveniently linked.

(K) The requirements for reporting in block K would be considerably simplified. The main difference with the current dataflow K would be a streamlining of information to avoid duplication of reporting, linking the measures to sectors and to the actual projection scenario considered in the air quality plans. In addition, we recommend to avoid requiring data that is difficult to produce – such as the impact of emissions reductions in air quality due to a single measure. Instead, we recommend reporting the evaluation of the impact of measures based on the combined projection scenario (as requested in block J).

These recommendations would reduce the total number of fields and parameters to be reported under dataflows H-to K from 75 to 57 and would improve the usability and usefulness of the reported information to trace progress in the implementation of the Ambient Air Quality directives.

4. Consider introducing a requirement to report emission information in relation to modelling applications

There are currently very limited requirements in e-reporting aiming to inform on the emission data used as basis for air quality modelling used either for assessment or for planning under the Air Quality Directives. Information on what emission data is used as basis for modelling applications is essential to assess the validity of the reported modelling results. However, the current requirements to report information on emission data are incomplete and not fit for purpose to understand neither the emissions leading to exceedances nor the estimated emission reductions in the air quality plans. Thus, the lack of reported information on emission hampers the capabilities of comparative assessments on the effectiveness of air quality plans across Europe. In addition, there is a lack of comparability of the required emission data across the different dataflows (H, I, J, K), hampering the usefulness of the emission reporting for air quality planning purposes.

Our recommendation is to include emission information (not emission data) as part of the metadata information necessary when reporting modelling results for assessment purposes under the AAQDs. In the case of air quality planning applications, reporting emission information as part of the air quality plans metadata is also recommended, and in addition, we recommend considering requiring that sector and total emission data is reported, both for the baseline and for the projection year. The reporting of sector emission data should follow the same gridded nomenclature for reporting (GNFR) as adopted under the Directive (EU) 2016/2284 (NEC directive). This emission data could be reported under the air quality planning data flow and would provide a basis for understanding the source-apportionment data, and also would help characterizing the baseline situation and the scenario results. Reporting quantitative emission values would also allow a comparative assessment across Member states. Further links with FAIRMODE to evaluate and identify the best metadata parameters to report is recommended.

1 Introduction

As part of the process under the European Green Deal (COM(2019) 640 final), the European Commission is currently revising its Ambient Air Quality Directives (AAQDs). The revision process was initiated in 2021 to further enhance the EU air quality legislation to avoid, prevent or reduce the harmful effects of air pollution on human health and the environment, in the framework of the Commission's zero pollution ambition for a toxic-free environment⁽¹⁾. An identified goal of this revision process is to align the EU air quality standards more closely with the Air Quality Guidelines of the World Health Organization (WHO) that were published on 22 September 2021⁽²⁾. Another identified goal for this revision, is to draw on the lessons learnt from the 2019 evaluation ('Fitness Check') of the Ambient Air Quality Directives, and to strengthen provisions on monitoring, modelling, and air quality plans in order to help local authorities achieve cleaner air.

The revision process that is currently taken place is guided by underpinning work by different expert groups and stakeholders under the Commission's *Inception Impact Assessment* to evaluate the impacts of a possible revision of the Ambient Air Quality Directives. While some expert networks, such as the Ambient Air Quality Expert Group and the technical experts working with implementing provisions for reporting (IPR), have been consulted regularly in the revision process, others have provided specific recommendations. Two examples of such European-wide expert networks that have provided separate sets of recommendations are the Network of Air Quality Reference Laboratories (AQUILA) and the Forum for Air quality Modeling (FAIRMODE).

This report aims to support the on-going revision of the Ambient Air Quality Directives by providing a series of recommendations relevant to the strengthening of air quality monitoring, modelling, and air quality plans. The recommendations focus specifically on the reciprocal exchange of information and reporting of ambient air quality for a possible review of the Commission Implementing Decision (2011/850/EU, IPR Decision)⁽³⁾. It builds on the experience and lessons-learnt from the EEA and technical experts at its European Topic Centre for Human Health and the Environment (ETC HE) working with implementing provisions for reporting (IPR) and focusing on the recommendations from FAIRMODE on the enhanced use of models for air quality management applications, identifies areas for further efficiency gains in e-reporting.

1.1 Context

The Ambient Air Quality Directives (2008/50/EC and 2004/107/EC, as amended by Commission Directive (EU) 2015/1480) (AAQDs) set common methods and criteria to assess air quality in all Member States in a comparable and reliable manner. Member States have to designate zones and agglomerations throughout their territory; to classify them according to prescribed assessment thresholds; to provide air quality assessments underpinned by measurement, modelling and/or objective estimation, or a combination of these. The Directives define standards for ambient air quality for key air pollutants to be attained throughout Member States against certain timelines. In case these standards are not met for a given pollutant, the Directives require Member States to prepare and implement air quality plans and measures. The AAQDs leave the choice of means to achieve these standards to the Member States but do explicitly require that exceedance periods are kept as short as possible. Member States are required to regularly report 'up to date' air quality measurements, the annual results of air quality assessment, as well as information on the plans and programmes they establish in a harmonized manner – both to the Commission as well as to stakeholders and the general public. The information needs to be updated as appropriate to the averaging periods. The relation to the different limit and target values needs to be clear.

⁽¹⁾ https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12677-Air-quality-revision-of-EU-rules_en

⁽²⁾ <https://www.who.int/europe/news/item/22-09-2021-statement-launch-of-the-who-global-air-quality-guidelines>

⁽³⁾ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32011D0850>

When information or alert thresholds are exceeded, Member States need to inform the public about the exceedance and the actions that are eventually taken.

The air quality reporting obligations are prescribed in detail in the Directives and related Implementing Decisions. The rules for the reciprocal exchange of information and reporting of Ambient Air Quality Directives are laid down under the Commission Implementing Decision of 12 December 2011 (2011/850/EU), generally known as Implementing Provisions for Reporting (IPR) Decision that are the basis for *e-reporting*. Guidance for *e-reporting* is provided in the document of 15 March 2018 that contains a Common Understanding to facilitate the implementation of the IPR Decision (IPR Guidance) and was prepared by the Member States and European Commission, with the extensive support by the European Environment Agency (EEA). The EEA, supported by its European Topic Center for Human Health and the Environment, oversees the collection of air quality data according to the provisions in the AAQ Directives and the IPR Decisions (e-Reporting) and manages the technological infrastructure involved in the data exchange and processing. The common data repository CDR is where the official reporting of air quality data takes place and where quality checks are performed. More details about the mechanism of reporting can be found at the Ambient Air Quality Portal managed by the EEA.⁽⁴⁾

The Commission's Fitness Check of the Ambient Air Quality Directives 2004/107/EC and 2008/50/EC was published in November 2019 (SWD(2019) 427 final). The Fitness Check concluded that the AAQ Directives have been partially effective in improving air quality, but also acknowledged that they have not been fully effective, and not all their objectives have been met to date. It further concluded that there is scope to better support local authorities in achieving cleaner air through strengthening air quality monitoring, modelling, and plans. It recognized that the Ambient Air Quality Directives have guided the establishment of a robust system for air quality assessment and have framed competent authorities' action to achieve cleaner air via air quality plans. However, according to the Fitness Check, the criteria on monitoring could be further clarified to reduce ambiguity and increase the comparability of air quality data. Also, air quality models have improved but they are not yet used to their full potential due to the lack of common modelling standards. In addition, air quality plans have not always lived up to the requirement to ensure compliance with the EU air quality standards.

The seven lessons learnt from the Fitness Check were:

- (1) Air quality remains a major health and environmental concern;
- (2) Air quality standards are instrumental, and partially effective, in reducing pollution;
- (3) Current EU standards are less ambitious than scientific advice from WHO;
- (4) Limit values have been more effective than other types of air quality standards;
- (5) Legal enforcement action by European Commission, and civil society, is an effective tool;
- (6) There is scope to further harmonize monitoring, modelling information, and air quality plans;
- (7) Not all reported data is equally useful, e-reporting allows for further efficiency gains.

Points (6) and (7) are specifically relevant for the work of the EEA as main responsible for e-reporting and are therefore the focus of this report.

This report reflects the experience and lessons-learnt from experts involved in e-reporting working with implementing provisions for reporting (IPR) under the Ambient Air Quality Directives at EEA and its European Topic Center for Human Health and the Environment. It focuses on air quality management practices using modelling results, namely for assessment and air quality planning practices. For these two aspects, it takes into consideration the advice compiled by the expert Forum for Air quality Modeling (FAIRMODE) in the 2022 document entitled "*Recommendations for the revision of the ambient air quality directives (AAQDs) regarding modelling applications*", hereafter denominated "the FAIRMODE Recommendations" and, to a lesser extent, the analysis and guidance needs specified in the *Inception*

⁽⁴⁾ <https://aqportal.discomap.eea.europa.eu/>

Impact Assessment work carried by consultants to the Commission in the documents entitled “*Strengthening of air quality monitoring, modelling and plans under the Ambient Air Quality Directives - Final report under Service Request 9 under Framework Contract ENV.C.3/FRA/2017/0012*”, hereafter denominated “the Commission SR9 report” (Menadue et al., 2022).

1.2 Structure and purpose of the report

This EIONET report is produced to support the on-going revision of the Ambient Air Quality Directives. It aims to provide an evaluation of the scope for further strengthening of the modelling and air quality plans information compiled under the AAQDs, by evaluating the efficiency and usefulness of the current e-reporting practices. The goal is to provide a series of recommendations to support the revision of reciprocal exchange of information and reporting of ambient air quality under the Commission Implementing Decision (2011/850/EU). The report builds on the experience and lessons learnt from the EEA and technical experts working with implementing provisions for reporting (IPR) to identify main principles to ensure meaningful e-reporting routines. It explores the consequences of the currently compiled recommendations from the FAIRMODE network (and, to some extent the guidance needs derived from the *Inception Impact Assessment* work) and identifies areas for further efficiency gains in e-reporting.

While it is recognized that any review of the legal provisions for e-reporting will be inherently linked to the actual revision of the AAQDs, this report intends to guide the possible revision of the IPR Decision by a) identifying general principles useful for the review and by b) providing an evaluation of the implications that the current main recommendations for strengthening the use of modelling in assessment and air quality planning may have on e-reporting practices. The main recommendations evaluated here in terms of their implications for e-reporting are:

Assessment

- 1) Revisions concerning reporting of representative area**
- 2) Revisions concerning reporting of exceedance indicators**
- 3) Revisions concerning reporting modelling results with model quality objectives (MQO)**

Planning

- 4) Revisions concerning reporting of air quality plans, including use of models for source-apportionment applications**

Both assessment and planning

- 5) Revisions concerning documenting emissions**

In all chapters concerned with these recommended revision topics, we follow a similar structure if possible. We introduce first the current reporting provisions; second, we summarize the experience on the use of e-reporting information and data gathered at EEA and its ETC HE; third, we contrast such experience and provide recommendations for the revision of e-reporting provisions in relation to the topic in consideration.

After this introduction chapter, the report presents first the series of identified principles recommended for enhancing the usefulness of e-reporting in future revisions of the IPR Decision and Guidance documents. It presents these principles based on current lessons-learned by experts at EEA and the ETC HE and explains why they are necessary and how they differ from current practices. The next two chapters focus on recommendations concerning the strengthening of air quality assessment practices, when the use of modelling results can complement current monitoring practices including an enhanced use of indicative measurements. Chapter 5 analyzes the implications for e-reporting related to an extended use of modelling results for air quality applications. Chapter 6 proposes a simplification of the reporting of air quality plans to strengthen common methodologies and ensure comparability across Europe. Chapter 7 is dedicated to the recommendation of documenting emission information as basis for modelling and planning applications and analyses the implications of such recommendation for e-reporting under the

AAQDs. The final chapter of the report, Chapter 8, presents the main conclusions and summarizes the recommendations.

2 Main principles for enhancing the usefulness of e-reporting

We have identified a series of principles and basic rules to guide a subsequent revision of the IPR Decision and the IPR Guidance document in the context of the revision of the AAQDs. These principles are to apply to all data, information and parameters that are to be reported under e-reporting

- Data/parameters need to be **transparent**
- Data and information need to be **comparable** for different periods and from one place to another
- Data and information need to be provided in such a form that is it easy to be assessed in terms of **completeness**

These three principles have already been widely used as basis for e-reporting. They are already included in the IPR Decision and have guided its implementation in the last decade. Data and information reported under the IPR Decision needs to be transparent, comparable, and complete. Transparency is a key principle to ensure both comparability and completeness evaluation of the reported data and a requirement to support accuracy assessments. However, these requirements are not sufficient to determine the accuracy and validity of the reported data. To ensure a meaningful evaluation of the reported data across Europe, data could, in addition, be quantifiable. It also needs to be complemented with relevant information to qualify the reported data, also when the information is not quantifiable. Such relevant information could preferably be delivered as a checklist of identified metadata (what we refer to as a “checklist approach”) instead of wordy reports, lengthy documents, or links to a pile of documentation in webpages. The checklist approach has also the advantage of allowing better comparability of data and methods reported and has a valuable competence-building dimension because it helps listing and categorization of the information to be compiled by identifying the necessary methodological steps. When reports are used to complement the quantifiable data, the information could be made available in accessible common repositories. At present, additional reports and information come from very different repositories and are not always easy to find. While it is recognized that the current e-reporting system aims to comply with these three additional principles, it falls short in many cases. Thus, in our experience with evaluation of e-reporting data, a better assessment of the accuracy, completeness and comparability of the e-reported data could be enabled by adopting completely the following three additional principles:

- Data and parameters need to be **quantifiable**
- Documentation on the reported data (metadata information) needs to be reported, preferably following a **checklist approach**
- Linked metadata documentation and reports need to be provided in established **common repositories**

The usability of the e-reported data is linked to the six principles mentioned above. However, the usefulness of the data is not necessarily linked to its usability, it is primarily linked to its purpose. Based on the experience from EEA and its ETC HE on the evaluation and assessment of the reported information for European overview analysis and the development of viewers for the e-reported data, two additional basic principles have been identified.

The first one is that information needs to enable an assessment of progress in the implementation of the AAQDs and be provided in a form that allows its use for such type of “progress to target” assessment activities. In our experience, a significant number of parameters and information requested by e-reporting are not currently used for further assessments nor are they used for compliance checking. Therefore, it is recommended to revise the information required at present by the IPR in order to prioritize reporting of

what is actually useful information. In many cases, there is a need to simplify the requirements and avoid unnecessary reporting burden for the Member States. A prioritization of the requirements for reporting information based on the capability of the data to be used in air quality management, compliance and assessment applications could have the additional advantage of reducing the administrative reporting burden in Member States.

The second one is related to the fact that there is a number of data, parameters and information that are required as either “voluntary”, “conditional,” or “mandatory only if available” in e-reporting. Such information is not always useful for individual or European-wide assessments and the requirement can be confusing sometimes. Therefore, our second additional recommendation is to adopt a prioritization approach to e-reporting data and parameters and require as mandatory only the information that is considered to be useful to trace progress in the implementation of the AAQDS.

Thus, the final two main principles for enhancing the usefulness of e-reporting are:

- Information needs to be **usable and useful** to trace the progress within the implementation of the AAQDs.
- The **mandatory, conditional, or voluntary** status of the required data and information needs to be clearly specified, avoiding statements such as “when available” that give rise to confusion.

We have followed these eight (8) principles in all of the following chapters of this report to guide our evaluation and to provide our recommendations for a possible update of the Implementing Provisions for Reporting (IPR) in relation with the revision of the AAQDs.

Table 2.1 below identifies the dataflows included in the IPR Decision and constitute the core of e-reporting. This report does not aim to do systematic review of the reporting under all these dataflows but focuses instead on the parts under dataflows D, G, H, I, J, K that are directly linked to the on-going revision of the AAQDs.

Table 2.1: Overview of the dataflows included in IPR – Decision 2011/850/EU that constitute the core of e-reporting

Dataflow short name	Dataflow name/information content	Reference in IPR – Decision 2011/850/EU following Annex II	Identifier in EEA Reporting Obligation Database (ROD)
A	Common data types	Article 5	
B	Information on zones and agglomerations	Article 6	ROD 670
pB	Preliminary (for year + 1) information on zones and agglomerations		ROD 693
C	Information on the assessment regime	Article 7	ROD 671
pC	Preliminary (for year + 1) information on the assessment regime		ROD 694
D	Information on the assessment methods	Articles 8 and 9	ROD 672
D1b	Information on the assessment methods		ROD 742
E	Information on primary validated data and primary up-to-date assessment data	Article 10	
E1a	Primary validated assessment data – measurements		ROD 673
E1b	Primary validated assessment data – modelled		ROD 674
E2a	Primary up-to-date (UTD) assessment data – measurements – collected via a dedicated API or provided via ftp		ROD 675
F	Information on generated aggregated data and statistics	Article 11	Not applicable, directly calculated by EEA
G	Information on the attainment of (air quality) environmental objectives	Article 12	ROD 679
H	Information on air quality plans	Article 13	ROD 680
I	Information on source apportionment	Article 13	ROD 681
J	Information on the scenario for the attainment year	Article 13	ROD 682
K	Information on measures	Articles 13 and 14	ROD 683

3 Revisions concerning reporting of representative area

The on-going review of the AAQDS aims to further strengthening of the monitoring, modelling, and air quality plans information. New possibilities for an improved description of the spatial and temporal status of air quality are enabled, given the enhanced availability of high-quality modelling information and data from additional monitoring instruments (sensor, satellite). The maturity of these modelling and measured data opens for a considerable amount of new information susceptible to being incorporated in the e-reporting system and improving the current understanding of the air pollution situation in Europe.

This report does not intend to speculate on what new data and information could be included in e-reporting in connection with the on-going revision of the AAQDS, but rather open for a discussion on what could be possible consequences for e-reporting under assessment methods (dataflow D) derived from the availability of new methods to determine the spatial and temporal distribution of air pollution in Europe. The availability of mature new methods beyond fixed measurements to assess the spatial and temporal distribution of air pollutants can support the evaluation of the representative area of fixed measurements. This representative area of fixed measurements has implications for network design and is to be reported under dataflow D. In addition, the determination of the area in exceedance of limit and target values per assessment zone has significant compliance implications related to the determination of the exceedance situation indicators to be reported under dataflow G (see next chapter).

3.1 Current reporting obligations on representative area (dataflow D)

The current obligations to report representative area are specified under dataflow D Information on the assessment methods for fixed measurements under items:

- **(16) Spatial Extent of representative area (data type 'Spatial Extent') (where available)**
- **(17) Evaluation of representativeness (where available)**
- **(18) Documentation of representativeness (web link) (where available)**

This information may or not be spatially aggregated, but it directly affects the exceedance situation to be reported in item (5) of dataflow G on the attainment of environment objectives. It should be noted, however, that the requirement for information on the representative area is only mandatory “where available”. This formulation (“where available”) hampers in practice the reporting of this type of information.

3.2 Experience on use of reported information on representative area

An evaluation of the data reported by Member States under dataflow D to support the characterization of stations spatial representativeness was conducted by Tarrasón et al., (2017). The evaluation showed that there were significant gaps in the reporting of spatial representativeness by Member States. This was assumed to be related to a lack of guidance on the methodologies to be used to calculate station representativeness.

3.3 Recommendations for the revision of e-reporting representative area (dataflow D)

The first guidance to assess the spatial representativeness (SR) of air quality sampling points was presented in Hooyberghs et al. (2017). The guidance introduced a tiered approach to the calculation of the spatial representativeness (SR) of air quality sampling points. Four different tiers were defined, referring to the different types of information used as basis for the methodology applied: Tier 1 - geospatial information, Tier 2 – use of indicative measurements and statistical methods, Tier 3 -modelling information, and Tier 4 - a combination of both modelling and measurement results. This guidance was further developed and evaluated within FAIRMODE and forms the basis for the current methodology to calculate the representative area of fixed measurements included in the “FAIRMODE recommendations.” (Thunis et al. 2022).

The introduction of the tiered approach to identify methodologies used in assessment of air quality such as in the case of spatial representativeness has clear implications for e-reporting. It can be expected that given the enhanced maturity and availability of modelling results, tiered approaches may also be adopted to document the calculation of both exceedance area and people exposed to the exceedance (see chapter 4). The implication for e-reporting is the need to open for this type of tiered approaches. Our recommendation is to adopt the checklist approach to report methodology used. In the checklist, a multiple choice can be introduced that informs on the tiered level used (Tier 1 to 4) to calculate the representative area. FAIRMODE recommends an enhanced use of models to facilitate the assessment of station representativeness. Not surprisingly, this means that FAIRMODE recommends the use of Tier 3 and/or Tier 4 approaches. The methodology proposed by FAIRMODE is based on modelled annual averaged concentrations varying within a specific margin of tolerance. The spatial representativeness area is pollutant-specific and defined according to a discontinuous approach within the boundaries of the air quality zone. The full description of the proposed methodology is given in the FAIRMODE draft working document (CT8) Guidance Document on Exceedance indicators and Spatial Representativeness (in prep). The adoption of a discontinuous approach imposes some challenges reporting the spatial extent of the representative area. Further guidance from FAIRMODE is needed to identify ways to report discontinuous data.

Our recommendations for the revision of e-reporting of representative area in dataflow D are listed below and summarized in Table 3.1.

- **Prioritize and drop the “where available” formulation to make reporting this information mandatory due to its relevance for attainment of environmental objectives**
- **Adopt the checklist approach to report methodology, using a multiple choice to inform on the tiered level used (Tier 1 to 4) and a yes/no question on whether or not the methodology follows FAIRMODE recommendation guidance on station representativeness.**
- **Establish a common repository for additional documentation on the methodology used**
- **The spatial extent of the representative area may be reported as a polygon or a series of polygons. Further guidance and interaction with FAIRMODE is needed to identify ways to report these discontinuous data**

Table 3.1: Summary recommendations to guide a possible revision of the e-reporting requirements on station representativeness (dataflow D)

Current reporting requirements on station representativeness IPR Decision 2011/850/EU Annex II, dataflow D	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Station representativeness	Comments on e-reporting Station representativeness
<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(16) Spatial Extent of representative area (data type ‘Spatial Extent’) (where available)</p> <p>(17) Evaluation of representativeness (where available)</p> <p>(18) Documentation of representativeness (web link) (where available)</p>	<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(16) Spatial Extent of representative area (data type ‘Spatial Extent’)</p> <p>(17) Evaluation of representativeness (select from checklist the Tiered approach used evaluate spatial representativeness)</p> <p>(18) Use of FAIRMODE guidance approach for the selected Tier (Y/N) and weblink to documentation in common repository</p>	<p>Prioritize and drop the “where available” formulation to make reporting this information mandatory due to its relevance for attainment of environmental objectives</p> <p>The spatial extent could be tentatively reported as a polygon. Further guidance from FAIRMODE is needed to identify ways to report discontinuous data.</p> <p>Adopt the checklist approach to report the used methodology and establish a common repository for documentation</p>

4 Revisions concerning reporting of exceedance indicators using modelling results

Reporting exceedances has been essential to the implementation of the AAQDs, and the methodology used has primarily been based on measurement data. In this chapter, we investigate whether the new availability of modelling and indicative measurement results can affect the reporting procedures under dataflow G.

4.1 Current reporting obligations on exceedance indicators (dataflow G)

The current obligations to report exceedance situations are specified under dataflow G Information on the attainment of environmental objectives (Article 12) and involves 13 different items.

- (1) Provider (data type 'Contact Details')
- (2) Reporting year
- (3) Change documentation (data type 'Documentation of Change')
- (4) Information on zone (link to B)
- (5) Exceedance situation (data type 'Exceedance Situation')
- (6) Pollutant
- (7) Assessment information (link to D)
- (8) Exceedance of the environmental objective
- (9) Exceedance of the environmental objective plus margin of tolerance
- (10) Exceedance considering natural sources
- (11) Exceedance considering winter sanding or salting
- (12) Exceedance situation after consideration of natural contributions and winter sanding or salting (data type 'Exceedance Situation').
- (13) Total numbers of exceedances (according to 8 to 11)

Furthermore, under point (5) Exceedance situation, specific exceedance indicators have to be reported:

1. Exceedance Situation ID
2. Exceeded environmental objective
3. Area of the exceedance situation (data type 'Spatial Extent')
4. Classification of the area
5. Administrative units
6. Estimate of the surface area where the level was above the environmental objective
7. Estimate of the length of road where the level was above the environmental objective
8. Monitoring stations in exceedance area (link to D)
9. Modelled exceedance (link to D)
10. Estimate of the total resident population in the exceedance area
11. Estimate of the ecosystem/vegetation area exposed above the environmental objective
12. Reference year

This information is the basis of compliance assessments under the AAQDs and has been thoroughly evaluated in the context of compliance checking, which is beyond the purpose of this report. Note also that in the current reporting there is no explicit indication of which Sampling Point or Model is actually responsible for the exceedance values reported.

4.2 Recommendations for reporting exceedance situations using modelling data

If the on-going revision of the AAQDs allows for an enhanced use of modelling results, these could no doubt be used to determine exceedance indicators. In such case, the current fields requested under e-

reporting would need to be extended to allow meaningful reporting specifically under point (5) above. It is not straightforward how exceedance indicators are to be determined with modelling results over a given area. FAIRMODE recommends an enhanced use of models to facilitate the assessment of exceedance situations and indicators in order to link better to exposure indicators and health impact assessment. The forum is currently developing new guidance to support the use of models for exceedance calculations. However, the guidance is not yet mature and needs further testing within FAIRMODE. The current proposal is to distinguish two (2) stages for the modelling estimation and reporting of the exceedance situations and indicators.

The proposed first stage implies reporting an Exceedance Flagging Indicator that can be easily assessed within specific ranges and that aims to express the severity of the exceedance in the air quality zone. This information could be reported under data flow G on the attainment of environmental objectives. How this information would be reported under e-reporting is not currently clear, but it would require an extension of the current reporting in dataflow G to allow for reporting both methodologies (metadata) and actual data ranges, preferably following a checklist approach.

The proposed second stage implies reporting an Exceedance Situation Indicator, following some of the fields in current data type 'Exceedance Situation'. The quantification of these exceedance situation indicators would require a more comprehensive assessment approach than the ranges in stage 1 and could be used as the starting point of the air quality planning process. An initial description of the proposed methodology is given in the Guidance Document on *Exceedance indicators and Spatial Representativeness*⁽⁵⁾. Again, it is not currently clear how this information would be provided under e-reporting, but it would require an extension of the current reporting in dataflow G to allow linking also to air quality plans reporting.

Exceedance situation reporting includes also reporting exceedances as a result of natural sources and winter sanding and salting (items 10, 11 and 12 in data flow G). A related FAIRMODE recommendation is to enhance the use of modelling in source-apportionment applications. This applies specially with respect to identification of natural sources, winter salting and sanding and long-range transport transboundary contributions. It requires that the AAQDs open for the use of models to support source-apportionment (as in the current Article 20, Article 21, and Article 25 of Directive 2008/50/EC). It also requires a revision of the text of the IPR Decision, (article 8 and Part I of Annex II) to enhance the use of models for source-apportionment applications. Guidance documents currently in use for the reporting of the contribution of natural and winter sanding and salting (SEC(2011) 207 and 208) do not reflect the maturity of modelling for use in source-apportionment. These documents need now to be revised to allow for optimal use of state of art measuring methodologies and modelling techniques.

Further discussion in cooperation with FAIRMODE is necessary in order to identify how modelling results can contribute to reporting of exceedance situation indicators and what are the necessary revisions to facilitate e-reporting of exceedance situation using modelling results.

⁽⁵⁾ <https://fairmode.jrc.ec.europa.eu/activity/ct8>

5 Reporting modelling results with MQO in dataflow D

It is expected that the current revision of the AAQDs will enhance the role of modelling under the AAQDs given the increased robustness of air quality modelling applications across Europe and the identified need from the Fitness check to strengthen provisions on monitoring, modelling, and air quality planning. This would follow to some extent FAIRMODE recommendations, that propose to make modelling mandatory for air quality planning, exposure calculations and short-term forecast. The FAIRMODE recommendations also state that “modelling should be strongly encouraged for monitoring network design, exceedance indicator estimates and near-real-time mapping, source-apportionment and estimates of long-range transport and to define zones and agglomerations.”

An enhanced use of modelling also requires a clear definition of the quality of modelling application results and a harmonized methodology to determine the quality of these modelling results. FAIRMODE recommends the use of FAIRMODEs Model Quality Indicators (MQI) and the application of a QA/QC protocol as basis for a Model Quality Objective (MQO) to provide a transparent and comparable quality assurance framework, like the one already defined for measurements. Although currently special support is provided by the e-Reporting data flows to accommodate the use of the FAIRMODE MQI, the definition used needs to be updated to allow also for percentiles and other statistics in addition to annual averages. FAIRMODE is currently working on a series of different model performance indicators (MPI) that would be able to evaluate both the temporal and spatial performance of the model. Our proposal here is to revise the definition of MQI and MQO in Annex I of the AAQD to align with FAIRMODEs MQI/MPI definitions and to revise the IPR guidance document for reporting Modelling Quality Indicators to correctly link and refer to FAIRMODE MQI/MQO and model QA/QC guidance documents.

Reporting modelling information under the IPR decision has taken place under dataflow D1b, while the actual modelling data and its quality MQI is reported under dataflow E1b. The current demands on data and metadata under dataflows D1b and E1b are very generic. A higher degree of consistency in the requirements for reporting modelling data including requirements on the preferred formats of the data and map projections of the reported gridded information would be necessary.

In addition, a process to identify what type of information and detailed metadata would have to be provided when modelling is used for air quality assessment and planning purposes needs to be coordinated by EEA and FAIRMODE: A possible simplification of the requirements is provided in Table 5.1.

Table 5.1: Possible revision of the e-reporting requirements on metadata documentation for modelling applications

Type of metadata information	Metadata information	Checklist contents
Basic information	Model name	
	Version	
	Contact information	
	Model type	Eulerian, Gaussian, Lagrangian, Statistical, Other
	Model documentation	Publication link
Coverage & Resolution	Model domain/ spatial coverage	Geographical extent
	Year	
	Temporal resolution	
	Spatial resolution	
Input data	Emissions	Specific set of requirements -see Chapter 7 of this report
	Meteorology	Model name and year
	Initial & boundary conditions	None, observations, nested model, EMEP, CAMS
	Data assimilation / fusion	Requested by FAIRMODE, currently not required
Data Quality – MQI and MPI	Actual values MQI for model domain	MQI alternative MPI in time
	Observations - measurements	Basis for MQI calculations / ASCII or CSV
	MQI methodology used	FAIRMODE, Other

In many countries, the same air quality modelling system is used for all types of air quality management applications. When this is the case, the metadata in Table 5.1 could be considered static documentation of the modelling system. However, it can be that different models are used in a single country or that different modelling systems are used for different applications. It is also possible that the modelling system information changes in time. In such situations, it is possibly more appropriate for the information on the modelling system not to be considered as static metadata but rather as metadata associated to each different application of the modelling system, either for the reporting of assessment and/or planning results. Such considerations need to be further elaborated in cooperation with FAIRMODE. Therefore, our main recommendation is to put in place a cross-cutting activity coordinated by EEA and FAIRMODE that identifies necessary changes in e-reporting to accommodate for an enhanced role of modelling to support air quality assessment and planning purposes and the need to report the quality of modelling applications.

6 Reporting air quality plans

6.1 Current reporting obligations for air quality plans (dataflows H- K)

The legal obligation to report air quality plans originates from the AAQD (Directive 2008/50/EC) in relation to Article 23 on the elaboration of air quality plans. If there are exceedances of limit and target values (reported in dataflow G) in an air quality zone, the AAQD directive requires that air quality plans are put in place in the zone. In order to elaborate adequate air pollution plans to reduce air pollution, the origin of pollution sources needs to be understood. The next step is to identify concrete control measures to address pollution sources affecting air quality levels in exceedance and then proceed with the elaboration of emission control scenarios. The rationale for reporting air quality plans laid down in the IPR Decision follows somehow the natural steps in the elaboration of air quality plans, beginning with dataflow H with information on the actual air quality plans, followed by dataflow I on source-apportionment, data flow J on the baseline scenario and the scenario for the attainment year and dataflow K on measures. Nevertheless, the current links established among the different dataflows makes difficult a clear analysis and monitoring of such steps. Article 13 of the IPR Decision (2011/850/EU) states that Member States shall make available the information set of in Parts H, I, J, and K of Annex II where the information to be reported on air quality plans is specified. It involves a total of 75 items (14 in dataflow H, 24 in dataflow I, 17 in dataflow J and 20 in dataflow K). The current list of 75 requested items is provided in the first column of the summary Table 6.3 at the end of this chapter.

Reporting of source-apportionment (dataflow I) is considered an intrinsic part of the reporting of air quality plans. Annex XV of the AAQD 2008/50/EC specifies the information to be included in the air quality plans and specifies the need to provide information on the origin of pollution (Annex XV, A. 5.) but without explicitly mentioning source-apportionment results. Source-apportionment is explicitly identified as relevant information to be reported in Article 13 of the IPR Decision (2011/850/EU) where the information to be reported on air quality plans is specified. Part I of Annex II is “information on source-apportionment.” The 24 items listed in part I includes a description of the main sources contributing to local, urban background and regional background air pollution.

6.2 Experience on use of reported information air quality plans (dataflows H-K)

The Fitness Check identified a series of shortcomings in relation to air quality plans that have long been recognized by EEA and ETC as well as national experts working with e-reporting under the IPR Decision. While the original rationale to organize information in separate blocks was useful to ensure a minimum set of information requirements and consistency in the reported data, the actual implementation of the reporting has proven demanding. It is currently not clear neither from the IPR Decision nor from the current IPR Guidance document how the different dataflows of the air quality plans hold together and what is their purpose and use. The interlinkages between these dataflows are complex and difficult to follow.

Dataflow I is at the centre of the reporting of air quality plans. The current viewer of reported information under dataflow I, available at the EEA web page⁽⁶⁾ provides a good overview of the completeness of reporting of source-apportionment information and allows an evaluation of the usefulness of these reported data. An example of the information in the EEA viewer is provided in Table 6.1 below.

(⁶) <https://aqportal.discomap.eea.europa.eu/index.php/users-corner/>

Table 6.1: Example of information available at the EEA viewer on Air Quality Source-apportionment (data flow I) reported within AQ e-Reporting

First Exceedance Date	Country Comment	Exceedance Reason	Regional Background Total	Urban Background Total	Local Increment Total	Regional Background Natural	Urban Background Natural	Local Increment Natural	Regional Background Inside Country	Regional Background Transboundary	Urban Background Transboundary	Local Increment Transboundary	Regional Background Other	Urban Background Other
2002	Angaben in A.2.5.4 und A.2.6.1 beziehen sich auf den durch die Probenahmestelle (s. A.2.5.6 (a)) repräsentierten Straßenabschnitt	Heavily trafficked urban centre	10	6	27								10	6
2006	Die Angabe vom 0,2 km geht von 200 m Strassenlänge pro Messstation aus.	Heavily trafficked urban centre	6	15	21								6	15
2019	Understanding on contributing sources comes from - CERC Study for Urban Environmental Indicators: Nitrogen dioxide levels in Dublin Report 2019. Environmental Protection Agency. For items unknown - the data provided by CERC is the totality of what is currently available but the competent authority and local authorities are committed to further work on this	Heavily trafficked urban centre												

Local Increment Shipping	Urban Background Traffic	Local Increment Traffic	AQ Attainment Id	B-G Namespace	Attainment Reporting Year	AQ Zone Id	Air Pollutant	Protection Target	Objective Type	Reporting Metric
0	0	0								
0	0	0								

The EEA viewer shows considerable gaps in the reporting of information on source-apportionment by Member States. This may be caused by a lack of resources or by a lack of competence or by a combination of both. In some cases, as in the case of France (A. Gressent, INERIS, pers.com.) lack of reporting is a choice made to avoid reporting information that is deemed to be either misleading or inappropriate, such as information on the incremental approach. The information required involves knowledge of a large number of sources and in different areas, which requires both competence and good administrative organization to be compiled. Responses to the questionnaire conducted in 2021 and reported under the “Commission SR9 report” showed that most Member States consider that reporting under dataflow I (and generally in the H-K dataflows) involves considerable administrative burden (Menadue et al., 2022). The responses indicated that administrative organizational issues may play a significant role in limiting the availability of the data in dataflow I. Still, the complexity and sometimes inappropriateness of the required information is also expected to play a role, given that the requirements involve information from three different areas (Regional background, Urban background increment, Local increment), and include understanding of total contributions to air pollution as well as contributions from eight different sectors (Traffic, Industry (including heat and power production), Agriculture, Commercial and residential, Shipping, Off-road mobile machinery, Natural and Transboundary). While the 24 fields requirement on source-apportionment in

Annex II, Part I of the IPR Decision may be demanding for Member States, an additional issue that is important to point out is whether the required fields are actually useful.

The requirements for e-reporting on dataflow I, as they are currently formulated in the IPR Decision, refer to the “increment” approach to source-apportionment, a method to determine the contribution from different sources that has long been discussed in the expert community and found not appropriate for use in air quality management applications (Thunis et al, 2019). This provides reasonable base to question the usefulness of the current requirements. The methodology chosen to calculate source-apportionment can give rise to significant differences in the results with implications for policy applications. The understanding on the different methodologies used to determine source-apportionment has improved in the last ten years following the implementation of the AAQD and the IPR Decision. Much of the work mapping current best practices on source-apportionment has taken place under FAIRMODE where the evaluation work has shown that the methodologies used to determine source-apportionment affect the results and not all methodologies are equally valid or useful for the different applications. According to Thunis et al. (2019), the increment method referred to in the IPR Decision is not currently recommended for air quality management applications because it can provide wrong results on the contribution of specific sources to air quality. Other methods, such as the “potential impact sensitivity” method (and even the “tagging” method for linear components), are considered better approaches to determine the contribution of different sources to air quality values and related indicators. A good example of the inconsistencies in the results is presented in Thunis et al. (2021) where the impact of sources in a city area on PM_{2.5} pollution over the city itself is calculated with the different methods with serious implications for the effectiveness of measures to control air pollution in the city area. That paper also proposes a unified nomenclature to harmonize the description of source-apportionment approaches. The proposed unified nomenclature has the advantage that it provides clarity on what needs to be specified in order to understand the key elements of source-apportionment (SA), namely, the indicator to be analyzed (pollutant concentrations, exposure values...), the receptor area where the SA is calculated (city area, region around the city, air quality zone, spatial and temporal average...), the SA method used (increment method, tagging, potential impact sensitivity or brute force) and the source evaluated (described in terms of sector, spatial and temporal average). These four aspects are key to correctly interpret the results from source-apportionment studies in support of air quality planning in a given area.

The main purpose of source-apportionment studies is to support the elaboration of plans in a (source) area to reduce exceedances and improve air quality in a given (receptor) area. Thus, the usefulness of the SA reported information is determined by whether or not it helps to identify the main sources of pollution to be addressed by control action in the (source) area. Probably as a result of the increment method approaches, the current formulation of the requirements in dataflow I involves SA information in three different spatial source areas: local, urban, and regional. Not all these source areas are equally useful for the elaboration of plans. To be useful, the SA information in dataflow I should inform the choices in the elaboration of plans in the (receptor) area with exceedances. In our view, the SA information could be compiled in that (source) area and if transboundary sources (that is, sources outside the boundaries of the chosen receptor area) are seen to be of significance in the receptor area, then a larger source region may be identified for further analysis of the transboundary contribution

It should also be noted that information on SA for regional background pollution concentrations is currently widely available for the whole of Europe. European-wide consistent datasets with information on source-apportionment at regional scale are currently available from the JRC Urban Atlas, the CAMS service and the EMEP programme. The requirement to include regional contributions in their source-apportionment report may result in unnecessary administrative burden and also an unnecessary repetition of work. Instead, guidance on how to use the above (or another) existing regional source-apportionment information from European wide services could be put in place. Guidance on how to use urban and local source-apportionment information to inform the elaboration of scenarios for air quality planning could also be put in place. This new guidance could help streamlining the requirements in current dataflow I and could lead to a simplification of the reporting requirements for source-apportionment.

As for the information compiled under other (H-K) dataflows, an analysis was recently completed by ETC colleagues (Sousa et al., 2020). Their evaluation of reported air quality plans and measures submitted from 2014 to 2020 indicated that, while the current reported information serves to map the measures currently implemented by Member States, it is not adequate to assess the likelihood of attainment or effectiveness of measures. Information on measures reported in dataflow K is generally quite complete (an example is presented in Table 6.2 below). A part that is currently missing, however, is the evaluation of their effectiveness and the expected impact of the measures on air quality levels and health impacts. This is probably because this information is currently identified in dataflow K as mandatory, where available, for the level of concentrations and for the number of exceedances, while nothing is indicated for health impacts. The formulation “mandatory where available” is a bit unfortunate, especially given the importance of the requested information to trace the implementation of the Air Quality Directives. It is also recognized that the current requirements in dataflows H to K do not recognize explicitly the role of modelling in air quality planning and that further guidance is needed for Member States to elaborate appropriate air quality plans. However, even when air quality planning modelling results are available, they do not usually refer only to one type of measure. Scenarios are made for a combination of measures and the impact assessment is better conducted for a combined scenarios/projections, so the requirement to assess the impact of individual measures may turn out to be unrealistic. An additional issue is that in order to create good scenarios, it is important to rely on source-apportionment information (dataflow I) and understanding what are the main sources of pollution in a specific (receptor) area. In this way, air quality plans can aim to address all relevant sources effectively and avoid the inclusion of some measures that may be ineffective because they address sources of little significance. The correspondence between the data reported in each of the H-K dataflows is not always easy to elucidate.

Table 6.2: Example of information available at the EEA viewer on Air Quality measures (data flow K) as reported within AQ e-Reporting

Analysis on compliance and AQ measures

This viewer shows combined information on Air Quality Attainments and AQ Measures reported within AQ e-Reporting

Share Download CSV

Country	Zone Id	Protection Target Id	Objective Type Id	Reporting Metric Id	Air Pollutant Label	Number Of Exceedance Situations	Year Of Last Reported Air Pollution Level	Last Reported Air Pollution Level	First Exceedance Year	Last Exceedance Year	Measure Id	Measure Type	Administration Level	Measure Reporting Year	Air Pollution Level At Measure Reporting Year
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_49	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_50	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_51	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_52	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_53	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_54	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_55	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_56	integrated	local	2017	26.58
Bulgaria	ZON-BG0001	H	LV	aMean	Particulate matter < 2.5 µm (aerosol)	3	2020	7.29	2014	2018	BG0001_SF_PM2.5_a_benzo(a)pyrene_a_2017_57	integrated	local	2017	26.58

Showing 121-150 of 38239

In summary, the current experience with reporting air quality plans indicates that:

- The e-reporting system for dataflows H to K is perceived as rigid and not very user friendly since the interaction between the different dataflows is not simply designed and is not well understood by users;
- The administrative burden associated with completion of the air quality data flows (H to K) in the e-reporting system is particularly high, as it is demanding to separate a single air quality plan in four different dataflows;
- There is a need for guidance on how to elaborate air quality plans and explaining how to deal with the different dataflows;
- There is a lack of quantification of the impact of measures in air quality plans and often it is not clear if measures will achieve compliance as soon as possible;
- Air quality plans do not always address all sources effectively; some measures may be ineffective, or seem disproportionate because the link with dataflow I is not always well implemented;
- Wider impacts of air quality plans are not always clear especially in relation to the expected exceedance situation and health benefits. This is probably because this information is not currently mandatory to be reported.
- The current requirements in dataflow I are demanding for Member States and there are significant gaps in the reported information;
- The formulation of e-reporting dataflow I refers to the “increment method” which has been identified as non-appropriate for air quality management applications in studies by the FAIRMODE community;
- The requirement to report source-apportionment information for different (source) areas (local, urban, and regional) creates unnecessary burden as it would be more effective to focus instead on reporting SA information to support air quality planning, that is, in the (receptor) area where the air quality plan is to be conducted;
- Regional European-wide consistent datasets with information on source-apportionment at regional scale are currently available and could be used to support reporting of this type of information by Member States.

6.3 Recommended revision to the IPR dataflows H-K on air quality plans

Based on the above-mentioned experience with the fields reported in dataflow H-K, we have formulated below a series of recommendations with the aim to identify efficiency gains in e-reporting of air quality planning and increase the quality and usefulness of the reported data.

The main recommendation is to streamline the requirements for reporting air quality plans in dataflows H to K avoiding duplication of reporting fields. The system that we propose keeps some of the positive elements of the original reporting specially with regards to the structure of the information but aims to enhance its usability to trace progress in the implementation of the Air Quality Directives. Instead of having 4 different interlinked dataflows, we propose to streamline into **a single dataflow**, keeping different blocks of information. The e-reporting approach that we propose here aims to correct the main limitations of the current e-reporting system in dataflows H to K, namely: 1) the lack of sufficient interconnection among the dataflows, 2) the lack of reference to modelling results 3) the reference to the non-appropriate “increment method” for source-apportionment and 4) the unrealistic expectation that each measure can be associated to a quantifiable reduction in emissions.

We recommend to adopt the recommendation from FAIRMODE to use modelling tools to determine the impact of measures in the air concentration levels and other associated indicators, so that the required information links directly to modelling results. The modelling results to be reported under the air quality plans need to be provided in a form that is easily quantifiable and comparable across Member States. We propose three air quality indicators to be reported in order to assess the impact of measures in air quality, aiming to characterize both yearly mean values and hotspots.

In addition, we follow FAIRMODE recommendations for the description of source-apportionment to guide the elaboration of scenarios, and we recommend reporting emission information for scenarios and projections (see chapter 7). Concerning the reporting of source-apportionment data, our main recommendation is to revise the current requirements, avoiding the reference to the increment method, simplifying the request for information, and linking it better to the actual air quality plans in the air quality zone with exceedances. While a simplification of the requirements for e-reporting of source-apportionment information will probably contribute to reduce the administrative burden by Member States, the main goal of the revision should be to secure better alignment with air quality planning. FAIRMODE suggests including a series of additional metadata fields (type of approach used, range of applicability, spatio-temporal averages applied at the receptor, spatio-temporal characteristics of the source, etc.) to characterize the source-apportionment methodology chosen by the Member State to conduct its source-apportionment. Although FAIRMODE recommends the use of modelling as basis for the selected source-apportionment methodology, their recommendation for e-reporting concerns only documenting the method used. This provides some additional flexibility in case that the Member States uses receptor modelling or other monitoring-based methodologies for source-apportionment. To ensure consistency across legal instruments, FAIRMODE also recommends that the requested information on sources and source sectors follow the GNFR emission classification promoted under the NEC directive. However, the FAIRMODE specific changes proposed to the 24 current requirements in dataflow I results in an extension of these to 33 requirements or more⁽⁷⁾. Our proposal however is to link the request for SA contributions to the actual receptor area (or eventually the whole AQ zone) where the air quality plans are to be developed, following the governance structure valid in each Member State. The SA evaluation will help identify the main contributors to air quality concentrations in a given receptor area and development of air quality control plans in the area. By adopting this approach, the required parameters could easily be reduced to 15. In the case that the transboundary contribution, that is, when the contribution from sources outside of the source (AQ zone) area is significant, the requirement could include an additional description of the source-apportionment of sources in the regional background air. In such cases, measures at national or international level may be relevant and the evaluation of the SA

(7) <https://fairmode.jrc.ec.europa.eu/activity/ct1>

contributions from the different sectors could be based on European-wide analysis of source-apportionment. There is no need for changes in the AAQDs (2008/50/EU) with respect to source-apportionment. However, both the IPR Decision (2011/850/EU) Annex II – Part I and the IPR guidance need to be significantly revised. Our concrete recommendation for the revision of the text of IPR Decision (2011/850/EU) Annex II – Part I are summarized below.

- ***Link the requirement to report source-apportionment information to the need to identify main sources to inform the development of emission scenarios in air quality planning.***
- ***Revise the formulation of SA to directly link and support air quality planning in the actual receptor area or air quality zone. This means that it is necessary to simplify the three different spatial information levels currently required to include only those necessary and relevant to the area where the plan is elaborated. In case that the transboundary contribution is significant, additional information on the regional background contribution is to be required.***
- ***Adopt a checklist approach for the reporting of SA in relation to air quality plans.***
- ***Include information on the description of the methodology used for conducting the SA, to ensure comparability across Member States reports.***
- ***Use the GNFR nomenclature for the definition of the sources that need to be included in the e-reporting in dataflow I to ensure consistency between NEC and AAQDs reporting in terms of source-apportionment by using the same source categories.***

Following the source-apportionment calculations, control measures addressing the main source sectors can be identified and a scenario can be developed as part of the specific air quality plan. The rationale for reporting the air quality plan information and the main changes with the current e-reporting requirements are summarized below and presented in full detail in Table 6.3.

We propose a single air quality plan reporting dataflow consisting of four sequential blocks:

- **Block H:** It would contain all administrative information necessary to identify the air quality plan in the air quality zone (or receptor area) and as such, would serve as basis for reference and guides the interaction with other blocks I, J and K. The main difference with current e-reporting situation is that block H would now identify and characterize the base year (baseline year) both in terms of emissions (total values and sector totals) and of three air pollution quality indicators. Modelling is proposed to be made mandatory for the evaluation of the impacts of control measures in elaboration of air quality plans (following FAIRMODE recommendation). Documentation of the modelling system used for the elaboration of air quality plans is added to the requirements and a series of three air quality indicators are proposed to be reported. The three air quality indicators that are suggested are all referring to the exceedance situation and not to health impacts or population exposure. However, population exposure and other health impact indicators can be added to the reporting requirements once better guidance on how to calculate these is available. The indicators would aim at characterizing yearly averages but also hot spot short term situations. Also note the use of GNFR and possible adding of emission metadata information (see chapter 7), following FAIRMODE recommendations to ensure consistency between NEC and AAQDs reporting in terms of source-apportionment by using the same source categories
- **Block I:** The main difference is that the suggested requirement to report source-apportionment information would be linked to the same main sources as reported in block H. This is further to secure consistency in the source sector specification of the total emissions and sector information requested source-apportionment applications (block I), baseline (block H, with the current proposal) and scenario information (block J) and information on measures (block K). The proposal also includes information on the description of the methodology used for conducting the source-apportionment analysis, to ensure comparability across Member States reports and avoid obsolete references to the increment SA approach.
- **Block J:** The main difference with current e-reporting situation is that dataflow J would identify and characterize the projection year, the year of the proposed attainment scenario. The base year

information would be provided in block H (baseline year) and not here. The requirement is to report information on the scenario for the attainment or projection year both in terms of emissions (totals and sector totals) and of the same three air pollution indicators as in block H. Measures included in the projection year scenario would be identified in block K.

- **Block K:** The main difference with the current reporting is a streamlining of information to avoid duplication of reporting. The measures would be linked to specific emission sectors and to the actual projection scenario considered and reported in block J. In addition, we would avoid requiring data that is difficult to produce – such as the impact of emissions reductions in air quality due to a single measure. Instead, we recommend reporting the evaluation of the impact of measures on the basis of the combined projection scenario (as requested in block J). This block K contains key documentation requirements on the measures considered in the air quality planning scenario reported in the single dataflow.

The detailed proposal for revision of the e-reporting of air quality plans that is presented below reduces the total number of fields and parameters to be reported to 57 (even down to 46 if the transboundary contribution in the source area of the air quality plan is not so important) instead of 75 and aims to improve the usability and usefulness of the reported information to trace progress in the implementation of the AAQDs.

(Block H) Information on air quality plans – Baseline (Article 13)

- (1) Air quality plan: code
- (2) Air quality plan: name (with reference to both baseline year and projection year)
- (3) Provider (data type 'Contact Details')
- (4) Competent authority (data type 'Contact Details')
- (5) Air quality plan: reference year of first exceedance (link to G)
- (6) Code of the relevant exceedance situation(s) (link to G, common to dataflow I, J and K)
- (7) Air quality plan: status (active, planed, implemented)
- (8) Air quality plan: pollutants covered (checklist)
- (9) Air quality plan: date of official adoption
- (10) Baseline year
- (11) Attainment year (projection scenario year)
- (12) Area over which the air quality plan applies
- (13) Model used as basis for air quality plan: name
- (14) Baseline year emission total in source area in the relevant spatial unit
- (15) Baseline Emission sector totals in relevant spatial unit per pollutant
 - a. traffic (GNFR F)
 - b. industry (GNFR A, B, D)
 - c. agriculture (GNFR K, L)
 - d. commercial and residential (GNFR C)
 - e. shipping (GNFR G)
 - f. off-road mobile machinery (GNFR I)
 - g. natural (GNFR_N)
 - h. transboundary (if needed)
- (16) Reference to Emission model (documentation, weblink repository)
- (17) Baseline year average concentration levels in receptor area with exceedances
- (18) Baseline year maximum concentration levels in receptor area with exceedances (hot spots)
- (19) Baseline year number of exceedances in receptor area with exceedances
- (20) Reference to air quality plan (web link, repository)

(Block I) Information on source-apportionment (Article 13)

- (21) SA method used (Sensitivity, tagging, other) in source area
- (22) Contribution SA - traffic (GNFR F)
- (23) Contribution SA - industry (GNFR A, B, D)
- (24) Contribution SA - agriculture (GNFR K, L)
- (25) Contribution SA - commercial and residential (GNFR C)
- (26) Contribution SA - shipping (GNFR G)
- (27) Contribution SA - off-road mobile machinery (GNFR I)
- (28) Contribution SA – natural (GNFR_N)
- (29) Contribution SA – transboundary (if needed)

Conditional requirement if transboundary contribution is large

- (30) SA method used for background (Sensitivity, tagging)
- (31) Background Contribution SA - traffic (GNFR F)
- (32) Background Contribution SA - industry (GNFR A, B, D)
- (33) Background Contribution SA - agriculture (GNFR K, L)
- (34) Background Contribution SA - commercial and residential (GNFR C)
- (35) Background Contribution SA - shipping (GNFR G)
- (36) Background Contribution SA - off-road mobile machinery (GNFR I)
- (37) Background Contribution SA - natural
- (38) Background Contribution SA - transboundary (if needed)

(Block J) Information on the scenario for the attainment year (Article 13)

- (39) Scenario year Emission total in source area in the relevant spatial unit
- (40) Scenario year Emission sector totals in relevant spatial unit
 - a. traffic (GNFR F)
 - b. industry (GNFR A, B, D)
 - c. agriculture (GNFR K, L)
 - d. commercial and residential (GNFR C)
 - e. shipping (GNFR G)
 - f. off-road mobile machinery (GNFR I)
 - g. natural (GNFR N)
 - h. transboundary (if needed)
- (41) Reference to projection documentation (weblink repository)
- (42) Scenario year projected average concentration levels at receptor(s) area with exceedances
- (43) Scenario year projected maximum concentration levels at receptor(s) (hot spots)are with exceedances
- (44) Scenario year projected number of exceedances at receptor(s) area with exceedances
- (45) Projection: included measures (Link to K)

(Block K) Information on measures (Articles 13 and 14)

- (46) Measure: code
- (47) Measure: name
- (48) Measure: description
- (49) Measure: classification (including addressed pollutants, checklist)
- (50) Measure: type (checklist)
- (51) Measure: administrative level
- (52) Measure: affected source sector (from checklist compatible with GNFR)
- (53) Measure: spatial scale

- (54) Estimated implementation costs (mandatory)
- (55) Measure: Planned implementation: start and end date
- (56) Date when the measure is planned to take full effect
- (57) Indicator for monitoring progress of measure implementation (from checklist: active, planned, fully implemented).

Table 6.3: Overview of recommended revisions for reporting air quality plans under the IPR Decision (H to K) becomes a single dataflow, with associated blocks

Current air quality planning reporting requirements IPR Decision 2011/850/EU Annex II, dataflows H to K	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Air quality planning	Comments on e-reporting Air quality planning information
<p>(H) Information on air quality plans (Article 13)</p> <p>(1) Provider (data type 'Contact Details')</p> <p>(2) Change documentation (data type 'Documentation of Change')</p> <p>(3) Air quality plan: code</p> <p>(4) Air quality plan: name</p> <p>(5) Air quality plan: reference year of first exceedance</p> <p>(6) Competent authority (data type 'Contact Details')</p> <p>(7) Air quality plan: status</p> <p>(8) Air quality plan: pollutants covered</p> <p>(9) Air quality plan: date of official adoption</p> <p>(10) Air quality plan: timetable of implementation</p> <p>(11) Reference to air quality plan (web link)</p> <p>(12) Reference to implementation (web link)</p> <p>(13) Relevant publication (data type 'Publication')</p> <p>(14) Code of the relevant exceedance situation(s) (link to G)</p>	<p>(Block H) Information on air quality plans – Baseline(Article 13)</p> <p>(1) Air quality plan: code</p> <p>(2) Air quality plan: name (with reference to both baseline year and projection year)</p> <p>(3) Provider (data type 'Contact Details')</p> <p>(4) Competent authority (data type 'Contact Details')</p> <p>(5) Air quality plan: reference year of first exceedance (link to G)</p> <p>(6) Code of the relevant exceedance situation(s) (link to G, common to all blocks I, J and K)</p> <p>(7) Air quality plan: status (active, planned, implemented)</p> <p>(8) Air quality plan: pollutants covered (checklist)</p> <p>(9) Air quality plan: date of official adoption</p> <p>(10) Baseline year</p> <p>(11) Attainment year (projection scenario year)</p> <p>(12) Area of application of the air quality plan</p> <p>(13) Model used as basis for air quality plan: name</p> <p>(14) Baseline year emission total in source area in the relevant spatial unit</p> <p>(15) Baseline emission data totals by sector in relevant spatial unit</p> <ul style="list-style-type: none"> a. traffic (GNFR F) b. industry (GNFR A, B, D) c. agriculture (GNFR K, L) d. commercial and residential (GNFR C) e. shipping (GNFR G) f. off-road mobile machinery (GNFR I) g. natural (GNFR_N) h. transboundary <p>(16) Reference to Emission model (documentation, weblink repository)</p> <p>(17) Baseline year average concentration levels at receptor(s)</p> <p>(18) Baseline year maximum concentration levels at receptor(s)/hot spots</p>	<p>Dataflow H would characterize the air quality plan over the source area where exceedances occur at given receptor locations.</p> <p>It would keep most of the administrative information necessary to identify the air quality plan and as such would serve as basis for reference for the following blocks , now in a single dataflow for the air quality plan and not 4 different dataflows,</p> <p>The main difference with current e-reporting situation is that dataflow H would identify and characterize the base year (baseline year) both in terms of emissions and of air quality indicators.</p> <p>Modelling is proposed made mandatory for the evaluation of the impacts of control measures in elaboration of air quality plans (following FAIRMODE recommendation). Documentation of the model used for the elaboration of air quality plans would be required.</p> <p>Emission sources are proposed to be reported because they are essential to assess the effectiveness of the air quality plans.</p> <p>Modelled results in the form of three main pollutant indicators (a hotspot indicator is included) are proposed to be reported in dataflow H for the base year (not in dataflow J as previously required).</p>

Current air quality planning reporting requirements IPR Decision 2011/850/EU Annex II, dataflows H to K	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Air quality planning	Comments on e-reporting Air quality planning information
	<p>(19) Baseline year number of exceedances at receptor(s)</p> <p>(20) Reference to air quality plan (web link, common repository)</p>	
<p>(I) Information on source-apportionment (Article 13)</p> <p>(1) Code(s) of exceedance situation (link to G)</p> <p>(2) Reference year</p> <p>(3) Regional background: total</p> <p>(4) Regional background: from within Member State</p> <p>(5) Regional background: transboundary</p> <p>(6) Regional background: natural</p> <p>(7) Urban background increment: total</p> <p>(8) Urban background increment: traffic</p> <p>(9) Urban background increment: industry including heat and power production</p> <p>(10) Urban background increment: agriculture</p> <p>(11) Urban background increment: commercial and residential</p> <p>(12) Urban background increment: shipping</p> <p>(13) Urban background increment: off-road mobile machinery</p> <p>(14) Urban background increment: natural</p> <p>(15) Urban background increment: transboundary</p> <p>(16) Local increment: total</p> <p>(17) Local increment: traffic</p>	<p>(Block I) Information on source-apportionment (Article 13)</p> <p>(21) SA method used (Sensitivity, tagging, other) in source area</p> <p>(22) Contribution SA – traffic (GNFR F)</p> <p>(23) Contribution SA – industry (GNFR A, B, D)</p> <p>(24) Contribution SA – agriculture (GNFR K, L)</p> <p>(25) Contribution SA – commercial and residential (GNFR C)</p> <p>(26) Contribution SA – shipping (GNFR G)</p> <p>(27) Contribution SA – off-road mobile machinery (GNFR I)</p> <p>(28) Contribution SA – natural (GNFR_N)</p> <p>(29) Contribution SA – transboundary</p> <p><i>Conditional requirement if transboundary contribution is large</i></p> <p>(30) SA method used for background (Sensitivity, tagging)</p> <p>(31) Background Contribution SA – traffic (GNFR F)</p> <p>(32) Background Contribution SA – industry (GNFR A, B, D)</p> <p>(33) Background Contribution SA – agriculture (GNFR K, L)</p> <p>(34) Background Contribution SA – commercial and residential (GNFR C)</p> <p>(35) Background Contribution SA – shipping (GNFR G)</p>	<p>The main difference is that requirement to report source-apportionment information would be linked to the same main sources as identified in block H to inform the development of emission scenarios in air quality planning. Therefore, there would be no need to repeat information already given in block H. The reference year would be the baseline year.</p> <p>This is further to secure consistency in the source sector specification of the emission totals requested source-apportionment applications baseline and scenario information and information on measures</p> <p>The proposal also Ides information on the description of the methodology used for conducting the source-apportionment analysis. to ensure comparability across Member States reports and avoid obsolete references to the increment SA approach</p> <p>Both SA in the source area and for background contributions area considered</p>

Current air quality planning reporting requirements IPR Decision 2011/850/EU Annex II, dataflows H to K	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Air quality planning	Comments on e-reporting Air quality planning information
<p>(18) Local increment: industry including heat and power production</p> <p>(19) Local increment: agriculture</p> <p>(20) Local increment: commercial and residential</p> <p>(21) Local increment: shipping</p> <p>(22) Local increment: off-road mobile machinery</p> <p>(23) Local increment: natural</p> <p>(24) Local increment: transboundary</p>	<p>(36) Background Contribution SA – off-road mobile machinery (GNFR I)</p> <p>(37) Background Contribution SA – natural</p> <p>(38) Background Contribution SA – transboundary</p>	<p>Note the use of GNFR and possible adding metadata information, following FAIRMODE recommendations to ensure consistency between NEC and AAQDs reporting in terms of source-apportionment by using the same source categories</p>
<p>(J) Information on the scenario for the attainment year (Article 13)</p> <p>(1) Code of exceedance situation (link to G)</p> <p>(2) Code of scenario</p> <p>(3) Code of air quality plan (link to H)</p> <p>(4) Reference year for which projections are developed</p> <p>(5) Reference year from which projections are started</p> <p>(6) Source-apportionment (link to I)</p> <p>(7) Relevant publication (data type 'Publication')</p> <p>(8) Baseline: description of the emission scenario</p> <p>(9) Baseline: total emissions in the relevant spatial unit</p> <p>(10) Baseline: included measures (link to K)</p> <p>(11) Baseline: expected concentration levels in the projection year</p> <p>(12) Baseline: expected number of exceedances in the projection year</p> <p>(13) Projection: description of the emission scenario</p> <p>(14) Projection: total emissions in the relevant spatial unit</p> <p>(15) Projection: included measures (Link to K)</p> <p>(16) Projection: expected concentration levels in the projection year</p> <p>(17) Projection: expected number of exceedances in the projection year</p>	<p>(Block J) Information on the scenario for the attainment year (Article 13)</p> <p>(39) Scenario year Emission total in source area in the relevant spatial unit</p> <p>(40) Scenario year Emission sector totals in relevant spatial unit</p> <p>a. traffic (GNFR F)</p> <p>b. industry (GNFR A, B, D)</p> <p>c. agriculture (GNFR K, L)</p> <p>d. commercial and residential (GNFR C)</p> <p>e. shipping (GNFR G)</p> <p>f. off-road mobile machinery (GNFR I)</p> <p>g. natural (GNFR N)</p> <p>(41) Reference to projection documentation (weblink repository)</p> <p>(42) Scenario year projected average concentration levels at receptor(s)</p> <p>(43) Scenario year projected maximum concentration levels at receptor(s) (hot spots)</p> <p>(44) Scenario year projected number of exceedances at receptor(s)</p> <p>(45) Projection: included measures (Link to K)</p>	<p>The main difference with current e-reporting situation is that dataflow J now would identify and characterize only the projection year, the year of the proposed attainment scenario.</p> <p>Information on the scenario for the attainment year would be identified both in terms of emissions and of air pollution indicators.</p> <p>The scenario would be characterized both in terms of sector emissions and of identified measures.</p> <p>The base year information would be provided in dataflow H (baseline year) and not here. Some of the current reported fields are not required in the new proposal to avoid duplication of efforts in reporting and to secure that information in dataflows H to K are conveniently linked.</p>

Current air quality planning reporting requirements IPR Decision 2011/850/EU Annex II, dataflows H to K	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Air quality planning	Comments on e-reporting Air quality planning information
<p>(K) Information on measures (Articles 13 and 14)</p> <p>(1) Code(s) of exceedance situation (link to G) (2) Code of air quality plan (link to H) (3) Code of evaluation scenario (link to J) (4) Measure: code (5) Measure: name (6) Measure: description (7) Measure: classification (8) Measure: type (9) Measure: administrative level (10) Measure: time scale (11) Measure: affected source sector (12) Measure: spatial scale (13) Estimated implementation costs (where available) (14) Planned implementation: start and end date (15) Date when the measure is planned to take full effect (16) Other key implementation dates (17) Indicator for monitoring progress (18) Reduction in annual emissions due to applied measure (19) Expected impact in level of concentrations in the projection year (where available) (20) Expected impact in number of exceedances in the projection year (where available)</p>	<p>(Block K) Information on measures (Articles 13 and 14)</p> <p>(46) Measure: code (47) Measure: name (48) Measure: description (49) Measure: classification (checklist) (50) Measure: type (checklist) (51) Measure: administrative level (52) Measure: affected source sector (from checklist compatible with GNFR) (53) Measure: spatial scale (54) Estimated implementation costs (mandatory) (55) Measure: Planned implementation: start and end date (56) Date when the measure is planned to take full effect (57) Indicator for monitoring progress of measure implementation (from checklist: active, planned, fully implemented)</p>	<p>The main difference with the current reporting would be a streamlining of information to avoid duplication of reporting. The information on measures would link to sectors and to the actual projection scenario considered as basis for the air quality plans (dataflow H, J, and I)</p> <p>In addition, we avoid requiring data that is difficult to produce – such as the impact of emissions reductions in air quality due to a single measure. Instead, we recommend reporting the evaluation of the impact of measures on the basis of the combined projection scenario (as requested in dataflow J).</p>

7 Reporting emissions information under the AAQDs

7.1 Current obligations for reporting emissions

The AAQD 2008/50/EC specifies that “in order to protect human health and the environment as a whole, it is particularly important to combat emissions of pollutants at source and to identify and implement the most effective emission reduction measures at local, national and Community level.” Emissions are thus essential to understanding the origin of air pollution and key to the control of air quality levels in the core of the AAQDs. The references to report emissions appear in two separate parts of the AAQD 2008/50/EC in relation to: a) assessment and b) air quality planning.

There is a reference to reporting emissions in relation to the **assessment of air quality** as part of the description of assessment methods. Article 9 of the IPR Decision establishes that Member States shall make available the information set out in Part D of Annex II on the quality and traceability of the assessment methods applied. Part D of Annex II in the IPR Decision includes item (23) where main sources (including traffic, domestic heating, industrial sources, or source area, etc.) are to be reported *where available*. Note however, that item (23) is related to information on fixed measurements and that **reporting of emission data or information in relation of modelling assessments is not established in the IPR Decision**.

The legal obligation to report emissions in relation to the **elaboration of air quality plans** originates in Article 23 of the AAQD 2008/50/EC. Annex XV of that AAQD specifies the information to be included in the local, regional, or national air quality plans and specifies the need to provide information on the origin of pollution. In particular, Annex XV - A. 5.- “Origin of pollution”, explicitly indicates the requirement to provide (a) list of the main emission sources responsible for pollution (map); (b) total quantity of emissions from these sources (tons/year); (c) information on pollution imported from other regions. This requirement is reflected in Article 13 of the IPR Decision (2011/850/EU) in its reference to Part J of Annex II “information on the scenario for the attainment years” where reporting of emission information is required for both the baseline situation (item 9) and the projection scenario (item 14). In Part K of Annex II on information on measures, item (18) requires information on the reduction in annual emissions due to applied measure, relating measures applied in a specific sector to emission reductions

In addition, Annex XVI (d) on “Public Information” of the AAQD also requires that timely information to the public includes an indication of the main source emission sectors and recommendations for action to reduce emissions. However, such requirements are not included as part of in the IPR Decision and do not constitute an e-reporting obligation. Note also that the requirement to specify “main source emission sectors” does not necessarily mean other than identifying the main sectors and that there is no specific requirement to provide information on the actual amount of the emissions from these main sectors.

The above-mentioned obligations for emission reporting under the AAQD come in addition to the legal obligation to report emission data and information under the National Emission reduction Commitments Directive (2016/2284/EU) or NEC Directive. The NEC Directive sets national reduction commitments for five main air pollutants that have a significant negative impact on human health and the environment, namely, sulfur dioxide (SO₂), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), ammonia (NH₃) and fine particulate matter (PM_{2.5}). Member States are required to monitor and report the emissions of these five pollutants and a number of other pollutants listed in Annex I of the NEC Directive. Member States also have to draw up, adopt and implement national air pollution control programmes (NAPCP)⁽⁸⁾. These could show how they will meet their emission reduction commitments for 2020 - 2029, and how they will reach the more ambitious commitments by 2030 and beyond.

⁽⁸⁾ https://environment.ec.europa.eu/topics/air/reducing-emissions-air-pollutants_en-modal.

It should be noted however, that the different modelling applications under the AAQDs require emissions at different spatial and temporal resolution than those required under the NEC directive to cover regional, urban/local, street/microscale applications. For applications under the AAQD high-resolution emission data is necessary. However, neither the AAQDs nor the IPR Decision nor any of their related guidance documents provide any identification of the methods to be applied in the preparation of high-resolution emission data to be used as basis for modelling air quality assessments at different urban/local and microscales. Also, no reference is made as to how the quality of emission data used as input for air quality modelling is to be assessed. Since the focus of the NEC Directive is on national emission totals, its emission data compilation requirements do not consider the needs for high-resolution emission data that is required for air quality modelling applications under the AAQDs. And although the AQDD recognizes the need for information on emissions, the IPR Decision only identifies four items to report emissions.

This implies, in practice, that there are very limited requirements in e-reporting aiming to inform on the emission data used as basis for assessment and for air quality planning under the AAQDs.

7.2 Experience on use of reported information on emissions from dataflows D and J

The experience on use of reported information on emissions varies whether the information is required for assessment purposes (dataflow D) and for air quality planning purposes (dataflow J).

For **assessment purposes**, reporting of emission information is not mandatory, only “where available.” In practice, this means that there is a large variability of reporting of emission information under dataflow D. When emission information is reported, the data is a single number, with little information on where it applies, how it has been obtained or what methodologies have been used for its compilation. So, although the data is quantifiable, there is a lack of transparency in the data that makes it difficult for further use in comparability and assessment applications. It is also important to note that the information requested under dataflow D, item 23 refers to fixed measurements, not modelling data. There is no requirement to report emission data when reporting modelling assessment results. The emission information required under dataflow D refers to a number of different sectors but only as main source sectors, without specifying totals or actual sector categories. Therefore, it is not possible either to link this information to the reports in dataflow I on source apportionment, thus reducing the capabilities of use of the reported information.

For **air quality planning purposes**, the reporting of total emission data under dataflow J both for the baseline scenario (item 9) and for the projection scenario (item 14) is mandatory (see chapter 6). Emissions are reported as shown in Table 7.1 below, but only total numbers are required, with no additional information included. There is no information on what emitted pollutant it refers to and no possibility to include emission data for several precursors, as well as no links to source-apportionment in relation to what sectors are related. This lack of additional information on the emission data limits its usability to evaluate air quality plans and to assess the validity of the proposed actions to control air pollution. It also hampers the capabilities of comparative assessments on the effectiveness of air quality plans across Europe. No source sector emission data is required to be reported, thus making it difficult to link the information between dataflow J and dataflow I (on source-apportionment) to assess the capabilities of the proposed scenarios to actually reduce pollution levels. Source sector emission are only requested in Part K of Annex II in relation to specific measures, so only the sectors addressed by measures are included in the reporting. The reporting in item 18 of Part K requires only emission reductions due to the specific measures, not values before and after the measures are in place. This requirement provides information whose quality is difficult to assess independently as no additional information or initial estimation of the sector emissions is required. It is also important to note that usually, it is a group of measures that effectively combined contribute to reductions in emission data so that the requirement to pinpoint specific emission reductions to specific measures is unrealistic and difficult to comply with.

Table 7.1: Example of information available at the EEA viewer on Air Quality Scenarios (data flow J) as reported within AQ e-Reporting

Source Apportionment Id	Source Apportionment Reporting Year	Attainment Year	Scenario Code	Start Year	Publication	Base Scenario Emissions	Projection Scenario Emissions	NS WSS Correction	AQ Attainment Id
BG0006_Galabovo_PM10_d_SO2_h_2019_SA	2019	2023	BG0006_Galabovo_PM10_d_SO2_h_2019_SC	2023	Програма за намаляване на нивата на замърсителите в атмосферния въздух (ОПЧ10 и SO2) и достигане на установените норми за вредни вещества на общ. Гълъбово с период на действие 2019-2023г	3547.983	19949.013	noneApplied	ATT-BG0006_00001_LV_daysAbove_2019
ESAP.I.2019	2019	2028	IEEVAL.J.2019	2019	Dublin Region Air Quality Plan 2021	9.04	5.22		ATTAIN.IE.IE_Attainment_IE0007_poll_8_LV_aMean_H_abov
ESAP.I.2019	2019	2028	IEEVAL.J.2019	2019	Dublin Region Air Quality Plan 2021	9.04	5.22		ATTAIN.IE.IE_Attainment_IE0007_poll_8_LV_aMean_H_abov
ESAP.I.2019	2019	2028	IEEVAL.J.2019	2019	Dublin Region Air Quality Plan 2021	9.04	5.22		ATTAIN.IE.IE_Attainment_IE0007_poll_8_LV_aMean_H_abov
T_01.I_5_2019_1	2019	2030	J_5_119	2010	Piano regionale di qualità dell'aria	6.786	3.865	noneApplied	ATT.IT0119_5_H_LV_daysAbove_2019
T_01.I_5_2019_2	2019	2030	J_5_118	2010	Piano regionale di	1.803	1.142	noneApplied	ATT.IT0118_5_H_LV_daysAbove_2019

7.3 Recommended revision of the e-reporting emissions requirements (dataflows D, H-K)

The on-going revision of the Air Quality Directives aims to strengthen monitoring, modelling, and air quality planning and to improve the usefulness of e-reporting to allow further efficiency gains in response to the lessons learnt from the Fitness Check. Strengthening modelling and air quality planning involves improving the understanding and available information of its underlying emission data.

A key issue to consider is whether or not to extend the e-reporting requirements for information on the actual emission data that forms the basis for assessment and air quality planning. The current requirements are very limited and hamper completeness and comparability assessments across dataflows and across Member States. Our recommendation is to strengthen the emission information (metadata) reporting under the IPR Decision. This is to secure consistency in the source-sector specification required for reporting quantifiable emission data in a specific air quality zone specially for the purposes of source-apportionment and air quality planning. This means that the same source sector classification should be used for the determination of source-apportionment under dataflow I and for the evaluation of measures in dataflow K. This will enhance the usefulness of the data and allow “progress to target” assessment activities.

For planning purposes, as already mentioned in chapter 6, our recommendation is to revise the requirements in dataflow H on air quality plans to include reporting of a source area where air quality plans are to be conducted and then require that sector and total emission data are reported for this source area. This total and sector emission data are to be linked to the information reported for air quality planning and would provide a basis for understanding the source-apportionment data, the selection of the baseline and projection emission data and for evaluating the impact of the proposed control scenarios. Reporting quantitative emission values would also allow a comparative assessment across Member states.

For assessment purposes, our recommendation is to drop the requirement on dataflow D item (23) to report main sources and related traffic emission information in items (30), (31) and (32). This is because this information is only ad-hoc data values, whose data quality is difficult to assess and whose patchiness does not allow useful completeness or comparability assessments. Instead, simple emission information could be required in relation to reporting modelling information (dataflows D1b and E1b). Modelling results actively rely on emission data and thus, the requirement of emission information will be more

useful as it will allow a follow up to assess the quality of the information, comparable across Member States.

Following FAIRMODE, an additional recommendation would be to adopt the description of the emissions under the AAQDs to be consistent with the nomenclature used in GNFR under the NEC Directive, thus ensuring consistency across related legal instruments. If this recommendation is to be followed in e-reporting, the required documentation of the origin of the emission data needs to be as simple as possible, preferably in the form of a multiple-choice checklist to ensure comparability. We recommend to further liaise with FAIRMODE in the testing and identification of metadata information necessary to document emissions in order to produce a concrete number of fields to be eventually included in e-reporting.

The following aspects could be considered in a possible revision of e-reporting requirements on emissions:

- ***For air quality planning purposes, introduce a requirement to report emission totals per source area and sector streamlining emissions information that are the basis for the baseline results reported for air quality planning.***
- ***Introduce documentation requirements (metadata characterization) for the high-resolution emission data used under the AAQDs in relation to air quality planning purposes (FAIRMODE recommendation).***
- ***For assessment purposes, drop the requirements to report emission information associated to fixed measurements in dataflow D and introduce instead emission information reporting only in relation to the documentation of modelling information in dataflow D1b.***
- ***Adopt the description of the emissions under the AAQDs to be consistent with the nomenclature used in GNFR under the NEC Directive to ensure consistency across related legal instruments (FAIRMODE recommendation). This is to secure consistency in the source sector specification for air quality planning (current dataflow H), source-apportionment applications (current dataflow I), baseline and scenario information (current dataflow J) and information on measures (current dataflow K).***

Table 7.2: Overview of recommended revisions for reporting emission information under the IPR Decision

Current source and emission reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Emission Information	Comments on e-reporting emission information
<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(23) Main sources (traffic, domestic heating, industrial sources, or source area etc.) (where available)</p> <p>(30) Assessed traffic volume (for traffic stations)</p> <p>(31) Heavy-duty fraction of traffic (for traffic stations, where available)</p> <p>(32) Traffic speed (for traffic stations, where available)</p>	<p>Drop the requirements to report emission information associated to fixed measurements – Items (23), (30), (31) and (32)</p> <p>Add instead requirements to report emission metadata in Dataflow D1b in relation to modelling information-</p>	<p>Not useful for comparability and completeness analysis – limited possibilities for quality assessment</p> <p>This is to allow for assessments on the status and progress on the implementation of the AAQDs</p>
<p>(H) Information on air quality plans (Article 13) No emission information required</p> <p>(I) Information on source-apportionment (Article 13) No emission information required</p> <p>(J) Information on the scenario for the attainment year (Article 13)</p> <p>(9) Baseline: total emissions in the relevant spatial unit</p> <p>(14) Projection: total emissions in the relevant spatial unit</p>	<p>Add requirement report baseline emission data (annual totals and sector) in Dataflow H – air quality plans</p> <p><i>Addition could be related to Source area air quality planning and include</i></p> <p><i>Baseline Emission total in source area</i></p> <p><i>Baseline Emission sector totals</i></p> <ol style="list-style-type: none"> 1. <i>traffic (GNFR F)</i> 2. <i>industry (GNFR A, B, D)</i> 3. <i>agriculture (GNFR K, L)</i> 4. <i>commercial and residential (GNFR C)</i> 5. <i>shipping (GNFR G)</i> 6. <i>off-road mobile machinery (GNFR I)</i> 7. <i>natural (GNFR_N)</i> 8. <i>transboundary</i> <p><i>Emission model (documentation)</i></p> <p>Drop requirement to report baseline emission data in Dataflow J – link instead to H for baseline and add requirement to report emission data by sector data for projections in dataflow J</p> <p>Addition could be related to</p>	<p>This is to secure consistency in the source sector specification for air quality planning (current dataflow H), source-apportionment applications (current dataflow I), baseline and scenario information (current dataflow J) and information on measures (current dataflow K).</p> <p>Note the use of GNFR and possible adding metadata information, following FAIRMODE recommendations</p> <p>The proposal for reporting emission information would also apply in the case of revised air quality planning consistent with the proposals in chapter 6 of this report.</p> <p>This is to avoid duplication of efforts in reporting and securing that information in current dataflows H to K are conveniently linked. It would also be useful in the proposed revised air quality planning blocks</p>

Current source and emission reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision EEA/ETC_HE IPR Decision 2011/850/EU Annex II, Emission Information	Comments on e-reporting emission information
<p>(K) Information on measures (Articles 13 and 14) (11) Measure: affected source sector (18) Reduction in annual emissions due to applied measure</p>	<p>Source area air quality planning and include (14) Projection Emission total in source area Projection Emission sector totals</p> <ol style="list-style-type: none"> 1. <i>traffic (GNFR F)</i> 2. <i>industry (GNFR A, B, D)</i> 3. <i>agriculture (GNFR K, L)</i> 4. <i>commercial and residential (GNFR C)</i> 5. <i>shipping (GNFR G)</i> 6. <i>off-road mobile machinery (GNFR I)</i> 7. <i>natural (GNFR_N)</i> 8. <i>transboundary</i> <p><i>Emission projection model (documentation)</i></p> <p>Keep relation of measure with affected source sector, link to projection but drop the requirement on (18) to report annual reductions per measure</p>	<p>This is to avoid requiring data that is difficult to produce – better to document the projection scenario (in proposed block J) and link the measures to sectors and to the actual projection scenario considered as basis for the air quality plans.</p>

8 Conclusions and summary of recommendations

This report aims to support the on-going revision of the Ambient Air Quality Directives by providing a series of recommendations on the reciprocal exchange of information and reporting of ambient air quality (e-reporting) for a possible review of the Commission Implementing Decision (2011/850/EU). One of the seven lessons learnt by the Fitness Check of 2019 was directly addressed towards e-reporting and established that “not all reported data is equally useful, and that e-reporting allows for further efficiency gains”. This report addresses the concerns identified by the Fitness Check on e-reporting. It builds on the experience and understanding from the EEA and technical experts at its European Topic Centre for Human Health and the Environment (ETC HE) working with implementing provisions for reporting (IPR) and identifies areas for further efficiency gains in e-reporting.

While the experience with e-reporting during the last few years have many positive achievements, in particular with respect to increased availability of comparable quality assured air quality monitoring data across Member States, there are also some recognized drawbacks such as the limited comprehensive information on air quality plans. The on-going review of the AAQDS aims to further strengthening of the monitoring, modelling, and air quality plans information. In particular, the enhanced availability of high-quality modelling information and data from additional (sensor, satellite) monitoring instruments opens for a considerable amount of new information susceptible to be incorporated in the e-reporting system.

In order to deal with the possible new data and information and to secure further efficiency of the e-reporting system, we have identified a series of principles and basic rules. These are intended to guide a possible revision of the IPR Decision and the IPR Guidance document in the context of the revision of the AAQDs.

- Data and information required for e-reporting need to be **transparent**
- Data and information need to be **comparable** for different periods and from one place to another
- Data and information need to be provided in such a form that it is easy to be assessed in terms of **completeness**
- Data/parameters need to be **quantifiable**
- Information documenting the reported data (**metadata**) needs to be reported, preferably following a **checklist approach**
- Both data and metadata information need to be provided in established **common repositories**
- The required data and information need to be **usable and useful** to trace progress in the implementation of the Air Quality directives
- The **mandatory, conditional, or voluntary** status of the required data and information needs to be clearly specified, avoiding statements such as (when available) that give rise to confusion and misunderstandings.

These principles have already been widely used as basis for e-reporting. They are already included in the IPR Decision and have guided its implementation in the last decade. However, these requirements need to be complemented with relevant information/metadata to qualify the reported data. We propose that this information is reported following a “checklist approach” compiled in common repositories, instead of the wordy reports, lengthy documents, or links to a pile of documentation in webpages currently delivered to the system, especially with regards to air quality planning information. Further we recommend a prioritization of the requirements for reporting information based of the capability of the data to be used in air quality management, compliance, and assessment applications, in view to enable European-wide assessments of progress in the implementation of the Air Quality directives.

We have followed these principles to review the parts of the information required by the IPR Decision Annex II, specifically under dataflows D, G, H, I, J and K. These are the requirements that are directly linked

to the on-going revision of the Air Quality directives on its aim to strengthen monitoring, modelling, and air quality planning. The review has resulted in four main recommendations as follows:

1. **Revise the reporting requirements of representative area of fixed measurements (dataflow D)**
2. **Enhance cooperation with FAIRMODE for reporting of exceedance indicators and modelling results with Modelling Quality Objectives (MQO)**
3. **Simplify the e-reporting system for air quality plans (dataflows H-K)**
4. **Consider introducing a requirement to report emission information (metadata) in relation to modelling applications**

A detailed description of these recommendations for changes in the current requirements and the main reasons for these changes are summarized in the overview table below (Table 8.1).

Table 8.1: Overview of recommended revisions for reporting assessment information and air quality plans under Annex II of the IPR Decision

Current reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision by EEA/ETC_HE IPR Decision 2011/850/EU Annex II,	Comments on e-reporting Rationale of proposed changes
<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(16) Spatial Extent of representative area (data type 'Spatial Extent') (where available)</p> <p>(17) Evaluation of representativeness (where available)</p> <p>(18) Documentation of representativeness (web link) (where available)</p>	<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(16) Spatial Extent of representative area (data type 'Spatial Extent')</p> <p>(17) Evaluation of representativeness (select from checklist the Tiered approach used evaluate spatial representativeness)</p> <p>(18) Use of FAIRMODE guidance approach for the selected Tier (Y/N) and weblink to documentation</p>	<p>Prioritize and drop the “where available” formulation to make reporting this information mandatory due to its relevance for attainment of environmental objectives</p> <p>The spatial extent could be tentatively reported as a polygon. Further guidance with FAIRMODE is needed to identify ways to report discontinuous data.</p> <p>Adopt the checklist approach to report methodology and establish a common repository for documentation</p>

Current reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision by EEA/ETC_HE IPR Decision 2011/850/EU Annex II,	Comments on e-reporting Rationale of proposed changes
<p>(D) Information on the assessment methods (Articles 8 and 9)</p> <p>(ii) Fixed measurements</p> <p>(23) Main sources (traffic, domestic heating, industrial sources, or source area etc.) (where available)</p> <p>(30) Assessed traffic volume (for traffic stations)</p> <p>(31) Heavy-duty fraction of traffic (for traffic stations, where available)</p> <p>(32) Traffic speed (for traffic stations, where available)</p>	<p>Drop the requirements to report emission data associated to fixed measurements – Items (23), (30), (31) and (32)</p> <p>Add instead requirements to report emission metadata in Dataflow D1b in relation to modelling information-</p>	<p>Not useful for comparability and completeness analysis – limited possibilities for quality assessment</p> <p>This is to allow for assessments on the status and progress on the implementation of the AAQDs</p>
<p>(H) Information on air quality plans (Article 13)</p> <p>(1) Provider (data type ‘Contact Details’)</p> <p>(2) Change documentation (data type ‘Documentation of Change’)</p> <p>(3) Air quality plan: code</p> <p>(4) Air quality plan: name</p> <p>(5) Air quality plan: reference year of first exceedance</p> <p>(6) Competent authority (data type ‘Contact Details’)</p> <p>(7) Air quality plan: status</p> <p>(8) Air quality plan: pollutants covered</p> <p>(9) Air quality plan: date of official adoption</p> <p>(10) Air quality plan: timetable of implementation</p> <p>(11) Reference to air quality plan (web link)</p> <p>(12) Reference to implementation (web link)</p> <p>(13) Relevant publication (data type ‘Publication’)</p> <p>(14) Code of the relevant exceedance situation(s) (link to G)</p>	<p>(Block H) Information on air quality plans - Baseline(Article 13)</p> <p>(1) Air quality plan: code</p> <p>(2) Air quality plan: name (with reference to both baseline year and projection year)</p> <p>(3) Provider (data type ‘Contact Details’)</p> <p>(4) Competent authority (data type ‘Contact Details’)</p> <p>(5) Air quality plan: reference year of first exceedance (link to G)</p> <p>(6) Code of the relevant exceedance situation(s) (link to G, common to all blocks I, J and K)</p> <p>(7) Air quality plan: status (active, planned, implemented)</p> <p>(8) Air quality plan: pollutants covered (checklist)</p> <p>(9) Air quality plan: date of official adoption</p> <p>(10) Baseline year</p> <p>(11) Attainment year (projection scenario year)</p> <p>(12) Area of application of the air quality plan</p> <p>(13) Model used as basis for air quality plan: name</p> <p>(14) Baseline year emission total in source area in the relevant spatial unit</p> <p>(15) Baseline emission data totals by sector in relevant spatial unit</p> <p>a. traffic (GNFR F)</p>	<p>Dataflow H would characterize the air quality plan over the source area where exceedances occur at given receptor locations.</p> <p>It keeps most of the administrative information necessary to identify the air quality plan and as such serves as basis for reference for the following blocks , now in a single dataflow for the air quality plan and not 4 different dataflows,</p> <p>The main difference with current e-reporting situation is that the proposed dataflow H would identify and characterize the base year (baseline year) both in terms of emissions and of air quality indicators.</p> <p>Modelling is proposed made mandatory for the evaluation of the impacts of control measures in elaboration of air quality plans (following FAIRMODE recommendation). Documentation of the model used for the elaboration of air quality plans would be required.</p>

Current reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision by EEA/ETC_HE IPR Decision 2011/850/EU Annex II,	Comments on e-reporting Rationale of proposed changes
	<ul style="list-style-type: none"> b. industry (GNFR A, B, D) c. agriculture (GNFR K, L) d. commercial and residential (GNFR C) e. shipping (GNFR G) f. off-road mobile machinery (GNFR I) g. natural (GNFR_N) h. transboundary <p>(16) Reference to Emission model (documentation, weblink repository)</p> <p>(17) Baseline year average concentration levels at receptor(s)</p> <p>(18) Baseline year maximum concentration levels at receptor(s)/hot spots</p> <p>(19) Baseline year number of exceedances at receptor(s)</p> <p>(20) Reference to air quality plan (web link, common repository)</p>	<p>Emission sources are proposed to be reported because they are essential to assess the effectiveness of the air quality plans.</p> <p>Modelled results would be required in the form of three main pollutant indicators (average concentration, maximum concentration (hotspot) and number of exceedances) are proposed to be reported in dataflow H for the base year (not in dataflow J as previously required).</p>
<p>(I) Information on source-apportionment (Article 13)</p> <p>(1) Code(s) of exceedance situation (link to G)</p> <p>(2) Reference year</p> <p>(3) Regional background: total</p> <p>(4) Regional background: from within Member State</p> <p>(5) Regional background: transboundary</p> <p>(6) Regional background: natural</p> <p>(7) Urban background increment: total</p> <p>(8) Urban background increment: traffic</p> <p>(9) Urban background increment: industry including heat and power production</p> <p>(10) Urban background increment: agriculture</p> <p>(11) Urban background increment: commercial and residential</p> <p>(12) Urban background increment: shipping</p> <p>(13) Urban background increment: off-road mobile machinery</p> <p>(14) Urban background increment: natural</p> <p>(15) Urban background increment: transboundary</p> <p>(16) Local increment: total</p> <p>(17) Local increment: traffic</p>	<p>(Block I) Information on source-apportionment (Article 13)</p> <p>(21) SA method used (Sensitivity, tagging, other) in source area</p> <p>(22) Contribution SA - traffic (GNFR F)</p> <p>(23) Contribution SA - industry (GNFR A, B, D)</p> <p>(24) Contribution SA - agriculture (GNFR K, L)</p> <p>(25) Contribution SA - commercial and residential (GNFR C)</p> <p>(26) Contribution SA - shipping (GNFR G)</p> <p>(27) Contribution SA - off-road mobile machinery (GNFR I)</p> <p>(28) Contribution SA – natural (GNFR_N)</p> <p>(29) Contribution SA - transboundary</p> <p><i>Conditional requirement if transboundary contribution is large</i></p> <p>(30) SA method used for background (Sensitivity, tagging)</p> <p>(31) Background Contribution SA - traffic (GNFR F)</p> <p>(32) Background Contribution SA - industry (GNFR A, B, D)</p> <p>(33) Background Contribution SA - agriculture (GNFR K, L)</p> <p>(34) Background Contribution SA - commercial and residential (GNFR C)</p>	<p>The main difference would be that the requirement to report source-apportionment information would now be linked to the same main sources as identified in block H to inform the development of emission scenarios in air quality planning. Therefore, there would be no need to repeat information already given in block H. The reference year would be the baseline year.</p> <p>This is further to secure consistency in the source sector specification of the emission totals requested source-apportionment applications baseline and scenario information and information on measures. This would be a single dataflow with four sequentially linked blocks.</p> <p>The proposal also includes information on the description of the methodology used for conducting the source-apportionment analysis. to ensure comparability across Member States reports and avoid obsolete references to the increment SA approach</p> <p>Both SA in the source area and for background contributions area would be considered</p>

Current reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision by EEA/ETC_HE IPR Decision 2011/850/EU Annex II,	Comments on e-reporting Rationale of proposed changes
<p>(18) Local increment: industry including heat and power production</p> <p>(19) Local increment: agriculture</p> <p>(20) Local increment: commercial and residential</p> <p>(21) Local increment: shipping</p> <p>(22) Local increment: off-road mobile machinery</p> <p>(23) Local increment: natural</p> <p>(24) Local increment: transboundary</p>	<p>(35) Background Contribution SA - shipping (GNFR G)</p> <p>(36) Background Contribution SA - off-road mobile machinery (GNFR I)</p> <p>(37) Background Contribution SA - natural</p> <p>(38) Background Contribution SA - transboundary</p>	<p>Note the use of GNFR and possible adding metadata information, following FAIRMODE recommendations to ensure consistency between NEC and AAQDs reporting in terms of source-apportionment by using the same source categories</p>
<p>(J) Information on the scenario for the attainment year (Article 13)</p> <p>(1) Code of exceedance situation (link to G)</p> <p>(2) Code of scenario</p> <p>(3) Code of air quality plan (link to H)</p> <p>(4) Reference year for which projections are developed</p> <p>(5) Reference year from which projections are started</p> <p>(6) Source-apportionment (link to I)</p> <p>(7) Relevant publication (data type 'Publication')</p> <p>(8) Baseline: description of the emission scenario</p> <p>(9) Baseline: total emissions in the relevant spatial unit</p> <p>(10) Baseline: included measures (link to K)</p> <p>(11) Baseline: expected concentration levels in the projection year</p> <p>(12) Baseline: expected number of exceedances in the projection year</p> <p>(13) Projection: description of the emission scenario</p> <p>(14) Projection: total emissions in the relevant spatial unit</p> <p>(15) Projection: included measures (Link to K)</p> <p>(16) Projection: expected concentration levels in the projection year</p> <p>(17) Projection: expected number of exceedances in the projection year</p>	<p>(Block J) Information on the scenario for the attainment year (Article 13)</p> <p>(39) Scenario year Emission total in source area in the relevant spatial unit</p> <p>(40) Scenario year Emission sector totals in relevant spatial unit</p> <p>a. traffic (GNFR F)</p> <p>b. industry (GNFR A, B, D)</p> <p>c. agriculture (GNFR K, L)</p> <p>d. commercial and residential (GNFR C)</p> <p>e. shipping (GNFR G)</p> <p>f. off-road mobile machinery (GNFR I)</p> <p>g. natural (GNFR N)</p> <p>h. transboundary</p> <p>(41) Reference to projection documentation (weblink repository)</p> <p>(42) Scenario year projected average concentration levels at receptor(s)</p> <p>(43) Scenario year projected maximum concentration levels at receptor(s) (hot spots)</p> <p>(44) Scenario year projected number of exceedances at receptor(s)</p> <p>(45) Projection: included measures (Link to K)</p>	<p>The main difference with current e-reporting situation is that the proposed dataflow J would identify and characterize only the projection year, the year of the proposed attainment scenario.</p> <p>Information on the scenario for the attainment year would now be identified both in terms of emissions and of air pollution indicators.</p> <p>The scenario would also be characterized both in terms of sector emissions and of identified measures.</p> <p>The base year information would be provided in dataflow H (baseline year) and not here. Some of the current reported fields would not be required in the new proposal to avoid duplication of efforts and to secure that information in blocks H to K are conveniently linked.</p>

Current reporting requirements IPR Decision 2011/850/EU Annex II,	Recommended revision by EEA/ETC_HE IPR Decision 2011/850/EU Annex II,	Comments on e-reporting Rationale of proposed changes
<p>(K) Information on measures (Articles 13 and 14)</p> <p>(1) Code(s) of exceedance situation (link to G) (2) Code of air quality plan (link to H) (3) Code of evaluation scenario (link to J) (4) Measure: code (5) Measure: name (6) Measure: description (7) Measure: classification (8) Measure: type (9) Measure: administrative level (10) Measure: time scale (11) Measure: affected source sector (12) Measure: spatial scale (13) Estimated implementation costs (where available) (14) Planned implementation: start and end date (15) Date when the measure is planned to take full effect (16) Other key implementation dates (17) Indicator for monitoring progress (18) Reduction in annual emissions due to applied measure (19) Expected impact in level of concentrations in the projection year (where available) (20) Expected impact in number of exceedances in the projection year (where available)</p>	<p>(Block K) Information on measures (Articles 13 and 14)</p> <p>(46) Measure: code (47) Measure: name (48) Measure: description (49) Measure: classification (checklist) (50) Measure: type (checklist) (51) Measure: administrative level (52) Measure: affected source sector (from checklist compatible with GNFR) (53) Measure: spatial scale (54) Estimated implementation costs (mandatory) (55) Measure: Planned implementation: start and end date (56) Date when the measure is planned to take full effect (57) Indicator for monitoring progress of measure implementation (from checklist: active, planned, fully implemented)</p>	<p>The main difference with the current reporting would be a streamlining of information to avoid duplication of reporting. The information on measures would link to sectors and to the actual projection scenario considered as basis for the air quality plans (proposed blocks H, J, and I)</p> <p>In addition, we would avoid requiring data that is difficult to produce – such as the impact of emissions reductions in air quality due to a single measure. Instead, we recommend reporting the evaluation of the impact of measures on the basis of the combined projection attainment scenario (as requested in proposed block J).</p>

List of abbreviations

Abbreviation	Name	Reference
EEA	European Environment Agency	www.eea.europa.eu
FAIRMODE	Forum for Air Quality Modeling	https://fairmode.jrc.ec.europa.eu/
AQUILA	Network of Air Quality Reference Laboratories	https://joint-research-centre.ec.europa.eu/about-aquila_en

References

Hooyberghs, H., et al., 2017, *Assessing the spatial representativeness (SR) of air quality sampling points – Sensitivity and feasibility tests for a tiered approach* – Final Report Service Request 5 under Framework Contract ENV.C.3/FRA/2017/0012 Specific Contract: 07.0203/2018/793545/SFRA/ENV.C.3 (https://fairmode.jrc.ec.europa.eu/document/fairmode/WG1/20201221_ENV_comments_SR5_Task1_FINAL_clean.pdf) accessed 30.09.2022.

Menadue, H., et al., 2022, *Strengthening of air quality monitoring, modelling, and plans under the Ambient Air Quality Directives Final report* - Service Request 9 under Framework Contract ENV.C.3/FRA/2017/0012, European Commission - DG Environment, ENV.C.3/FRA/2017/0012.

Sousa Santos, G., et al., 2020, *Air Quality Plans and Measures Analysis of data submitted from 2014 to 2020*, Eionet Report - ETC/ATNI 2020/9, EEAs European Topic Centre on Air Pollution, Transport, Noise and Industrial pollution, NILU, Norway.

Targa, J., et al., *USER GUIDE TO XML & DATA MODEL FOR AIR QUALITY PLANS (H-K), v1*, ETC/ACM, Bilthoven, The Netherlands, (https://www.eionet.europa.eu/aqportal/doc/UserGuide2_AQD-HK_XML_v1.docx) accessed 30.09.2022.

Tarrasón, L., et al., 2017, *Assessing the spatial representativeness of air quality sampling points Application of siting criteria and sampling point classification* – Task 3 report Service Request 5 under Framework Contract ENV.C.3/FRA/2017/0012 Specific Contract: 07.0203/2018/793545/SFRA/ENV.C.3 (https://fairmode.jrc.ec.europa.eu/document/fairmode/WG1/20201221_ENV_comments_SR5_Task_3_FINAL_clean.pdf) accessed 30.09.2022.

Thunis P., et al., 2022, *Recommendations for the revision of the ambient air quality directives (AAQDs) regarding modelling applications*, EUR 31102 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-53279-8, doi:10.2760/761078, JRC129600.

Thunis, P., et al., 2019, *Source-apportionment to support air quality planning: Strengths and weaknesses of existing approaches*, *Environment International*, Volume 130, September 2019, 104825, (<https://doi.org/10.1016/j.envint.2019.05.019>) accessed 30.09.2022.

Thunis, P., et al., 2021, *Why is the city's responsibility for its air pollution often underestimated? A focus on PM_{2.5}*, *Atmos. Chem. Phys.*, 21, pp. 18195–18212, 2021, (<https://doi.org/10.5194/acp-21-18195-2021>) accessed 30.09.2022.

European Topic Centre on
Human Health and the Environment
<https://www.eionet.europa.eu/etcs/etc-he>

The European Topic Centre on Human Health and
the Environment (ETC HE) is a consortium of
European institutes under contract of the European
Environment Agency.

European Environment Agency
European Topic Centre
Human health and the environment

