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signed by Mr Jordi AYET PUIGARNAU, Director

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To: Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of  
the European Union

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Subject: COMMISSION STAFF WORKING DOCUMENT  
Evaluation of Directive 98/70/EC of the European Parliament and of the  
Council relating to the quality of petrol and diesel fuels ('Fuel Quality  
Directive')

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Delegations will find attached document SWD(2017) 178 final.

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**COMMISSION STAFF WORKING DOCUMENT**

**Evaluation of Directive 98/70/EC of the European Parliament and of the Council  
relating to the quality of petrol and diesel fuels ('Fuel Quality Directive')**

{SWD(2017) 179 final}

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## 1. INTRODUCTION

### 1.1. Purpose of the REFIT evaluation

As part of the Commission's Better Regulation agenda, the Fuel Quality Directive (FQD) was included in the Commission's REFIT programme<sup>1</sup> in order to provide a comprehensive policy and regulatory fitness evaluation of the FQD.

This evaluation examines the actual implementation of the FQD compared to what was expected. It provides conclusions on how the Directive has performed, what experience has been gained and what lessons can be learned. This analysis covers the relevance, effectiveness, efficiency, coherence and EU value added of the legislation. It also provides indications of the degree to which the legislation is still considered to be fit for purpose.

The evaluation helps the Commission to:

- Have a better understanding of why and/or how current EU legislation has worked well or not so well, identifying factors which have helped or hampered achievement of the objectives.
- Qualify and where possible quantify the impact of the FQD, in terms of technological impact on vehicle fuel efficiency, engine design, on the refinery sector, the social, economic and environmental impact notably the air quality and health aspects while maintaining a single market for fuels.

### 1.2. Scope of the REFIT evaluation

The evaluation covers all aspects of the FQD, except for the following parts:

The Article 7a of the FQD requires Member States to oblige fuel suppliers to reduce life cycle GHG emissions by a minimum of 6% by 31 December 2020. Due to the fact that the implementing legislation<sup>2</sup> for Article 7a of the FQD related to GHG reduction was adopted in 2015 and it has to be transposed by 21 April 2017 this article was excluded from the scope of this evaluation.

Articles 7b to 7e relating to the sustainability of biofuels were the subject of an evaluation in the context of the Renewable Energy Directive<sup>3</sup>. Those Articles are therefore also outside the scope of this evaluation.

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<sup>1</sup> Communication on Regulatory Fitness and Performance (REFIT): Results and Next Steps, COM (2013) 685

<sup>2</sup> Council Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels, OJ L 107/26, 25.4.2015

<sup>3</sup> Commission Staff Working Document SWD(2016) 416 final: REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council

The reference period for the evaluation was from 1995 (as a reference point prior to the introduction of the FQD in 1998) until 2014<sup>4</sup> (with quantitative emission data analysed between 1995 and 2013). The scope of the evaluation was all 28 EU Member States.

## 2. BACKGROUND TO THE INITIATIVE

The Fuel Quality Directive 98/70/EC<sup>5</sup> ("FQD") has the following objectives:

- To achieve a high level of protection of the environment and human health in relation to fuel used in road transport as well as non-road mobile machinery by reducing pollution from the transport sector, and enhancing air quality;
- To enhance the functioning of the single market for transport fuels and vehicles by setting minimum standards for the quality of transport fuels and ensuring the technical compatibility of such fuel with internal combustion engines and after-treatments;
- To reduce the of life cycle greenhouse gas (GHG) emissions from transport fuels.

It addresses certain fuels supplied for use in internal combustion engines in the road and non-road mobile machinery<sup>6</sup> (NRMM) sectors. Fuel specifications are established that apply to petrol, diesel, and bio-components blended in them used in road transport, as well as to gas oil used in NRMM. These fuel specifications are intended to limit primary air pollutants (lead and other metals, sulphur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), unburnt hydrocarbons, polycyclic aromatic hydrocarbons (PAH), benzenes, and carbon monoxide) and other toxic exhaust emissions which contribute to the formation of secondary pollutants (such as ozone) and which are emitted through the exhaust and evaporative fumes. For fuels used by NRMM (including on inland waterways) only the limits for sulphur, lead, and MMT apply, while the full fuel specifications for petrol and diesel are limited to road use.

Transport-related air pollution contributes to an increased risk of death, particularly from cardiopulmonary causes, and it increases the risk of respiratory symptoms, cancer, and other diseases<sup>7</sup>. Impacts on the environment include direct toxicity (in particular from lead), acidification and eutrophication of soil and water, leading to changes in species diversity<sup>8</sup>. By reducing exposure to these pollutants and toxic emissions, the FQD is expected to reduce risks to human health and the environment.

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<sup>4</sup> The evaluation study was initially planned to be finalised in early 2016. While it was only completed in 2017, the data analysis and stakeholder consultation could not be extended to a more recent date for contractual reasons.

<sup>5</sup> Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC. OJ L 350/ 28.12.1998

<sup>6</sup> Non-road mobile machinery also covers inland waterway vessels, agricultural and forestry tractors, and recreational craft'. It is abbreviated NRMM throughout the text.

<sup>7</sup> WHO (2005): Health effects of transport-related air pollution. [http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0006/74715/E86650.pdf](http://www.euro.who.int/__data/assets/pdf_file/0006/74715/E86650.pdf)

<sup>8</sup> EEA (2012)

The FQD also aims at ensuring the compatibility of fuels with engines and exhaust after-treatment systems. This should have an impact on the internal markets for fuels and for road vehicles and NRMM by avoiding disparity between the laws adopted by Member States on environmental specifications for fuels that could otherwise create barriers to trade in the EU or affect trans-boundary movements of road vehicles and NRMM.

The FQD obliges Member States to set up national fuel quality monitoring systems that include sampling and analyses of fuels as regards their compliance with the fuel specifications set out under the FQD. The FQD also specifies the analytical methods to be used by the Member States for this purpose. On an annual basis, Member States are required to report monitoring data to the European Environmental Agency (EEA), which issues annual summary reports on EU fuel quality monitoring<sup>9</sup>.

Prior to the introduction of the FQD in 1998 no common legally binding fuel quality requirements for environmental and health protection for transport fuels existed in the European Community. A comprehensive monitoring system ensuring fuels quality across the European Community did not yet exist. Pollution from transport fuels, and in particular regarding the high levels of lead and sulphur, was a recognised problem negatively affecting the environment and human health.

The requirements of the FQD have evolved over time with the introduction of new fuel specifications and reporting requirements. The fuel specifications set minimal and maximal limits for certain fuel constituents, which are relevant to limit emissions of pollutants, and to ensure the compatibility of fuels with engines and after-treatments. While narrowing the bandwidth of the chemical composition of fuels, the fuel specifications do not provide for a full harmonisation of fuel characteristics that are of minor importance these aims. Nevertheless, the introduction of the fuel specifications through the FQD and their evolution required fuel suppliers to improve the quality of transport fuels for which substantial investments in the refining sector were required.

The first fuel specifications for petrol and diesel sold for road transport in the EU came into force on 1 January 2000 as originally foreseen by the Directive adopted in 1998. These fuels specifications included the key provisions of a ban on lead and limits for benzene and aromatics in petrol, as well as for sulphur content at a level of 150 mg/kg in petrol and of 350 mg/kg in diesel.

In 2003, the FQD was amended by Directive 2003/17/EC<sup>10</sup> in order to improve air quality standards and to facilitate greenhouse gas (GHG) emission savings by lowering the permitted sulphur content. Member States were required, by 1 January 2005, to ensure that low sulphur fuels (with up to 10 mg/kg, and also lowered aromatics content for petrol) are placed on the market. High sulphur fuel could initially still also be kept on the market but it had to be fully replaced for on-road use by 1 January 2009. The maximum sulphur content of fuels used in NRMM was reduced in two steps, first to 2000 mg/kg from the entry into force of the 2003 Directive and then to 1000 mg/kg as of 1 January 2008.

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<sup>9</sup> <http://www.eea.europa.eu/publications/eu-fuel-quality-monitoring-2015>

<sup>10</sup> Directive 2003/17/EC amending Directive 98/70/EC relating to the quality of petrol and diesel fuels. OJ L 76 of 22.3.2003.

In 2009, the FQD was further amended by Directive 2009/30/EC, mainly in order to foster GHG emission reductions from fuel use. A reduction target on the GHG intensity of fuels placed on the market was introduced. The fuel specifications were adjusted regarding the use of biofuel blends in petrol and diesel. In petrol, the maximum levels of oxygen content and oxygenates (including ethanol) were increased in order to permit the blending with bioethanol up to 10%.

An upper limit for blending of Fatty Acid Methyl Ester (FAME, a type of biodiesel) in fossil diesel was introduced because high blends of FAME can lead to damage in non-adapted engines, in particular regarding a degradation of hoses, gaskets and other parts. No legally binding standard for the upper limit of FAME existed in 2009. The voluntary industry standard EN590:2004 permitted the blending of FAME up to 5%. The mandate to lower greenhouse gas emissions under the FQD (and the target for renewable energy in transport under the Renewable Energy Directive) led to the expectation that use of FAME would increase. While the FAME content was generally limited to 7% Member States could permit the marketing of diesel with higher FAME levels.

The limits for polycyclic aromatic hydrocarbons in diesel and aromatics in petrol were further reduced in order to further enhance air quality. The metallic additive MMT<sup>11</sup> was limited to 6 mg per litre from 2011 and to 2 mg per litre from 2014. The fuels specifications were also extended to inland waterway transport.

In 2011 and 2014, further provisions were introduced into the FQD by two implementing Directives: Commission Directive 2011/63/EU introduced the possibility for derogations of the vapour pressure for the blending of ethanol in petrol. Commission Directive 2014/77/EU introduced a specification of the test methods to be used by the Member States in fuel monitoring.

In 2015, Directive (EU) 2015/1513 amended the provisions in relation to biofuels, which are outside the scope of this evaluation and are not evaluated here.

The improvement of transport related pollutants since 1995 is provided in section 5.1. The FQD does not address the monitoring of pollutants from transport itself. Pollutants from transport, as well as associated activity data, are reported by Member States to the EEA under the Convention on Long-range Transboundary Air Pollution (LRTAP Convention). The pollutants covered by this reporting that are relevant from transport are: lead, particulate matter (PM 2.5), SO<sub>x</sub>, NO<sub>x</sub>, non-methane volatile organic compounds, total polycyclic aromatic compounds, and carbon monoxide.

## **2.1. Intervention logic of the FQD**

An intervention logic was established, which explains how the FQD in its current form (as amended by previous acts) was expected to work. It sets out its objectives, actions, expected results, expected impacts and identifies the key external factors which may have affected the actual intervention.

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<sup>11</sup> Methylcyclopentadienyl manganese tricarbonyl.

## Figure 1: Intervention logic of the FQD, in its current form (as amended)

*(bracketed text in italic font is out of the scope of the evaluation)*

A graphical representation showing the interactions between individual objectives, actions, expected results, expected impacts and External factors affecting the intervention is provided in Annex 4.

### Objectives

**Achieve a high level of protection of the environment and human health in relation to fuels used in road transport as well as non-road mobile machinery**

- Reduce pollution from transport sector
- Enhance air quality

**Enhance the functioning of the single market for transport fuels and vehicles**

- Set minimum standards for the quality of transport fuels
- Ensure technical compatibility of fuels with engines and after-treatments

*(Reduce greenhouse gas emissions from transport fuels)*

### Actions

Individual provisions included in the Directive, which are listed below, have to be transposed by Member States into national legislation. Member States are obliged to ensure that fuel placed on the internal market by suppliers meets the requirements set out in the FQD.

- Harmonise petrol and diesel specifications (Articles 3 and 4 and Annexes I and II) within certain limits by setting upper and lower limits for a range of constituents
- Limit summer vapour pressure of petrol (Article 3 and Annex I) - with optional derogations for Member States with lower summer temperatures and for ethanol blending
- Limit sulphur content in petrol, diesel and gas-oil for non-road mobile machinery (Article 3 and 4 and Annexes I and II) - with optional derogation for petrol used in Outermost Regions
- Limit maximal content of ethanol and other oxygenates in petrol (Annex I)
- Limit fatty acid methyl ester (FAME) in diesel (Annex II) to 7% with optional derogation for Member States to allow higher blends
- Ban lead (Article 3.1)
- Ensure the free circulation of transport fuels (Article 5)
- Enable Member States to impose more stringent environmental specifications in specific agglomerations or sensitive environments (Article 6)
- Enable Member States to deviate from fuel specifications in exceptional limit of supply in crude oils (Article 7)
- *(Reduce greenhouse gas emissions from transport fuels (Article 7a))*
- *(Ensure sustainability of biofuels (Article 7b-7e))*
- Ensure monitoring and reporting (Article 8)
- Regulate other metallic additives (Article 8a)
- Set a framework for enforcement including penalties (Article 9a)

## Expected results

The results are expected to result from the joint implementation of all actions listed above.

- Reductions of emissions of pollutants from road vehicles and non-road mobile machinery
- Prevention of damage to engines and after treatments
- Facilitation of the internal fuel market
- Cost reductions in Outermost Regions and Member States with low summer temperatures
- Enhanced air quality in specific agglomerations or sensitive environments
- Continuity of fuel supply also in exceptional situations of limited crude oil supply
- (*Reduction of the greenhouse gas intensity of the fuels supplied*)
- (*Sustainability of biofuels*)

## Expected impacts

- Improved status of human health and the environment
- Improved air quality
- (*Reduced GHG emissions from transport*)
- Safe operability of vehicles within the EU
- Enhanced competitiveness of fuel and vehicle manufacturing industry
- Improved functioning of the internal fuel market

## External factors affecting the intervention

These external factors influence the actual emissions from transport pollutants (e.g. through changes in fuel consumption or technological development), as well as the internal market for transport fuels and vehicles (e.g. due to national choices on biofuel use).

- National policies on transport, climate and energy
- Fuel consumption in transport, including the effects of the economic crisis and oil price developments
- Developments in the technology of car engines and exhaust after-treatment

## 2.2. Flexibilities provided to Member States with respect to the implementation

With the application of the FQD, all fuels for use in road transport and NRMM put on the EU market have to be compliant with the fuel specifications set out by the FQD. In particular, petrol placed on the market has to comply with the requirements set out in Article 3 and Annex I and diesel placed on the market has to comply with the requirements set out in Article 4 and Annex II. The fuel specifications set upper and lower limits for certain constituents of fuel but they do not require that fuels are chemically identical.

However, while the fuel specifications ensure a minimal level of harmonisation for fuel use, the FQD also permits certain choices to Member States as regards national requirements for the marketing of these fuels. These include:

- Derogations for outermost-regions on the maximum sulphur content of petrol – applied by France for the region of Mayotte;
- Derogations on the maximum vapour pressure of summer petrol – applied by Denmark, Estonia, Finland, Ireland, Latvia, Sweden and the UK in relation to lower winter temperatures and by Bulgaria and Spain in relation to ethanol blending;

- Permitting the marketing of diesel with a fatty acid methyl ester (FAME) greater than 7% - applied by France where diesel can contain up to 8% FAME.

The following flexibilities provided by the FQD have not been used by any Member State:

- Marketing of fuels with more stringent environmental specifications; Authorisation of less stringent specifications in exceptional change of supply of crude oils.

Further flexibility is permitted to Member States regarding the following other points, but no information was collected on their implementation by the Member States:

- Permitting the marketing of small quantities of leaded petrol for old vehicles;
- Permitting elevated sulphur content for use in NRMM, agricultural and forestry tractors and recreational craft and rail vehicles;
- Adjustment of the distillation point for diesel and gas oil to severe winter conditions.

Some Member States have transposed CEN standards for petrol and diesel (EN 228 and EN 590) into national legislation. These standards also include aspects not associated with pollutant emissions and thus go beyond the fuel specifications set out under the FQD.

Member States markets differ with respect to the blends of biofuels. These national policies on biofuels relate on the one hand to Article 7a of the FQD, and on the other hand to the target for renewable energy use in transport under the Renewable Energy Directive. These aspects are outside the scope of this evaluation and are not reviewed here.

### **3. STATE OF IMPLEMENTATION**

This section provides information about the legal implementation of the FQD in terms of transposition of the Directive into national law and differences among Member States with respect to the implementation. It also reports on the enforcement of the Directive in terms of ensuring that fuels placed on the market are in line with the fuel quality requirements. Finally, it summarises how pollutants from transport are monitored in the EU.

#### **3.1. Legal implementation of the FQD**

Prior to the entry into force of the FQD, no common legally binding fuel specifications existed across the Member States.

As of 2017, all Member States have transposed the FQD (with the above-mentioned exception of the Article 7a), but there have been delays in the transposition of the original Directive as well as of the subsequent amendments. The original Directive of 1998 had to be transposed by 1 July 1999, which was about 6 months after the publication of the Directive. 14 Member States (out of 15 Member States of the European Community at that time<sup>12</sup>) did not notify complete transposition measures by the deadline. It has taken four years for it to be fully transposed (the last of the related non-communication infringement cases was closed by the end of 2003).

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<sup>12</sup> Only France met the transposition deadline.

Two infringement cases were opened for bad application of the FQD. In 2001, one case was linked to the placing on the market of diesel with excessive sulphur content (closed in 2002), and in 2007, a second case was linked to the absence of quality control mechanisms (closed in 2008).

In 2003, the revised Directive had to be transposed by 30 June 2003, but all 15 Member States failed to comply with this deadline, which was only three months. It took three years for the Directive to be fully implemented (the last of the related non-communication infringement cases was closed by mid-2006).

One infringement case was opened in 2004 for bad application of the Directive, linked to the absence of quality control mechanisms (closed in 2005).

As for the revised Directive of 2009, which had to be transposed by 31 December 2010, the full implementation was also delayed by four years. 13 Member States did not notify complete transposition measures by the deadline<sup>13</sup> (the last of the related non-communication infringement case was closed by the end of 2014).

Two infringement cases were opened in 2013 for bad application of the Directive, linked to the placing on the market of petrol containing levels of ethanol exceeding the allowed content, which were both solved by mid-2015.

### **3.2. Enforcement of fuel quality standards**

The FQD requires Member States to report on an annual basis various types of information relating to the quality of petrol and diesel fuels sold in their territories. More specifically, Member States must sample fuels each year and analyse their technical characteristics to ensure that they are consistent with the requirements of the FQD.

The EEA publishes annual reports on fuel quality monitoring, the latest of which was published in 2015<sup>14</sup>. Together with the preceding report, it provided input for the Commission report on fuel quality for the reporting years 2014 and 2015<sup>15</sup>. In the 2015 reporting year, 27 of the 28 EU Member States (with the exception of Romania) submitted their fuel quality reports in accordance with the requirements of the FQD. The report indicates that the vast majority of fuels<sup>16</sup> are in line with the specifications laid down in the FQD. Following requirements regarding the test methods to be used by Member States that was introduced by Commission Directive 2014/77/EU, the monitoring and reporting of fuel quality had to become more complete and robust<sup>17</sup>.

The FQD requires that effective, proportionate and dissuasive penalties are applied by Member States in cases of non-compliance.

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<sup>13</sup> Member States meeting the initial transposition deadline were the Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Latvia, Lithuania, Luxemburg, Malta, Portugal, Spain and the United Kingdom.

<sup>14</sup> <http://www.eea.europa.eu/publications/eu-fuel-quality-monitoring-2015>

<sup>15</sup> COM(2017) 49 final

<sup>16</sup> For petrol, compliance with specifications in samples ranges between 74% and 100% with a median value of 99%. For diesel, compliance ranges between 89% and 100% with a median at 100%.

<sup>17</sup> In 2015, 23 Member States reached or exceeded the number of samples recommended for statistical assurance.

#### 4. METHOD

The evaluation was carried out between March 2015 and March 2017. The evaluation roadmap was published in June 2016<sup>18</sup>. The evaluation was supported by a study<sup>19</sup> carried out by an external contractor. The study included a review of literature and available quantitative data regarding the evolution of pollutants from transport, as well as economic data for the cost-benefit analysis. The literature review focussed on available information at the EU level, both published by the European Commission and by industry organisations.

Quantitative data on costs were obtained through literature review and through the follow-up interviews. No dedicated modelling approach was undertaken. Emission data were taken from national reports to the EEA under the Convention on Long-Range Transboundary Air Pollution (CLRTAP). Compliance rates with fuel standards were obtained from the Fuel Quality Monitoring Reports provided by the EEA. Estimates of costs for compliance with fuel quality standards were mainly taken from the Commission's report on sectoral fitness check for the petroleum refining sector<sup>20</sup>. Administrative costs were obtained from the stakeholder consultation exercise. The economic benefits resulting from the avoided damage cost associated with reduced EU road transport and NRMM emissions were calculated in the evaluation study using functions on the cost of damage to health and the environment in monetary terms quantified by the EEA<sup>21</sup>. Even though some major costs and benefits could be quantified in the evaluation, it was not possible to establish a comprehensive cost-benefit analysis of the FQD effects in the framework of this evaluation. In particular, the quantitative effects of a reduction of pollutants on the status of the environment and human health were difficult to establish because of multiple factors that have an impact in addition to transport pollutants.

Quantitative data could not always be found for each evaluation question. Annex 2 provides information about the data gaps and the steps taken in the method to address these gaps.

Stakeholders' views were collected in the framework of the study through a targeted written consultation and interviews. A workshop took place in March 2017, in which the study findings were presented and stakeholders were invited to provide additional comments. Given the technical nature of the FQD and its application to a limited range of stakeholders only targeted stakeholder consultation was conducted covering all relevant stakeholder groups. The list of consulted stakeholder groups, as well as a synopsis report of stakeholder views, is provided in Annex 3.

Further detail on the method used in the evaluation is provided in Annex 2.

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<sup>18</sup> [http://ec.europa.eu/smart-regulation/roadmaps/docs/2015\\_clima\\_021\\_evaluation\\_fuel\\_quality\\_en.pdf](http://ec.europa.eu/smart-regulation/roadmaps/docs/2015_clima_021_evaluation_fuel_quality_en.pdf)  
<sup>19</sup> Study *Evaluation of Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels as amended*, prepared by Amec Foster Wheeler, CE Delft and TNO, February 2017. Unless referenced explicitly otherwise, this study is the source of information of the findings presented in this Staff Working Document

<sup>20</sup> JRC (2015): *EU Petroleum Refining Fitness Check: Impact of EU Legislation on Sectoral Economic Performance*. EUR 27262 EN.

<sup>21</sup> EEA (2014) *Costs of air pollution from European industrial facilities 2008-2012*.

## 5. ANSWERS TO THE EVALUATION QUESTIONS

In this section a synthesis of the answers to the evaluation questions is presented. Where the evaluation questions overlap with each other, they are presented in a group and a joint response is provided.

### 5.1. Effectiveness

1. What are the achievements that can clearly be pinpointed?
2. What have been the (qualitative and quantitative) effects of the intervention?
3. To what extent can these changes/effects be credited to the intervention?

As shown in the intervention logic in section 2.1, the FQD was expected to contribute to a reduction of pollutants from transport fuels used in road transport and NRMM, and thereby to contribute to a high level of protection of human health and the environment.

Historic data series reported by the Member States to the EEA show a substantial reduction in emissions of the main pollutants from transport, which are sulphur oxide (SO<sub>x</sub>), lead, nitrogen oxides (NO<sub>x</sub>), particulate matter (PM) and polycyclic aromatic hydrocarbons (PAH). Over the period 1995-2013 transport emissions of SO<sub>x</sub> declined by -98% (see Figure 2), emissions of lead declined by -95% (see Figure 3), emissions of NO<sub>x</sub> declined by -51% (see Figure 4), emissions of PM10 declined by -42% (see Figure 5), and emissions of PAH declined by -62% (see Figure 6).

Figure 2: SO<sub>x</sub> emissions from transport sector compared to fuel sales in the period 1995-2013 (CLRTAP, EEA)

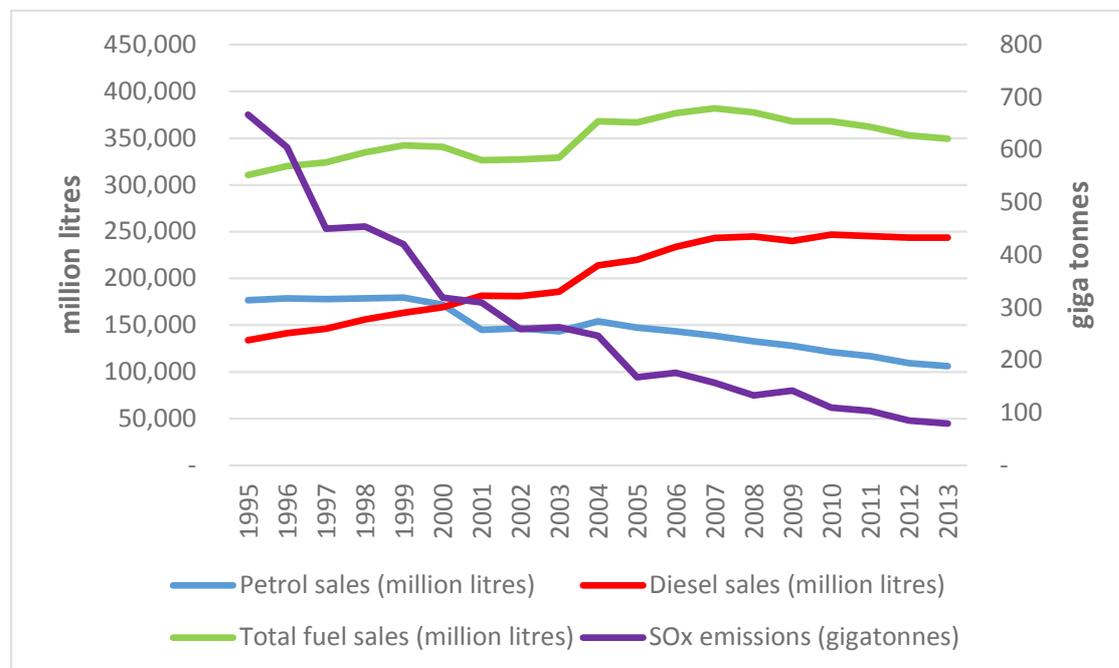


Figure 3: Lead emissions from transport sector compared to fuel sales in the period 1995-2013 (source CLRTAP, EEA)

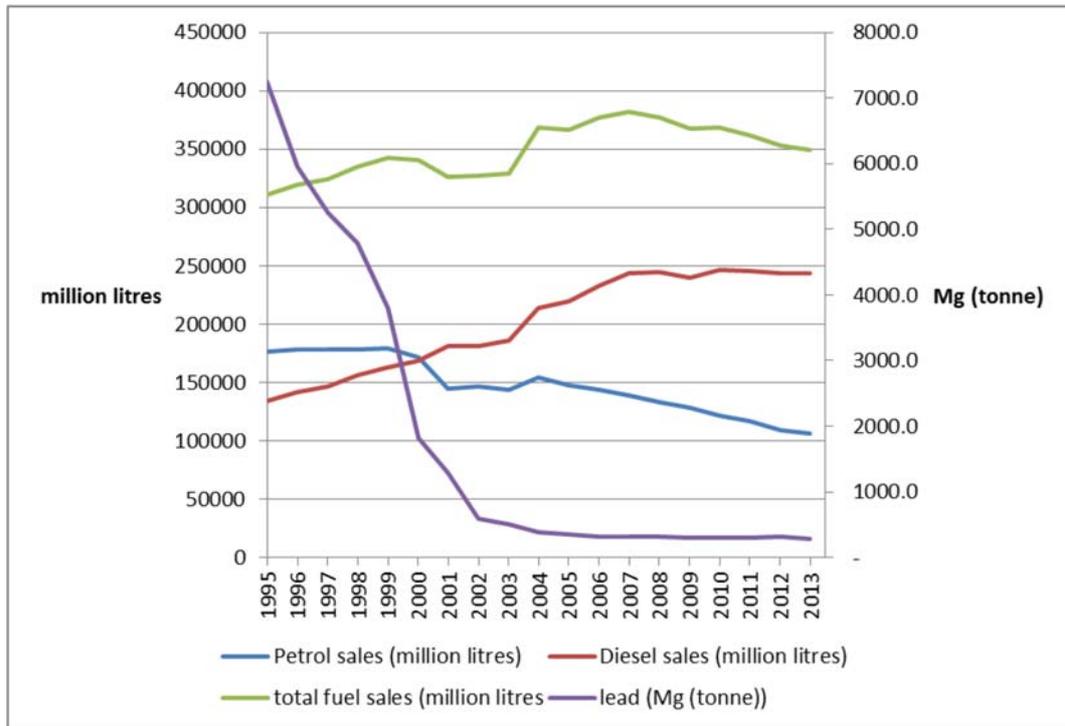


Figure 4: NO<sub>x</sub> emissions from transport sector compared to fuel sales in the period 1995-2013 (source CLRTAP, EEA)

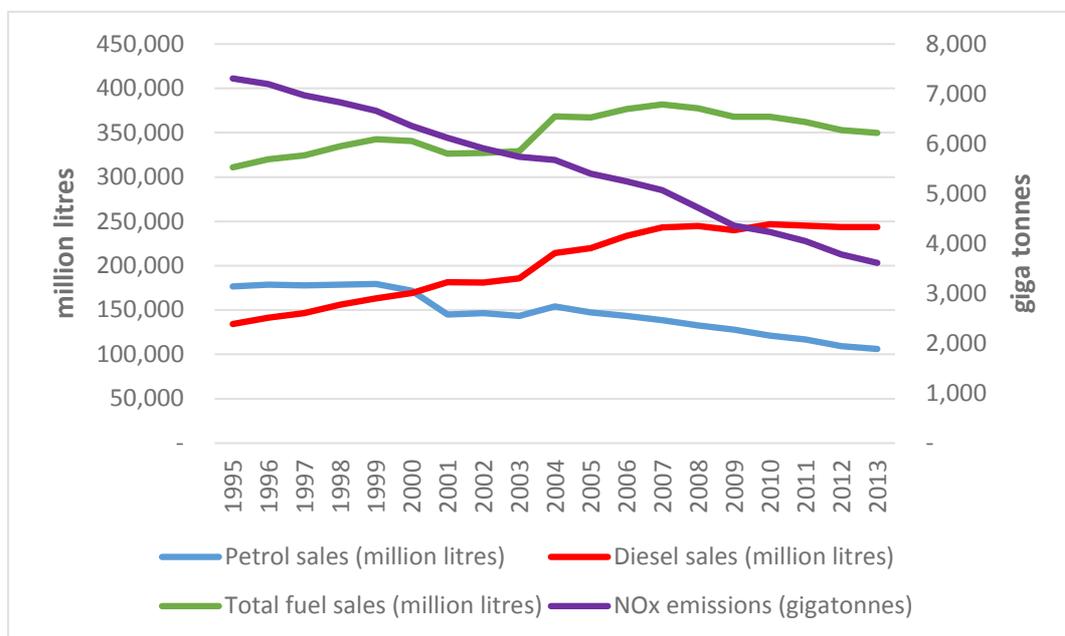


Figure 5:  $PM_{10}$  emissions from transport sector compared to fuel sales in the period 1995-2013 (source CLRTAP, EEA)

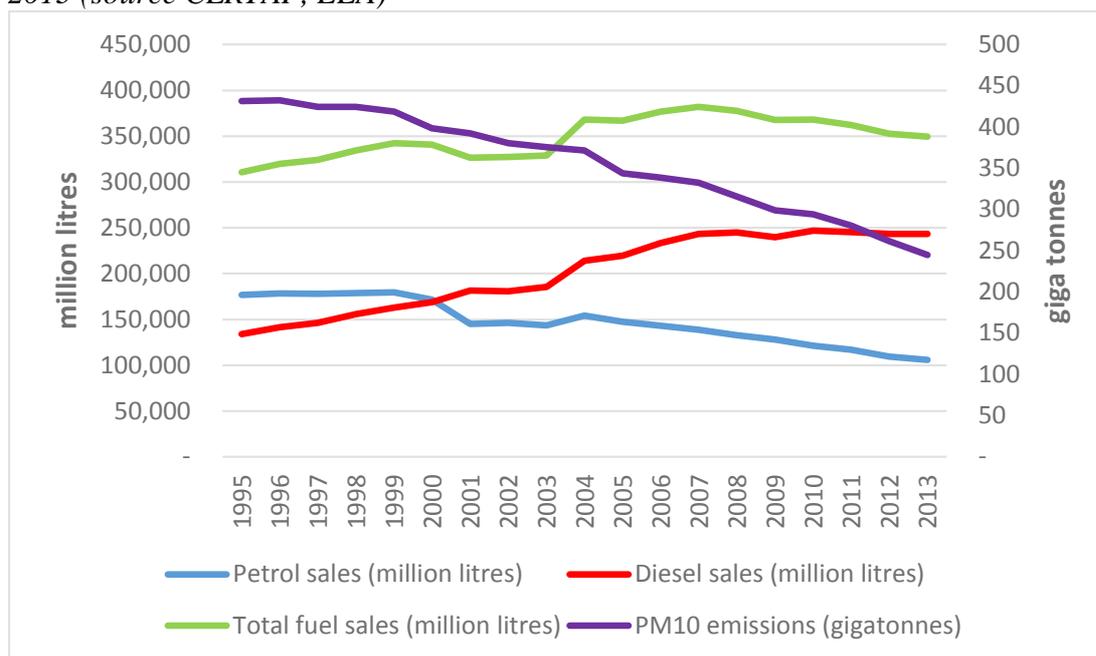
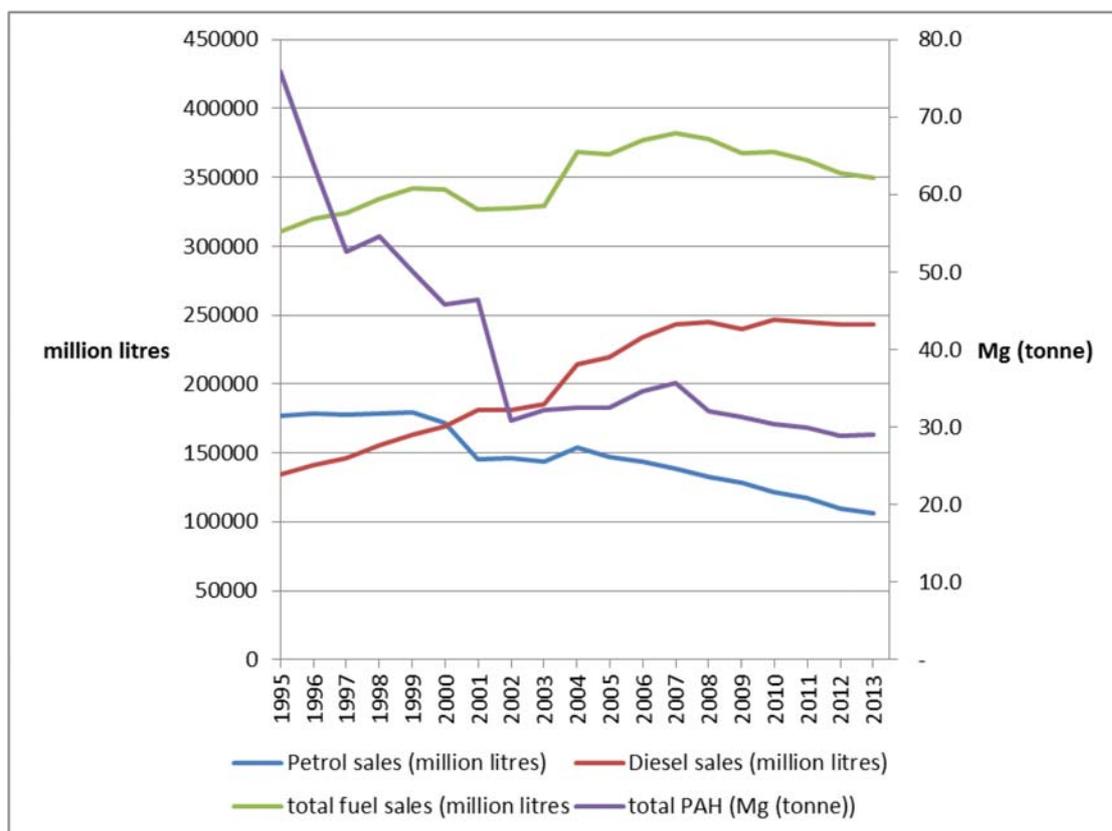


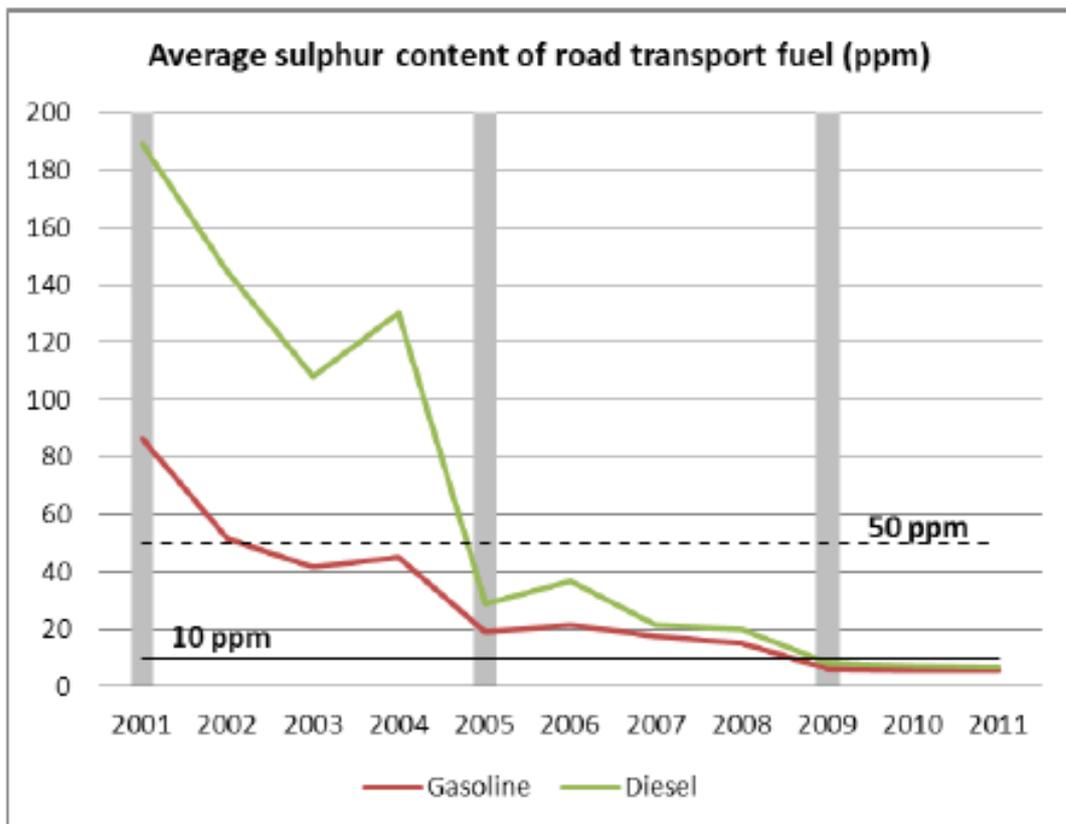
Figure 6: Total PAH emissions from transport sector compared to fuel sales in the period 1995-2013 (source CLRTAP, EEA)



These developments do not meet the high expectations presented in relation to the combined effect of the FQD and future vehicle efficiency standards when the legal proposal for the FQD was adopted by the Commission in 1996. At that time, projections indicated that  $NO_x$

emissions would decline by -64%, and urban particulates would decline by -69% between 1995 and 2010. As regards sulphur, the 50ppm threshold introduced through the FQD for diesel and gasoline fuels in 2005, and the 10ppm threshold in 2009, were met<sup>22</sup> (see Figure 7). No projections were presented for lead, or PAH. Instead, it was expected that volatile organic compounds would decline by -73% between 1995 and 2010, of which PAH are a fraction. Evaluation questions 6 to 8 address the likely causes for the remaining high emissions.

Figure 7: Average sulphur content of road transport fuel (ppm)( source EEA (2013) in JRC, 2015)



It is unlikely that the observed emission reductions would have occurred in the absence of legal requirements for fuel specifications, as well as binding vehicle emission standards, because they generally entail substantial investments in the refining sector (see cost benefit analysis of the FQD below). Therefore, a part of the emission reductions, and in particular of pollutants directly addressed by the FQD (SO<sub>x</sub>, lead, PAH), can be attributed to the intervention by the FQD, which cover the largest share of transport fuels used in road transport and NRMM. However, a possible contribution in emission reductions from transport not addressed by the FQD (railways, international aviation and shipping) cannot be separated.

<sup>22</sup> SWD(2015) 284 F2.

In general, a reduction of the sulphur content in fuel implies the reduction of both the SO<sub>x</sub> and PM emissions. In particular, the observed reductions of SO<sub>x</sub> emissions correlate to the progressive lower sulphur limits permitted in fuels (see Figures 2 and 7).

The emission reductions of NO<sub>x</sub> and PM have been mainly achieved through the introduction of advanced emission standards<sup>23</sup> as part of the EU framework for the type approval of cars, vans, trucks, buses and coaches. Current standards are Euro 6 for light duty vehicles<sup>24</sup> (cars and vans) and Euro VI for heavy duty vehicles<sup>25</sup>.

The introduction of these vehicle emission standards was only possible after amending the petrol and diesel specifications of the FQD by Directive 2003/17/EC, which lowered the permitted sulphur levels. This is because sulphur contained in the fuel above certain levels reduces the performance of catalytic converters (which remove NO<sub>x</sub> and other pollutants from tailpipe emissions) and limits the after-treatment technology options that can be used to meet the emission standards. The reduction of sulphur content technically enabled progress in the emission reductions of NO<sub>x</sub> and PM. Therefore, the FQD and the vehicle emissions standard legislation have jointly contributed to the observed emission reductions.

The FQD is also expected to ensure the technical compatibility of fuels used on road and in NRMM with internal combustion engines and after-treatments. Member States authorities and other stakeholders were consulted about the occurrence of possible vehicle damage resulting from the use of fuel not meeting the specifications set out by the FQD. There have been no reports of such incidences.

Minimum fuel requirement obligations are an important driver towards the delivery of a single market. Responses to the stakeholder questionnaire indicate a divided response regarding the success of the FQD in contributing to the internal fuel market. The majority of Member States responded in the affirmative (13 out of 17 respondents), whereas the majority of fossil fuel and biofuel industry stakeholders consider the FQD has not sufficiently ensured a single market (36 out of 40 respondents). The position of the Member States which consider that the FQD does not ensure a single market is linked to the fact that since the full requirements of fuel standards are not legally specified in the FQD, fuel quality can vary. The

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<sup>23</sup> Emissions of PM, NO<sub>x</sub>, un-burnt hydrocarbons (HC) and carbon monoxide (CO) are pollutants regulated by Euro Emissions Standards.

<sup>24</sup> Regulation (EC) No 715/2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information. OJ L 171/1 of 29.6.2007.

Commission Regulation (EC) No 692/2008 implementing and amending Regulation (EC) No 715/2007 on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information. OJ L 199 of 28.7.2008.

Commission Regulation (EU) 2016/427 amending Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6). OJ L 82 of 31.3.2016.

<sup>25</sup> Regulation (EC) No 595/2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC. OJ L 188 of 18.7.2009.

Commission Regulation (EU) No 582/2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) and amending Annexes I and III to Directive 2007/46/EC of the European Parliament and of the Council. OJ L 167 of 25.6.2011.

negative responses from the majority of fossil fuel and biofuel stakeholders, and one fuel additive manufacturer, were mainly in relation to the potential for derogations (for higher vapour pressure, and the derogation regarding the maximum FAME content in diesel)<sup>26</sup>. As obstacles for fully delivering a single market, also the lack of harmonization in the roll-out of E10 (petrol blended with up to 10% of ethanol) across the EU and the differences in the biofuel blending requirements across Member States were highlighted.

Nevertheless, it can reasonably be concluded that the strengthening of the environmental contribution in the fuel specifications in a harmonised manner has reduced the barriers to entry for EU and non-EU fuel suppliers. This is because fuel suppliers can dedicate (part of) their plants to the refining of EU-specification compliant fuel or manufacturing of compatible vehicles, rather than being required to comply with multiple specifications across different Member States that could have resulted from non-harmonised national approaches to improve the environmental performance of fuels.

In this regard the FQD is likely to have a beneficial effect in terms of the reduction of costs to society (both for consumers and for the industry) even though it could only be evaluated against a hypothetical scenario, in which Member States would have improved the environmental performance of fuels in a non-harmonised manner. Such evaluation has not been undertaken.

The monitoring and reporting requirement on fuel quality under the FQD are considered valuable because they permit to assess the actual fuel quality in the EU of fuels regulated by the FQD. Currently the majority of the fuel placed on the EU market is compliant with the FQD specifications as evidenced in the summary FQD annual reports and Member States Fuel Quality Monitoring annual reports. For petrol, compliance with specifications in samples ranges between 74% and 100% with a median value of 99%. For diesel, compliance ranges between 89% and 100% with a median at 100%<sup>27</sup>. The monitoring and reporting requirement does not extend to fuels not addressed by the FQD, which means that no information is available about the market uptake of these fuels through this mechanism.

Given the proven threat that transport pollutants pose for the environment and human health it is certain that the reduction of pollutant emissions has contributed positively on the status of human health and of the environment. The reduction of transport pollutants helps protecting the environment by improving air quality, as well as lowering the impact on the pollution of soil and water from transport fuels (EEA, 2012). However, as many additional factors besides transport pollutants are relevant it is difficult to quantify to which extent human health and the environment have improved due to the intervention by the FQD alone.

*4. To what extent has the approach taken, aspects relating to the scope and the goals set in the legislation ensured progress towards the main objectives?*

*5. To what extent has the approach taken, in terms of both scope and main elements in the legislation, ensured achievement of the objectives?*

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<sup>26</sup> Section 2.2 shows how often these derogations have been used.

<sup>27</sup> However, one demonstrated case in which a large volume of non-compliant petrol was sold is Lithuania, where 7 million litres RON98 E15 were sold in 2014.

As explained in section 2, the FQD has taken an approach to continuously further develop and improve the fuel specifications for petrol and diesel over time. In addition to the ban on lead, tolerance levels for pollutants were lowered over time. Fuel specifications were applied first to fuels used in road transport, then extended (partially) to NRMM, and finally also (partially) to inland waterways. Changes in the fuels specifications allowed an increased uptake of biofuels (by increasing the allowed levels for blending of ethanol and other oxygenates). At the same time an upper limit for ethanol and other oxygenates and FAME was maintained in order to ensure compatibility with engines and after-treatment systems, which have to be adapted to the biofuel blend.

This approach of continued evolution of the fuel specifications allowed reducing emissions over time in line with technological development. It can be expected that the gradual improvement of the standards over time has also contributed to lowering compliance costs.

For fuels used by NRMM (including on inland waterways) only the limits for sulphur, lead, and MMT apply, while the full fuel specifications for petrol and diesel are limited to road use. This limitation can be explained by the fact that pollution from on-road vehicles is more likely affecting more densely populated regions, and can reach higher levels of concentration. The Commission report pursuant to Article 9 of the FQD<sup>28</sup> analysed the option of extending the fuel specifications also to NRMM. It did not identify outstanding issues that would currently necessitate aligning the requirements for non-road mobile machinery gas-oils with those for on-road diesel.

The scope of the FQD does not cover all fuels used in transport. The most frequently used types of fuels (petrol and diesel/gas oil containing also low blends of biofuels) are addressed, but fuels with higher blends of biofuels (above 30% biofuel content) are outside the scope of the FQD. This issue is addressed in detail in section 5.4.

Annual EEA reports on fuel quality indicate that the rate of compliance with the fuel specifications is very high<sup>29</sup>. It is likely that compliance is supported by the obligatory monitoring and reporting requirements for Member States and by requirements for national penalties regimes under the FQD. However, no information was collected about national penalties regimes in the framework of this evaluation.

*6. What unintended or unexpected positive and negative effects, if any, have been produced?*

*7. What factors influenced the achievements observed, how and to what extent?*

*8. What factors had a positive or negative influence on the achievements observed and how?*

As outlined in relation to evaluation questions 1 to 3, the emission reductions of major pollutants were smaller than initially expected. The factors driving these developments were, on the one hand, an increase in fuel consumption (and in particular of diesel fuel) over the past decade, which partly offset some achievements in emission reductions. On the other hand, the remaining high levels of the emission of some pollutants, and in particular NO<sub>x</sub> from diesel cars is primarily to be attributed to sub-optimal application of after-treatment of

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<sup>28</sup> SWD(2017) XXX  
<sup>29</sup> See footnote 18.

exhaust gases. The fuel quality plays a minor role in this context, as is evident from the fact that exhaust emissions can differ substantially between different vehicles using the same type of fuel.

As outlined in section 3.1, the transposition of the FQD and its amendments has taken considerably longer than foreseen by the legislation. To some extent, this may have been the result of very short deadlines for the transposition or for individual provisions to become operational in the Member States. It was not assessed whether the delays in transposition affected the expected results and impacts of the FQD.

In addition to these unexpected effects, some implications resulting from the policy design of the FQD are perceived negatively by stakeholders. Some stakeholders from the fuel and automotive industry highlighted a potentially negative effect of the FQD by criticising that the FQD does not fully harmonise the internal market for transport fuels. These stakeholders claim increased costs to arise for fuel suppliers and limited possibilities for the optimisation of engines to result as compared to hypothetical situation in which a narrower range of fuel specifications would apply.

The legal base and the focus of the FQD is related to the protection of the environment and human health and its aim does not include a full harmonisation of the internal fuel market. Consequently, the fuel specifications are harmonised within a certain band width and do not imply that fuels placed on the EU market are chemically identical. Transport fuels can contain well above 100 different chemical compounds and they are produced from a diverse range of crude oil feedstocks, which differ with respect to their chemical composition.

One factor contributing to a differentiation of the national fuel markets is the way how Member States make choices within the broad range of margin as regards support to biofuel and its blending in transport fuels. This has led to a situation, where, in particular, biofuel blends are supplied unevenly across the EU, principally due to different bioethanol blends levels (E0, E5, and E10). This range of bioethanol blends is in line with the specifications for biofuel components, which specifies an upper limit of 10% bioethanol. This also reflects the different policies put in place by Member States with regards to biofuels. Under the FQD, biofuels are primarily used as a contribution to lower greenhouse gas emissions from fuels. These aspects are related to Article 7a, and are outside the scope of the evaluation.

A particular choice available to Member States concerns the blending limit of FAME in diesel. For blends of FAME<sup>30</sup> in diesel, the FQD sets an upper limit of 7% as a standard. Nevertheless, Member States may permit FAME levels greater than 7% without justification or approval procedure required under the FQD. Higher FAME levels than 7% increase the biodiesel share of the diesel blend<sup>31</sup>. The marketing of diesel with above 7% share of FAME (B8 with up to 8% FAME) is currently limited to France. All diesel fuels sold in France in 2015 were labelled as B8. The automobile industry and fuel suppliers argued against the fact that the FQD allows the introduction of B8 in France as this would contribute to market fragmentation if the diesel standard in France differs from that in other Member States. The

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<sup>30</sup> Fatty acid methyl ester, a type of biodiesel.

<sup>31</sup> Alternatively, higher uptake of biodiesel can also be achieved by blending so-called drop-in fuels, such as hydro-treated vegetable oil (HVO), for which no limits apply as they are fully compatible with diesel engines. The production capacities for HVO are, however, still very limited and confined to few Member States.

automobile industry requested clear labelling<sup>32</sup> of B8 as well as the supply of a protection grade (B7) for potentially non-compatible vehicles. However, the French authorities argued that no compatibility problems arise from the use of B8 in standard diesel vehicles.

National choices regarding the marketing of fuels with biofuel content above 30%, such as B100 (biodiesel – 100 FAME), E85 (petrol fuel nominally containing 85% ethanol or more than 50% ethanol for seasonal grades), HVO containing up to 7% FAME, or pure vegetable oil, fall out of the scope of the FQD and are disregarded here.

National fuel markets also differ, to some extent, from each other as a result of consumer preferences (e.g. differences in vehicle age, and diesel vs. petrol share). Market driven differences exist also in relation to petrol fuels with different octane grades (RON), all of which being in line with the fuel specifications.

In addition, the margin of manoeuvre provided to Member States within the flexibilities allowed under the FQD (see section 2.2) leads to a further differentiation of the national fuel markets resulting from regulatory requirements. Fuel suppliers claimed to have higher costs resulting from the need to supply to national markets with different fuel requirements. In this regard, substantial differences result from biofuel blending obligations and other support measures for biofuels in some Member States (e.g. availability of E10 in some but not all Member States).

The stakeholder consultation did not reveal any compatibility issues that would have created malfunctioning of vehicles due to non-adapted fuel quality which potentially could have been exacerbated by the flexibilities permitted under the FQD<sup>33</sup>.

The European Committee for Standardization (CEN) developed the voluntary industry standards EN 228 for petrol and EN 590 for diesel, which are generally aligned with the fuel specifications under the FQD in the sense that all fuels compliant with these standards are also compliant with the FQD. However, the CEN standards include further requirements not set out under the FQD (e.g. in respect of pump marking, phosphorus content and existent gum content in petrol, water and ash content in diesel, etc). These standards are under constant further development. Some Member States require the use of these industry standards on an obligatory basis. In the stakeholder consultation, industry sources stated that petrol and diesel fuels supplied to the EU market for road transport are generally in accordance with these standards<sup>34</sup>. Therefore, it is unlikely that the fact that these standards are obligatory in some Member States, while being voluntary in others leads to distortions of the internal fuel market.

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<sup>32</sup> In the context it should be noted that the Alternative Fuels Infrastructure Directive sco2014/94/EU requires consumer information on fuel and car compatibility as of 18 November 2016.

<sup>33</sup> The only damage that has been reported to occur from fuels meeting the fuel specification is filter clogging in lower temperatures due to the FAME content in B7 blends, however, it is unclear under which circumstances the damage occurred and whether there is a need for regulatory changes.

<sup>34</sup> An exception to this would be B8 diesel containing up to 8% FAME, which cannot be compliant with EN 590 that limits FAME content to 7%.

## 5.2. Efficiency

9. To what extent are the costs resulting from the implementation of the legislation proportionate to the benefits that have been achieved as regards each main element of the FQD?

The main administrative costs for Member States in relation to implementing the FQD arise from the monitoring and reporting requirements, including requirements for fuel sampling<sup>35</sup>. Data on sampling costs were obtained from the Member States in the consultation exercise. The cost-effectiveness of the monitoring and reporting obligations is perceived differently by the Member States. Seven Member States stated that the monitoring and reporting effort was proportional to the value and benefits arising from this reporting, while four Member States indicated that this was not the case. Costs vary significantly across Member States, with estimated costs for overall fuel sampling and monitoring costs ranging from 173,000 euro to 650,000 euro annually per Member State. These costs ranges can only be considered indicative, given that data was only provided by six Member States<sup>36</sup>. They do, however, illustrate the range and variability in costs, which are influenced by a number of factors, including the choice of Fuel Quality Monitoring System applied, the number of fuel samples taken and analysed (which is a function of the size of the market), and other factors such as labour costs.

Compliance with the fuel specifications is associated with significant costs in the fuel production process. In the consultation exercise, stakeholders from the fuel production industry stressed that the main costs arising for fuel manufacturers are in relation to the desulphurisation of fuel, which is energy intensive and also increases greenhouse gas emissions from the refining process. No quantification of the overall costs for compliance were provided by respondents to the consultation, but some representatives from the fuel production industry indicated that investment in hydrodesulphurisation and hydrogen units can reach tens of million Euros, depending on refinery site. About half of the fuel industry respondents considered the 2009 amendment of the FQD, which lowered the content of aromatics to have increased production costs, whereas the other half of industry respondents did not report such cost production effect. The majority of fossil fuel manufacturers and associations also state that the changes in PAH level have led to increased production and distribution costs. Costs and benefits resulting from the existence of derogations for the vapour pressure of summer petrol is analysed in section 5.4.

The EU Petroleum Refining Fitness Check<sup>37</sup> assessed the economic impact of the FQD requirements on the refining industry. It also concluded that the economic impact is to a great extent associated with the FQD's limits on the sulphur content of fuels. Other provisions of the FQD did not result in tangible economic impacts during 2000-2012 as investments for meeting vapour pressure requirements occurred before 2000; the reduction of the content of

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<sup>35</sup> As shown in the intervention logic, Member States are required to ensure monitoring and reporting of fuel quality (Article 8).

<sup>36</sup> Two of these Member States considered the administrative burden to be proportional to the benefits, while one stated the opposite. The three other Member States did not answer this question in the consultation or did not respond.

<sup>37</sup> JRC (2015): *EU Petroleum Refining Fitness Check: Impact of EU Legislation on Sectoral Economic Performance*. EUR 27262 EN.

polycyclic aromatic hydrocarbons took place at the same time as hydrodesulphurization, resulting in negligible additional costs; lead-based additives to gasoline were phased out before 2000; the use of MMT in European countries was avoided as a result of a consensus among users and producers; and there is no reliable way of estimating any additional costs related to FAME regulation incurred within the main refineries' operations. It was observed that the largest part of the operating cost increase experienced by EU refineries was related to energy costs (regardless of whether it is fuel quality related or not), probably from growing energy prices.

As outlined in section 2, the FQD provided for a stepwise approach in increasing the level of the protection of the environment and human health. The fuel specifications were made more stringent in consecutive amendments. Capital investments over the period 2000-2012 peaked in 2004 and 2008<sup>38</sup>, most likely because investment efforts were concentrated in order to comply with the new regulations coming into force in 2005 and 2009. It is likely that the spreading out over time of the investment needs for complying with the FQD requirements has helped limiting the impact on the competitiveness of refineries.

The Petroleum Refining Fitness Check also indicated that, overall, average annual capital investment costs for refineries to meet the fuels specifications were estimated to be 3.4 million euros per refinery and year for petrol and 4.9 million euros per refinery and year for diesel and gas oil (with a total of 8.5 million euros for all fuels) over the 2000-2012 period. In addition, the increased annual operating costs attributable to the fuel specifications were estimated 8.9 million euros per refinery and year. The Petroleum Refining Fitness Check also states that the actual expenditures of the industry in the framework of FQD compliance are comparable to the expected expenditures estimated in ex-ante impact assessment for the 2009 amendment<sup>39</sup>. Specific data on the administrative burden associated with the legislations were not available within the Petroleum Refining Fitness Check.

As outlined in section 6.1, the FQD has led to a decrease in fuel related emissions from transport, which is expected to lead to benefits in terms of avoided costs for the environment and human health. The cost of damage to health and the environment in monetary terms from air pollution has been quantified by the EEA<sup>40</sup>. Using these estimates and historic emission trends allows a quantification of the economic benefits resulting from the avoided damage cost associated with reduced EU road transport and NRMM emissions. These were calculated in the evaluation study by Amec Foster Wheeler, CE Delft and TNO<sup>41</sup> at 695 million euro for reduction in SO<sub>x</sub>, and 8,611 million euro for reduction in NO<sub>x</sub> for the period 2009-2013 for the EU 28. Further benefits would result from reductions in PM and PAH.

The Commission Staff Working Document on the Sectoral Fitness Check for the Petroleum Refining Sector<sup>42</sup> quantifies the reduction of the damage from the SO<sub>2</sub> emissions avoided by complying with the transport fuel sulphur standards to around 16.2 billion euro in total between 2001 and 2011 (i.e. 1.5 billion euro per year on average). The benefits to society

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<sup>38</sup> JRC (2015): *EU Petroleum Refining Fitness Check: Impact of EU Legislation on Sectoral Economic Performance*. EUR 27262 EN.

<sup>39</sup> SEC(2007) 56.

<sup>40</sup> EEA (2014) *Costs of air pollution from European industrial facilities 2008-2012*.

<sup>41</sup> *Study Evaluation of Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels as amended*, prepared by Amec Foster Wheeler, CE Delft and TNO, February 2017.

<sup>42</sup> SWD(2015) 284 F2.

arising from desulphurisation have also been estimated as being 197 million euro<sup>43</sup> per average EU-28 refinery during the period 2001-2011. It is to be noted that the latter estimates apply for a broader period of time during which SO<sub>2</sub> emissions declined more strongly. Correspondingly, the estimated benefit is higher than that estimated in the evaluation study by Amec Foster Wheeler, CE Delft and TNO.

The fact that the FQD provides for a harmonisation of the environmental specifications of transport fuels is expected to have a beneficial impact as compared to a hypothetical situation, in which comparable specifications were set at national level. This would have led to a more fragmented market with associated higher costs for fuel suppliers to comply. This could also have led to additional costs to consumers resulting from incomplete compatibility of vehicles with non-harmonised fuels. These effects, as well as the impact of fuel specifications on costs in the development and manufacturing of engines and after-treatments could not be quantified in the framework of this evaluation.

It is not possible to provide a full analysis across all costs and benefits of the FQD but the above data, which cover the largest share of the costs to industry and Member State monitoring, as well as the health related and environmental benefits of the main pollutants, already indicate that the benefits resulting from the delivery of health and environmental benefits under the FQD are higher than the costs. Therefore, the FQD can likely be considered cost effective.

In response to the consultation, stakeholders were divided about the question whether the benefits of the FQD outweigh the costs. Three Member States responded positively about the cost/benefit impact of the FQD, three Member States believe that costs outweigh the benefits, while 9 others stated that they did not know. The majority of car manufacturers and fuel producers<sup>44</sup> also responded positively.

*10. To what extent are the costs resulting from the implementation of the legislation different based on the approach taken to implement the legislation (while achieving the same results)? Which approach was most efficient?*

The evaluation of the FQD revealed that there have not been any alternative approaches applied.

*11. What are the major sources of inefficiencies? What steps could be taken to improve the efficiency of the Regulations? Are there missing tools and/or actions to implement the FQD more efficiently?*

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<sup>43</sup> This value is a cumulative estimate for the period 2001-2011. It is calculated using EEA damage cost values on the benefits of decreasing SO<sub>2</sub> intensities, and it represents the difference between a baseline situation where the average sulphur content in gasoline and diesel would have remained at the level determined by the FQD in 2000 (150 ppm for gasoline and 350 ppm for diesel), against the actual reported sulphur levels in fuel (source JRC, 2015).

<sup>44</sup> Positive responses came from 22 out of 39 respondents, including 12 fossil fuel manufacturers and suppliers, 7 biofuel industry members, one engine manufacturer, one equipment manufacturer, and one anonymous respondent. Three respondents, all fossil fuel manufacturers or suppliers, believe that costs of the FQD outweigh its benefits. 14 out of the total respondents state they do not know.

Elements of the FQD would have to be considered inefficient if there were alternative means to achieve a comparable or better result with lower effort in terms of administrative burden or compliance costs. The stakeholder consultation did not reveal any suggestion to replace the central element of the FQD, the setting of fuel specifications for fuels used in road transport and NRMM, by an alternative, potentially more efficient delivery mechanism.

The stakeholder consultation did not highlight any obvious inefficiencies of the FQD. However, some stakeholders pointed at potentially avoidable costs that result from the current design of the FQD. Stakeholders from the fuel industry stated that increasing the level of harmonisation of the internal fuel market by further limiting the bandwidth of fuel specifications could contribute to lowering costs for fuel suppliers. In particular, most fuel suppliers argued that costs of the placing on the market of fuels could be reduced if the number of biofuel blends was reduced. No quantitative estimates of these potential cost savings were provided by the industry. However, since E5 and E10 (the two predominant petrol blends) require the same base petrol blend, the additional costs in relation to the provision of these two blends are probably limited.

Also, stakeholders from the automotive industry stated that they would see a benefit in further narrowing down the range of fuels specifications, which would allow a better fine-tuning of engines to the fuels. No quantitative estimates of the potential cost savings were produced.

The question of limiting national flexibilities with respect to biofuels would have to be assessed in relation to the greenhouse gas reduction from fuels because this is the main objective of using biofuels. This question is not addressed in the present evaluation. There is no clear evidence that such changes would facilitate meeting the aims of the FQD in terms of the protection of the environment and human health, and to ensure the compatibility with engines, more efficiently.

More generally, the potential benefit that could result from a narrowing down of the bandwidth would require an impact assessment considering the benefits in economic and environmental as well as health related terms, and the costs in terms of required adjustments in the fuel production and associated trade implications. Such impact assessment is beyond the scope of this ex-post evaluation.

It was suggested by a small number of Member States that the parallel application of the legally binding fuels specifications under the FQD with the more extensive requirements of the voluntary industry standards EN 228 and EN 590 would be inefficient. These Member States suggested including the full requirements of both CEN standards into the FQD in order to achieve a greater harmonisation of the single market for fuel. However, it is not evident whether such a change would have a substantial impact as most fuels placed on the market comply with these standards also in the absence of corresponding requirements in national legislation. The real economic impact of the potential unequal application of the CEN standards has not been demonstrated and additional health and environmental benefits would not necessarily emerge. There would also be legal barriers for introducing a reference to a voluntary industry standard into EU legislation, which is not publicly available free of charge, and which is constantly being further developed.

In conclusion, while there may be economic benefits for certain market operators in increased harmonisation of the internal market for transport fuels there is currently no compelling

evidence that national flexibilities provided by the FQD constitute an inefficiency of the legislation or have led to severe market disruptions.

### 5.3. Relevance

*12. To what extent do the (current) objectives of the FQD still respond to needs in the EU considering current and expected technical, environmental and economic challenges?*

The objective of the FQD to achieve a high level of protection of the environment and human health in relation to fuel used in road transport as well as NRMM by reducing pollution from the transport sector, and enhancing air quality remains still valid because the pollutants from this sector addressed by the FQD would still constitute a major danger for the environment and human health if left unregulated.

As the Commission stated in the European Strategy for a Low-Emission Mobility<sup>45</sup>, emissions from conventional combustion engines will need to further reduce after 2020. The deployment of zero- and low-emission vehicles will need to be increased but it can be expected that conventional combustion engine vehicles will remain on the market still for some decades. Correspondingly, the need to define fuel standards will also remain important.

Also the objective to enhance the functioning of the single market for transport fuels and vehicles by setting minimum standards for the quality of transport fuels and ensuring the technical compatibility of such fuel with internal combustion engines and after-treatments remains valid. Technical progress in the efficiency and performance of engines can imply that engines and after-treatment systems become even more vulnerable to fuels not compliant with the fuels specifications. The maintenance of common fuel standards is therefore even likely to become more important over time.

The stakeholder consultation showed broad support for maintaining an approach of legally binding fuel standards under the FQD from Member States, NGOs and all industries concerned. No stakeholder opted for generally giving up fuel specifications and replacing them by national legislation or voluntary industry standards.

In addition to defining fuel specifications for transport fuels the FQD includes some specific provisions, which require to be individually assessed as regards their continued need. In particular, the use of metallic additives is restricted under the FQD, which includes a quantitative limit on the use of MMT in fuel. At present, MMT is not used in the EU. When responding to the consultation, most Member States, as well as fuel producers considered it likely that it would not be used even in the absence of this provision. Nevertheless, the limitation can be considered relevant as a safeguard.

*13. Are there technological, economic, or administrative issues that are not covered by the existing legislation and that could be introduced in view of their potential added value?*

In relation to the evaluation question it is pertinent to consider the current limitations of the scope of the FQD. The fuel specifications under FQD do not fully cover all possible fuels and

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<sup>45</sup>

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exclude blends of biofuel above 30% as well as certain alternative fuels (such as hydrogen, bio-methane, electricity, liquefied petroleum gas, compressed natural gas and liquefied natural gas). This aspect is analysed in section 6.4.

While the fuels specifications set out by the FQD define minimal requirements for environmental and health related grounds they do not establish a fully harmonised internal market for transport fuels. The minimal requirements include upper and lower limits for certain constituents in fuels in order to lower the emission of pollutants from the fuels use and to ensure the compatibility of fuels with engines and after-treatments. These minimal requirements allow fuels to be composed of a rather broad range of chemical compounds while being in line with the fuel specifications. This flexibility is required in order to allow refineries to use a broad range of different feedstocks (mainly crude oil of different sources and biofuel feedstocks) for the fuel production. As it emerges from the subsequent sections there is currently no indication that the internal market for transport fuels in the EU is dysfunctional and would require more in-depth steps towards full harmonisation.

## 5.4. Coherence

*14. How well does the legislation fit with and complement other EU policies and their objectives (e.g. environmental, social or economic)?*

*15. How does the legislation interact with other EU/ national/ international initiatives which have similar objectives (e.g. actions in the field of environment, single market, climate action)?*

*16. What synergies, overlaps and/or inconsistencies can be identified between the legislation's requirements and between the legislation and other policies?*

An assessment of the coherence needs revealed that the FQD is primarily interacting with the Renewable Energy Directive 2009/28/EC<sup>46</sup>. Further, some issues of the internal coherence within the FQD were identified, which are assessed below.

The FQD aims at ensuring a high level of protection for the environment and human health by lowering the emission of pollutants from the use of transport fuels. At the same time, by ensuring the compatibility of transport fuels with engines and after treatment it contributes to the functioning of the internal market for transport fuels as well as for vehicles that can be safely operated cross-border. The FQD thus complements other EU legislation aiming at enhanced air and water quality with a particular focus on transport fuels.

The FQD has close interactions with the Renewable Energy Directive, which sets, among others a target of 10% for the share of energy from renewable sources in transport by 2020 for each Member State. Biofuels provide the most significant contribution to meeting this target (in 2015, 88% of renewable energy in transport came from biofuels<sup>47</sup>). This target is related to the target set out under the FQD to lower the GHG intensity of the fuel mix by 6%

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<sup>46</sup> Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, OJ L 140, of 5.6.2009

<sup>47</sup> Renewable Energy Progress Report, COM(2017) 57 final.

by 2020. The latter target, which is based on Article 7a of the FQD, is out of the scope of this evaluation.

In the stakeholder consultation, Member States have a more positive view regarding the coherence of the FQD than industry representatives. Some stakeholders from the fuel supplying industry, including some biofuel producers, suggested that the upper limits for bioethanol (10%) and FAME (7%) set out in the FQD could hamper the introduction of biofuels and could thus become an obstacle for reaching the 10% target for renewable energy in transport under the Renewable Energy Directive. They also argued that reaching the 6% target for fuel suppliers to reduce the GHG intensity of transport fuels by 2020 according to Article 7a of the FQD would be facilitated through higher upper limits for these biofuels. Among Member States, most (14 out of 18 responding) consider that the fuel specifications have not impeded the introduction of biofuels. The biofuel blending limit is generally not seen as contradicting the two above-mentioned targets. Only one Member State indicated that the 10% limit for ethanol has impeded the introduction of biofuels, since HE15<sup>48</sup> had to be removed from the market as a consequence.

Work undertaken for this evaluation has found no evidence suggesting that the biofuels blending limits established by the FQD would be incoherent with the two targets because, at present, Member States are still far from reaching full implementation of the upper limits set in the FQD<sup>49</sup>. Biofuel use could still substantially increase before the blending limits would be reached. In 2013, the average share of biodiesel in diesel was 5.2%<sup>50</sup>, which is still below the blend limit for B7, which is 6.4% (both percentages expressed in energy content). In petrol, shares were found to be still relatively limited with only E5 being available in a majority of Member States. Further, it is not necessary to meet these targets alone through the use of ethanol and FAME, for which there are blending limits. Alternative contributions are available to be counted towards the 10% target under the RED that are not or less affected by these blending limits. These contributions include the use of hydro-treated vegetable oil (HVO), advanced biofuels that can be double-counted towards the target<sup>51</sup>, biomethane, or the use of renewable electricity in transport (which also benefits from multiple counting). For the 6% target under the FQD, also contributions from low emission fossil fuels (LPG, CNG, and LNG) and upstream emission reductions can be counted.

No quantitative analysis was undertaken to study the impact of fuel specifications set at EU level on internal and external trade, and whether and how they may have affected the competitiveness of EU fuel producers in comparison to competitors in third countries. In qualitative terms, common minimal fuels standards are expected to allow easier market access for third country competitors as compared to a situation, in which fuel standards are not harmonised. They can also be assumed to potentially expose European refineries to greater competition but, at the same time, such competition may have stimulated investments to increase the competitiveness of EU fuel producers, which could have led to lower fuels costs for consumers. In the stakeholder consultation, most fuel producers underlined that the setting of common fuel standards does not provide a competitive advantage for European

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<sup>48</sup> HE15 is a blend of 15% hydrous ethanol and 85% petrol.

<sup>49</sup> ICF et al 2015

<sup>50</sup> Taking into account B0, B7 and B8 blends. To be noted that B7 and B8 may contain less than 7% or 8% biodiesel (percentages expressed in volume content).

<sup>51</sup> Advanced ethanol would also be constrained by the blending limit, but due to double counting the physical share required to meet the target would be reduced to half.

producers because the market is equally open to competitors from third countries. Biofuel producers consider the FQD to provide a strong home market, while fossil fuel manufacturers and suppliers in their majority do not think that this is the case.

*17. To what extent are the legislation requirements complementary to each other, mutually supportive and non-contradictory?*

This question addresses the coherence with each other of the different elements included in the FQD ("internal coherence"). It therefore is important to consider particular provisions contained in the FQD that constitute specific derogations from the standard fuel specifications. It is also necessary to analyse the scope of the FQD as regards certain types of fuels not covered by the fuel specifications.

### **Provisions in the FQD permitting derogations from general principles**

As outlined in the intervention logic, the FQD allows certain derogations from the generally applying fuel specifications. It has been evaluated whether these derogations can be considered coherent with the overall approach of the FQD. This concerns the following derogations:

- Possibility to increase the vapour pressure for petrol in summer in Member States with low summer ambient temperatures and in the case of ethanol blending;
- Possibility increase the sulphur content in fuels used in outermost regions;
- Possibility to increase the FAME content beyond 7%.

The Commission has to grant an approval for the first derogation request from the Member States. No approval procedure applies for the others.

The vapour pressure derogations are generally considered important by the Member States that apply them<sup>52</sup>. In principle, the production of summer petrol with higher vapour pressure is cheaper than that of lower vapour pressure, which means that the derogations can achieve some cost savings. Member States justified their submission of derogations stating that the required investment would be at least €37 million and increase operational costs by at least €47 million per year if the derogations were not granted. On the other hand, the application of the derogation in some, but not all Member States leads to a differentiation in the market, which can increase costs for fuel suppliers that operate in Member States with different requirements. Therefore, the opinions of the fuel industry are divided on this question. Five out of 40 industry stakeholders responded that the low ambient summer temperatures derogation lead to higher costs, 6 stakeholders state that no higher costs result. Five respondents do not believe that the benefits outweigh the costs. Producers of oxygenates (such as ethers), which can lower the vapour pressure if blended in summer petrol would favour the discontinuation of the vapour petrol derogations. Given the different commercial interests involved, it is not unexpected to see different opinions on this issue.

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<sup>52</sup> The low ambient summer temperatures derogation has been granted to Denmark, Estonia, Finland, Ireland, Latvia, Sweden and the UK. The vapour pressure waiver related to the bioethanol content has been granted to Bulgaria and Spain.

Higher vapour pressure will lead to greater fugitive emissions (i.e. evaporative emissions from the unburned fuel) but this effect is reduced under conditions of low summer temperature. As ethanol has a higher vapour pressure than standard petrol, the blending of ethanol in petrol can increase the overall vapour pressure of the blend unless the petrol base is adjusted. The environmental impact of the derogations is subject to the case-by-case approval of the Commission. Altogether, there is no evidence that the vapour pressure derogations are incoherent with the general requirement for vapour pressure under the FQD or that they unduly compromise the protection of the environment and human health.

Further, fuels with higher sulphur content can be placed on the market in outermost regions deviating from the general applicable limit. This derogation can be justified as some of these regions may, for geographic reasons, import transport fuels primarily from third countries, where less stringent requirements on the sulphur content may apply. Requiring the full application of the FQD fuel specifications could imply that fuels have to be transported over much longer distances, and higher costs would apply for the consumer in these regions. This derogation has so far been applied by a single region (Mayotte). France considers it important to maintain this provision on economic grounds.

There are also safeguard provisions allowing the non-respect of the fuels specifications in case of exceptional circumstances disrupting supply of crude oil. These provisions have not yet been applied.

Under the FQD, the fuel specifications for road diesel generally limit the content of FAME to 7%. This limit is also taken over in the voluntary industry standard for on-road diesel (EN 590). Vehicle manufacturers issue engines guarantees if fuels are used that are compliant with this standard. However, Member States may permit the placing on the market of diesel fuel with FAME content greater than 7%. There is no requirement for offering a protection grade for diesel with a FAME content limited to 7% that would enable the operation of vehicles not adapted to higher blends of FAME. Using this flexibility without offering a protection grade could, in principle, lead to a conflict with the objective of the FQD to ensure the compatibility of fuels with engines and after treatments if the FAME content is substantially increased against the standard. However, this flexibility is currently implemented in a very limited way by the introduction of B8 in France (see section 5.1). The automobile industry and some fuel suppliers argued that this would lead to market fragmentation. So far, there have been no demonstrated negative implications on the operation of vehicles or the environment. Further monitoring will be required to understand whether there is a need for a change of this provision.

Altogether, given their very limited use, it can be concluded that the above-mentioned derogations are currently not considered to unduly compromise the aim of protecting the environment and human health and of ensuring compatibility of fuels with engines and after-treatments.

### **Limitations in the scope excluding or restricting the fuel specifications for certain fuels**

The FQD does not include all fuels used in road and non-road transport in its scope. The fuel specifications apply to fuels meeting the definition of petrol and diesel set out in Article 2 of the FQD. As this definition refers to certain codes of the Combined Nomenclature (CN) for the designation of products, which only apply to fuels containing a minimum of 70% mineral oil, higher blends of biofuel above 30% are out of the scope of the FQD. Therefore,

the FQD does not ensure a high level of protection of the environment and human health in relation to these fuels, nor compatibility of these fuels with engines and after treatments. Examples of such fuels are E85 (containing 85% ethanol) or B100 (pure FAME). As these fuels are not compatible with standard engines, higher blends of biofuels are rather produced for niche markets and non-road use (e.g. B100 can be used in some NRMM). Being out of scope of the FQD there is no obligation for reporting these fuels and so data on the precise share are not available. It is likely that these fuels represent a negligible share of the total EU fuel market, but they may gain importance in the future.

In the consultation exercise, some Member States, fuel suppliers and NGOs saw merit in changing fuel definitions so as to no longer making reference to CN-codes, which could in principle broaden the scope of the application of the Directive to include higher blends of biofuels. A broadening of the scope of the FQD to also cover maritime transport was suggested by an anonymous respondent.

At present, the European Committee for Standardization (CEN) is also carrying out research work on behalf of the Commission<sup>53</sup> on various biofuels blends and in particular E20/25. Some car manufacturers claim that their engines can already operate with a E20 or E25 blend. The results from the CEN contract are expected in 2019.

The Commission report pursuant to Article 9 of the FQD<sup>54</sup> analyses the option of introducing higher blends (above 30 percent) of biofuels into the range of fuels for which fuel specifications apply under the FQD. Considering the significant number of vehicles that are expected to remain in the 2020 fleet and beyond that are incompatible with higher blends of biofuels and the technical implications and related costs for the fuel distribution infrastructure (e.g. service stations, pipelines, storage tanks, pumps) and logistics in the fuel supply chain, the report concludes that there does not appear at present to be a case for changing the FQD specifications of general market fuels with regards to maximum EU bio-blend levels. The Commission should revisit this question in light of the development of CEN standards for higher blends and the need to ensure the long-term decarbonisation of transport.

From the onset, the scope of the FQD focussed on the most commonly used fuels petrol and diesel for on-road use, as well as gas-oil for non-road use. The scope has not been extended to advanced fuels, such as hydrogen, biomethane, or electricity, as well as existing fossil fuels such as LPG, CNG or LNG. The exclusion of these fuels does not seem to lead to unacceptable risks for the environment and human health because the use of these fuels results in fewer emissions of primary and secondary pollutants as compared to petrol and diesel. In particular, lead and sulphur emissions are not relevant for these fuels. Further, these fuels have reached a low level of market penetration at the present time.

The environmental specifications for diesel fuels to be used for road vehicles do not fully apply to gas-oils used in non-road mobile machinery (NRMM). The limit in the sulphur content to 10 ppm is already aligned between NRMM gas-oils and on-road diesel but other parameters set out in Annex II (such as e.g. the minimum cetane number and 7% FAME content) do not apply to NRMM. The Commission report pursuant to Article 9 of the FQD assessed the possibility and implications of further extending these requirements to NRMM fuel and the related implications. It concluded that such an extension is unlikely to have a

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<sup>53</sup> Contract SA/CEN/RESEARCH/EFTA/000/2014-13.

<sup>54</sup> COM(2017) xxx final

significant impact for most Member States. There could be some limited benefits to reduce air pollution. NRMM manufacturers would also see limited benefits, notably fewer maintenance requirements and lower engine development costs resulting from joint development with engines for heavy-duty road use. The overall impact on European refineries is expected to be relatively small. No outstanding issues were identified that would currently necessitate aligning the requirements for NRMM gas oils with those for on-road diesel.

Some Member States already require fuels used in NRMM (and in particular agricultural machinery) to comply with the specifications for on-road use. In the consultation exercise, some engine manufacturers pointed out that this contributes to market fragmentation.

*18. To what extent are objectives and achievements coherent with the Europe 2020 strategy and Europe 2030 policy goals?*

The Europe 2020 strategy includes the objective to achieve sustainable growth by, amongst others, building a more competitive low-carbon economy that makes efficient, sustainable use of resources and by protecting the environment, reducing emissions and preventing biodiversity loss. The FQD contributes to these objectives by setting fuel specifications for road and non-road transport, which reduce pollution these sectors, as explained in section 5.1. The reduction of transport pollutants helps protecting the environment by improving air quality, as well as lowering the impact on the pollution of soil and water from transport fuels (EEA, 2012).

The target for the reduction of the greenhouse gas intensity of transport fuels set out by the FQD is beyond the scope of this evaluation.

## **5.5. EU Added Value**

*19. What is the additional value resulting from the EU intervention(s), compared to what could be achieved by Member States at national and/or regional levels?*

*20. What would be the most likely consequences of stopping or withdrawing the existing EU intervention?*

As discussed earlier, by defining fuel specifications, the FQD ensures a comparable level of protection of the environment and human health against threats resulting from pollution by transport fuels. In the absence of EU legislation on fuel quality it is likely that Member States would adopt national provisions filling the empty space. This would risk that the level of protection for the environment and human health would become unequal across the EU, putting some citizens at a disadvantage.

In the consultation exercise, by far most Member States and other stakeholders recognised that a single market could not be delivered in the absence of the FQD. Therefore they value it in that regard. Industry representatives prefer the legally binding framework of the FQD, and certain stakeholder sub-groups (e.g. fossil fuel manufacturers and suppliers) in their majority would prefer even greater steps towards harmonisation of the single market under the FQD.

Addressing fuel specifications at a national level could lead to a fragmentation of the internal fuel market if these national provisions were not fully aligned. While the economic impact of such market fragmentation cannot be quantified in this evaluation it is likely that it could result in increased costs for fuel producers who would have to produce different types for fuels in line with national requirements, and, ultimately, consumers as these additional costs would be passed on to them. Furthermore, vehicle manufacturers would have to monitor all national provisions on fuel quality in order to ensure that engines and after-treatments would be compatible with fuel supplied in all Member States. In the event of significant divergence of national requirements for fuels cross-border movements of vehicles could become more difficult or even impossible.

There are different opinions regarding the question whether flexibilities provided to the Member States limit the added value of the FQD. Three-quarters of the Member States do not believe that this is the case. Among industry stakeholders, opinion is divided clearly: fossil fuel manufacturers and suppliers state that the added value of the FQD has been reduced by the introduction of different biofuel limits by certain Member States, while the majority of biofuel stakeholders believe it has not.

As outlined in section 5.2, compliance with the fuel specifications requires substantial costs in the refining process. Some of these are operational costs (e.g. for de-sulphurisation). Therefore, there is a risk that the environmental and health related performance of transport fuels would deteriorate in the absence of legally binding requirements for fuel specifications.

Even though voluntary industry standards (CEN) are currently applied to virtually all road transport fuels compliance with these voluntary standards cannot be ensured in the same way as with legally binding standards. At present, Member States monitor and report on fuel quality on the legal basis provided by the FQD. A majority of Member States responding to the consultation sees an added value of maintaining the FQD as an obligatory instrument enforcing fuels quality<sup>55</sup>. Also, all but two industry stakeholders believe that CEN standards do not fully replace the FQD and prefer the maintenance of the legally binding standards provided by the FQD.

In conclusion, the FQD provides EU added value by ensuring, in a harmonised manner, a high level of protection of the environment and human health regarding pollutants related to transport fuels. By setting minimal standards for fuel quality it contributes to the functioning of the internal market for transport fuels and vehicles.

## 6. CONCLUSIONS

The FQD has the objectives to achieve a high level of protection of the environment and human health in relation to fuels used in road transport as well as non-road mobile machinery (NRMM) by reducing pollution from the transport sector, and enhancing air quality and to enhance the functioning of the single market for transport fuels and vehicles by setting

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<sup>55</sup> 12 MS responding that CEN standards EN 228 and EN 590 would not have the same results as the intervention at EU-level delivered by the FQD. Two MS believe this would have the same result. Four Member States responded not to know.

minimum standards for the quality of transport fuels and ensuring the technical compatibility of such fuel with internal combustion engines and after-treatments.

The evaluation concluded that the FQD is effective in ensuring high levels of environmental and health protection in relation to fuels used in road transport and NRMM as evidenced by substantial reductions of the main pollutants from transport, which are sulphur oxide (SO<sub>x</sub>), lead, nitrogen oxides (NO<sub>x</sub>), particulate matter (PM) and polycyclic aromatic hydrocarbons (PAH). These reductions have been achieved to some extent by defining obligatory fuel specifications that became progressively stricter over the time of application of the FQD. To some extent, they have also helped trigger improved vehicle emission standards, which were dependent on improvements in fuel quality in order to be achievable. The emission reductions of major pollutants were smaller as initially expected. The increase in fuel consumption (and in particular of diesel fuel) over the past decade partly offset some achievements in emission reductions.

The FQD was also found effective in ensuring that engines and after treatment systems of road vehicles and non-road mobile machinery are not affected when using fuels aligned with the fuel specifications. No reports of engine damage resulting from inappropriate fuels not meeting the fuel specifications were obtained during the stakeholder consultation exercise.

A full cost-benefit evaluation of the FQD was not undertaken, in particular because of data limitations. However, from the available data on the main costs of complying with the fuel specifications and the administrative costs for Member States' authorities related to monitoring and reporting as well as the estimated economic benefits obtained from avoided damage to the environment and human health it appears that the FQD is likely to be efficient in achieving its goals as the benefits appear to outweigh the costs.

Coherence of the FQD with other EU legislation was assessed, and in particular with the Renewable Energy Directive, which has the greatest interaction with the FQD. Amongst others, the Renewable Energy Directive, provides for a target on renewable energy in transport to be met in 2020. Work undertaken for this evaluation has found no evidence suggesting that the biofuels blending limits (for ethanol and FAME) established by the FQD would be incoherent with this target and with the target for a reduction of the greenhouse gas intensity of transport fuels set out by the FQD. The assessment of the greenhouse gas target under Article 7a of the FQD was outside the scope of the evaluation.

Several specific provisions in the FQD were assessed with respect to the internal coherence of the Directive. No major issues were identified that would require a change of the Directive at the present time.

The vast majority of transport fuels placed on the EU market is in line with the FQD fuel specifications. This indicates that the current monitoring and reporting system under the FQD is appropriate.

By defining fuel specifications, the FQD ensures an appropriate level of protection of the environment and human health against threats resulting from pollution by transport fuels. In the absence of EU legislation on fuel quality it is possible that Member States would adopt national provisions filling the empty space. This would entail the risk that the level of protection for the environment and human health would become unequal across the EU, putting some citizens at a disadvantage. Addressing fuel specifications at a national level could also lead to a fragmentation of the internal fuel market if these national provisions are not fully aligned. Even though voluntary industry standards (CEN) are currently applied to

virtually all road transport fuels compliance with these voluntary standards cannot be ensured in the same way as with legally binding standards.

It can be concluded that the FQD is generally fit for purpose and should remain in place. Nevertheless, some points have been identified in the evaluation process, which deserve further consideration. These primarily relate to the functioning of the internal market. In line with its scope the FQD has not been constructed as an instrument to fully harmonise the internal transport fuel market. It therefore allows certain margin for national measures related to transport fuels, including while not limited to the blending of biofuels.

In consequence, there is a diversity of fuel blends supplied across different Member States, which may lead to higher costs for fuel suppliers. There are also some fuels for which the environmental specification of the FQD do not apply.

However, these above-mentioned findings do not entail that the overall objectives of the FQD would be compromised. Also, the work undertaken for this evaluation has not produced any compelling evidence that national flexibilities provided by the FQD have led to severe market disruptions.

As this situation may change in the future it is considered appropriate to continue monitoring of the development of the internal market for transport fuels.

## 7. ANNEXES

### **Annex 1 – Procedural information**

An external study was commissioned in support of the evaluation. The contract for the external study was signed with Amec Foster Wheeler, CE Delft and TNO on 26 March 2015 with the final report being accepted on 13 February 2017 (Study contract reference: CLIMA.C.2/SER/2014/0027r).

A stakeholder consultation was organised in the framework of the study (see Annex 2).

An inter-service steering group (ISG) was established to assist in the preparation and execution of the evaluation to ensure the quality of the evaluation and coherence with other policies. The following Directorate Generals participated in the ISG: DG Climate Action (CLIMA), Secretariat General (SG), DG Mobility and Transport (MOVE), DG Energy (ENER), DG Internal Market, Industry, Entrepreneurship and SMEs (GROW), and DG Environment (ENV).

The evaluation study was launched before the adoption of the Better Regulation Package (19 May 2015). The evaluation presented in this Staff Working Document followed as much as possible the procedures foreseen in the Better Regulation Package, and it is based on a set of evaluation questions that was first presented in the Evaluation Roadmap published in June 2016<sup>56</sup>. The evaluation was not selected for assessment by the Regulatory Scrutiny Board of the Commission.

The final study report was subject to a quality assessment agreed by the ISG. The final study is published in the EU bookshop.

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<sup>56</sup> [http://ec.europa.eu/smart-regulation/roadmaps/docs/2015\\_clima\\_021\\_evaluation\\_fuel\\_quality\\_en.pdf](http://ec.europa.eu/smart-regulation/roadmaps/docs/2015_clima_021_evaluation_fuel_quality_en.pdf)

## **Annex 2 – Methods used in preparing the evaluation**

In order to carry out the evaluation, an intervention logic (see Figure 1 in the main text and Annex 4) was developed.

Data collection methods included a stakeholder consultation (see Annex 3), literature review and analysis of available quantitative data.

The literature review focussed on available information at the EU level, both published by the European Commission and by industry organisations. Quantitative data on costs were obtained through literature review and through the follow-up interviews.

In order to assess the more quantitative aspects of the FQD, and to permit an assessment of efficiency considering costs and benefits where possible, data analysis has been carried out. No dedicated modelling approach was undertaken. This section describes the steps that have been undertaken to find and analyse statistical data to complement and verify the outcomes of the questionnaire and literature analysis.

### **Identification of data needs**

As a first step, the study identified the needs for quantitative analysis for each of the five evaluation criteria (effectiveness, efficiency, coherence, and relevance and EU added value). This has shown that especially the evaluation themes ‘effectiveness’ and ‘efficiency’ require a quantitative assessment of data, especially in relation to impacts on emissions, cost impacts and fuel markets. The evaluation themes ‘coherence’, ‘relevance’ and ‘EU-added value’ rely more on policy analysis and stakeholder opinions and can mostly not be assessed using quantitative indicators. The data analysis started with searching for the sources identified for each quantitative indicator and potential other sources.

The key data sources listed in Table 1 have been used.

**Table 1: Data sources used for quantitative analysis**

| <b>Data source</b>  | <b>Type of data</b>   |
|---|---|
| <b>Data reported by Member States under CLRTAP. <a href="http://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-convention-on-long-range-transboundary-air-pollution-lrtap-convention-9">http://www.eea.europa.eu/data-and-maps/data/national-emissions-reported-to-the-convention-on-long-range-transboundary-air-pollution-lrtap-convention-9</a></b> | <b>Emission pollutant trends</b>  |
| <b>Fuel Quality Monitoring Reports and In relation to fuel sales, data for the period 1995-2000 data is taken from Eurostat, whereas data from 2001 onwards is taken from Figure 1 of the 12<sup>th</sup> Annual Report on Quality of Petrol and Diesel fuel used for road transport in the EU (European</b>  | <b>Fuel sales data<br/>Level of compliance<br/>and (to a lesser extent) the penalties imposed</b> |

| Data source  | Type of data                                 |
|--|--|
| Commission, 2015b) (in million litres).  |  |
| ICF, 2015 based on Eurostat and FQM reports  | Data on biofuel blends and mandates          |
| Follow-up interviews with Member States  | Administrative burden in relation to the FQD |
| Eurostat labour costs data:<br><a href="http://ec.europa.eu/eurostat/statistics-explained/index.php/Hourly_labour_costs">http://ec.europa.eu/eurostat/statistics-explained/index.php/Hourly_labour_costs</a> | Costs of labour across the EU                |

### Data analysis in relation to emissions impacts

The data source for the emission impacts covered the relevant air polluting emissions, the relevant years and included the emissions from the transport sector. General sources on air quality (the concentration in the air) are not sufficient, because it is not clear to what extent changes in the concentration could be attributed to the transport sector. Data reported by Member States under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) were therefore used. This data has been submitted by Member States and are the official inventories produced by Member States and submitted to the EEA in the context of the LRTAP convention.

### Data analysis in relation to cost and benefits

The cost indicators defined for the various evaluation questions are mainly linked to cost for stakeholders groups (penalties, compliance costs etc.). The values of these costs were, however, hard to retrieve from general fuel cost data, such as Eurostat, because the level of disaggregation is not sufficiently detailed. Costs of compliance for fuel suppliers are not publicly available, because it can be seen as confidential information about the competitiveness of a company. The cost of compliance for Member States mainly consists of man-hours required for monitoring processes etc. This is also not publicly available information. Analysis of costs and benefits of compliance for fuel suppliers has been provided in the Commission's report on sectoral fitness check for the petroleum refining sector.

### Constraints and data limitations

Quantitative data could not always be found for each evaluation question. There are a number of limitations in the data available at present, as follows. The table below summarises the identified key data gaps, and the steps which have been taken to address them.

**Table 2: Quantitative data gaps and steps taken to address them**

| Data gap area   | Steps taken to address this gap   |
|---|---|
| Costs of implementing the Directive at the Member State level                                   | <ul style="list-style-type: none"> <li>▪ Follow-up interviews with Member States included request to provide data on the costs to competent authorities of monitoring and reporting.</li> <li>▪ 5 Member States provided some data, including estimates of the expenditure on fuel sampling, and estimates of the administrative man time spent in reporting under Article 8. The man-time costs reported by Member States on the administrative time required by the Competent Authority to comply with the FQD, have been monetised by applying Eurostat hourly labour costs, providing an estimate of the financial costs of reporting.</li> </ul> |
| Costs of implementing the Directive to industry, in particular fuel suppliers and manufacturers | <ul style="list-style-type: none"> <li>▪ Stakeholders invited to supply data and links to reports in the questionnaire. These have been followed up where provided.</li> <li>▪ In follow-up interviews with selected stakeholders these were again asked to provide information if possible.</li> <li>▪ Commission's Staff Working Document on Sectoral fitness check for the petroleum refining sector SWD(2015) 284 final/2, 7.1.2016 ) which contains quantitative estimates of the cost to refineries of adapting to comply with the FQD.</li> </ul>  |
| Quantitative data on impact of the Directive on engine development                              | <ul style="list-style-type: none"> <li>▪ Stakeholders were invited to provide information in the questionnaire and to supply links to reports. However, only qualitative information was provided.</li> </ul>   |
| Quantitative data on the benefits of the Directive  | <ul style="list-style-type: none"> <li>▪ Stakeholders invited to comment on the benefits of the Directive in the questionnaire, however no quantitative data was provided.</li> <li>▪ Literature review has been carried out to identify damage function costs, these have been applied to historic data on pollutant emissions in order to estimate avoided damage costs.</li> </ul>   |

## Annex 3 – Stakeholder consultation (synopsis report)

### Introduction

Stakeholders' views have been an important element providing input to the evaluation of the FQD. The stakeholder consultation activities conducted during the evaluation collected views on the practical implementation of the FQD to date and on its environmental as well as economic impact on relevant stakeholder groups.

### Consultation methods

In order to ensure that all affected and interested stakeholders are represented during the stakeholder consultation, at the initial stages of the evaluation a consultation strategy was developed, which included a mapping of stakeholders to identify relevant stakeholder groups which can be summarised as follows:

**Table 3: Consulted stakeholder groups**

|  |
|--|
| <b>Industry</b> <ul style="list-style-type: none"><li>• Fossil fuel manufacturers and suppliers</li><li>• Biofuel industry</li><li>• Synthetic fuels industry</li><li>• Fuel additive manufacturers</li><li>• Manufacturers of fuel retail delivery equipment</li><li>• Automobile and equipment manufacturers</li><li>• Waterway transportation</li></ul> |
| <b>National competent authorities</b>  |
| <b>Environmental and social NGOs</b>   |

The stakeholder consultation exercise comprised of **questionnaires** provided to Member State competent authorities and identified stakeholder groups, available through an internet platform (available between 25 August and 24 September 2015). A wide range of relevant stakeholders were contacted directly to raise awareness of the survey and invite responses. The questionnaires are included in the study report<sup>57</sup>.

In addition, in order to increase the participation from Member States, **follow-up telephone interviews** were carried out with some Member States that either had not responded to the questionnaire or where additional detail was sought (Finland, France, Italy, the Netherlands, Poland, Spain, Sweden, and the UK) and stakeholders (Euromot, ACEA, Fuels Europe, ePure, and T&E).

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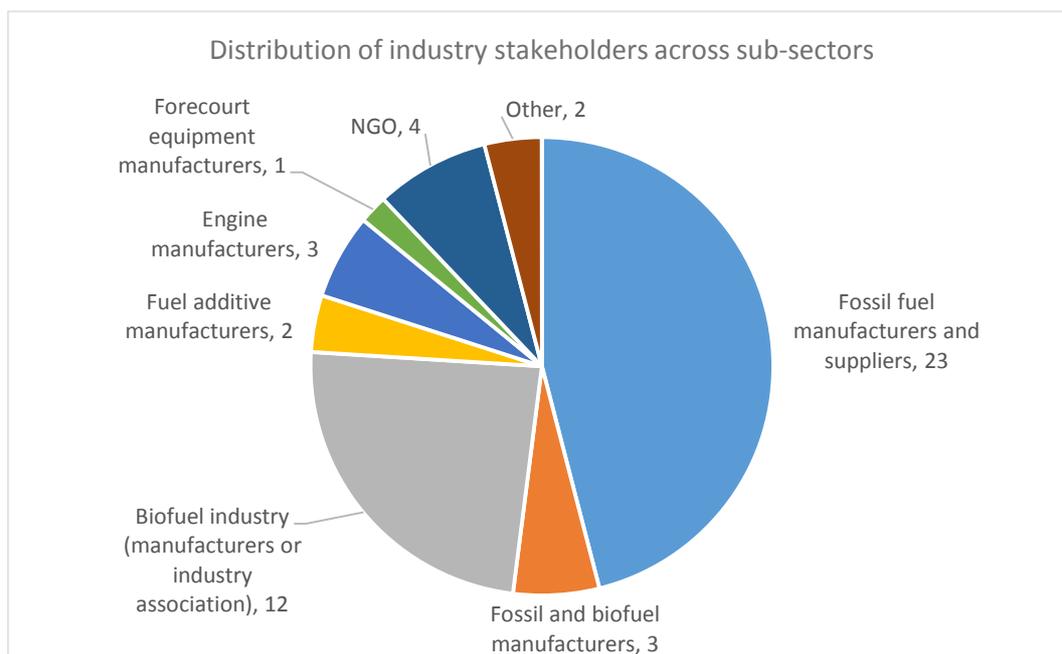
<sup>57</sup> Study Evaluation of Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels as amended, prepared by Amec Foster Wheeler, CE Delft and TNO, February 2017.

A **Stakeholder Workshop** was organised on 13 March 2017 with 31 participants, in which the results of the evaluation study were presented to interested parties. The objective of the workshop was to present and validate the preliminary findings of the evaluation. The workshop was chaired by DG CLIMA. Feedback was collected during the meeting and by written submissions after the workshop. At the workshop no new or major issues were raised by stakeholders.

A total of 17 responses to the questionnaire were received from Member State authorities (Austria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Latvia, Luxembourg, Malta, the Netherlands, Romania, Slovakia, Slovenia, Sweden and the United Kingdom). Additional 50 responses were received from other stakeholders. The responding stakeholders included 23 fossil fuel manufacturers and suppliers (this includes private sector companies, the Fuels Europe industry association, the Union of European Petroleum Independents (UPEI) and national oil industry associations from individual Member States), 12 biofuel industry stakeholders (manufacturers and industry associations), three fossil and biofuel manufacturers, three engine manufacturers, two fuel additive manufacturers, the manufacturers of fuel retail delivery equipment (Forecourt Equipment Federation, FEF), the Alliance for Synthetic Fuels in Europe (ASFE), Inland Navigation Europe (INE) and four environmental non-governmental organisations (NGOs), and two anonymous responses. Full details of the responding stakeholders can be found in Appendix A to the evaluation study.

Figure 9 illustrates the distribution of stakeholders across industry sub-sectors, NGOs and others.

**Figure 9: Distribution of stakeholders by sub-sector**



Four written submissions were received following the stakeholder workshop (from the biofuel industry, a fuel additive manufacturer, the European Committee for Standardization, and an environmental NGO)

## Consultation results

The analysis of the inputs to the consultation is presented along the key evaluation topics, i.e. relevance, effectiveness, efficiency as well as EU added value and coherence. The analysis is not exhaustive of all points raised by stakeholders. It focuses on the most important issues raised and summarises the views expressed.

### *Relevance*

Member States generally consider the FQD as relevant in order to ensure a high level of environmental protection and establish an internal market. The majority (11 out of 17) of the Member State respondents (Germany, Malta, the United Kingdom, Austria, the Czech Republic, the Netherlands, France, Denmark, Sweden, Slovenia and Finland) state that a single market could not be ensured without the FQD.

Some fossil fuel suppliers and the automotive industry would prefer even greater harmonisation of the fuel market (in particular fewer fuel grades). Fossil fuel and biofuel suppliers highlight the additional cost in relation to supplying multiple blends.

Derogations from the general fuel specifications allowed for Outermost regions are viewed positively by France (the only Member State, where they are applied at present) for the region of Mayotte. On the other hand, Spain indicated that this derogation has not been necessary in the Canary Islands because a local refinery present on there would also supply to other parts of Europe in line with the fuel specifications. Derogations for maximum levels of petrol vapour pressure are considered relevant to reduce costs in all Member States where they are applied<sup>58</sup>.

Restrictions on the use of metallic additives (in particular MMT) are considered relevant by most responding Member States (13 positive responses, 4 do not know) even if it is considered likely by 7 Member States that they would not be used in the absence of such legislation. Contrary to this, one chemical company producing fuel additives points at MMT being used outside the EU and promotes its use. Germany, a fuel additive manufacturer and a biofuel producer stated that the use of MMT is unnecessary and would be harmful for vehicle technology. An environmental NGO asked for MMT to be banned completely.

Requirements for monitoring and the application of penalties are generally seen as relevant by the Member States although 4 out of 17 Member States consider the monitoring costs as high, while 7 Member States consider the costs proportional to the benefits obtained from monitoring and reporting. The need for penalties is recognised by 14 out of 17 Member States. Some Member States would, however, see no continued need for harmonised rules on penalties.

Doubts have been voiced by some Member States whether the provision on the marketing of fuels with more stringent environmental specifications (Article 6) would be relevant as it has not been used to date.

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<sup>58</sup> The low ambient summer temperatures derogation has been granted to Denmark, Estonia, Finland, Ireland, Latvia, Sweden and the UK. The vapour pressure waiver related to the bioethanol content has been granted to Bulgaria and Spain.

## *Effectiveness*

Responses to the stakeholder questionnaire indicate a divided response regarding the success of the FQD in contributing to the internal fuel market. The majority of Member States responded in the affirmative (13 out of 17 respondents), whereas the majority of fossil fuel and biofuel industry stakeholders consider the FQD has not sufficiently ensured a single market (36 out of 40 respondents).

The position of the Member States which consider that the FQD does not ensure a single market (Germany, Estonia) is linked to the fact that since the full requirements of fuel standards are not legally specified in the FQD, fuel quality can vary.

The negative responses from the majority of fossil fuel and biofuel stakeholders, and one fuel additive manufacturer, were mainly in relation to the potential for derogations (for higher vapour pressure, and the derogation regarding the maximum FAME content in diesel<sup>59</sup>). Also highlighted was the lack of harmonization in the roll-out of E10 (petrol blended with up to 10% ethanol) across the EU and the differences in the biofuel blending requirements across Member States and therefore not fully delivering a single market.

The automobile industry and fuel suppliers argued against the fact that the FQD allows the introduction of B8 in France as this would contribute to market fragmentation and they requested clear labelling as well as the supply of a protection grade (B7) for non-compatible vehicles. The derogation option for higher FAME blends beyond B7 was also criticised by NGOs as the environmental impact does not have to be considered. One representative of the biofuel industry requested the introduction of a similar derogation also for bioethanol (i.e. allowing petrol to contain above 10% ethanol).

Fuel suppliers highlight the additional possible costs arising in relation to the need to supply a number of different biofuel grades in petrol (E0, E5, and E10). The main additional costs arising for fuel suppliers are in relation to additional administration and distribution costs of having to supply a number of different fuel grades, especially when operating in multiple Member States, as suppliers chose to continue delivering the conventional fuel grades and in addition have to supply a range of different fuel grades. However, no supporting evidence was provided by fuel manufacturers and suppliers in relation to the additional costs incurred due to supplying multiple blends. One representative of the biofuel industry requested the introduction of a minimal content of 5% ethanol in petrol, and to remove petrol up to 5% ethanol (E5) from the market after 2020.

Some Member States, fuel suppliers and NGOs would see a merit in changing fuel definitions so as to no longer making reference to CN-codes, which could in principle broaden the scope of the application of the Directive to include higher blends of biofuels. However, no clear evidence has been identified to indicate that the current use of CN codes as definitions would obstruct the EU single fuel market, considering the low share of higher blends in the EU fuel mix at present. Further, tailor-made fuel definitions included in the FQD might lead to a lack of coherence or even discrepancies with other pieces of EU legislation, like Customs rules, that rely on the CN-codes. Stakeholders potentially affected by such a change may not have been fully addressed in this consultation exercise.

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<sup>59</sup> See Section 2.2 regarding the implementation of these derogations.

A broadening of the scope of the FQD to also cover maritime transport was suggested by an anonymous respondent in order to improve data transparency on the fuel quality and to achieve improvements particularly regarding sulphur content. The fuel specifications were also requested to apply to captive fleets in order to cover a broader range of fuels used in the EU. It was also suggested to assess whether alternative fuels (such as hydrogen, biomethane, and electricity) need to be included as well.

Biofuel stakeholders indicated that the blending limits for certain types of biofuels may hamper the introduction/use of biofuels.

Some stakeholders would favour further development of fuel specifications. Some Member States would prefer including CEN standards EN228 and EN590 in the fuel specifications. Regarding this question, the European Committee for Standardization argues against the linking of voluntary industry standards and legal requirements in EU legislation as this may impede the further evolution of such voluntary standards. Also, relevant CEN standards may include more detail than needed for FQD compliance. Vehicle manufacturers indicate that the application of detergents and minimum oxidation stability (and other possible improvements) would better help ensuring proper functioning of present and future vehicle powertrains and emission control systems. Environmental NGOs would also be open to enhance the use of cleaner fuels to ensure that more advanced engine technologies can be deployed.

No stakeholder provided any indication of malfunctioning of engines or emission control systems under the current fuel specifications. The only exception to this are observations from Sweden and the UK of filter clogging in lower temperatures due to the FAME content in existing B7 blends. This is an area of ongoing research and the precise element responsible for the issue has not yet been identified.

The Member States authorities and stakeholders consulted for this study reach the conclusion that the majority of the petrol and diesel put in the market complies with the FQD requirements (which is also confirmed by the EEA fuel quality reports).

Engine manufacturers pointed out that some, but not all Member States require NRMM (and in particular agricultural machinery) fuels to comply with the on-road machinery, which is considered to contribute to market fragmentation.

As regards the requirement for monitoring most comments from stakeholders relate to the reporting requirements in relation to Article 7a of the FQD regarding GHG emission reductions, which is outside the scope of this evaluation.

### *Efficiency*

Stakeholders are divided about the question whether the benefits of the FQD outweigh the costs. Three Member States (Austria, Germany and Sweden) are entirely positive about the cost/benefit impact of the FQD. Sweden states that in the absence of the FQD fuel suppliers would likely have to comply with REACH, at higher costs. Moreover, Germany argues that car manufacturers benefit the most from a more stringent regulation, since higher quality fuels enable them to meet the relevant end of life and greenhouse gas limits more easily, therefore decreasing the costs of reducing emissions from vehicles. Three other Member States (France, the Czech Republic and the Netherlands) believe that costs outweigh the benefits. The Czech Republic comments on the fact that older vehicles are still prevailing in the national car fleet. Nine out of 17 Member States stated that they did not know.

The majority of car manufacturers and fuel producers are positive about the cost-benefit relationship and believe that the costs do not outweigh the benefits (22 out of 39 respondents, including 12 fossil fuel manufacturers and suppliers, 7 biofuel industry members, one engine manufacturer, one equipment manufacturer, and one anonymous respondent). Three respondents, all fossil fuel manufacturers or suppliers, believe that costs of the FQD outweigh its benefits. 14 out of the total respondents state they do not know.

Most fossil fuel manufacturers, with some support by biofuel producers, indicate that restrictions on the marketing of petrol and diesel resulting from the FQD lead to an increase in fuel production costs. In particular, significant costs were claimed to occur in the refining sector from desulphurisation.

The latest amendment of the FQD, which lowered the content of aromatics, is considered by about half of the industry respondents to have increased production costs, whereas this is not the case in the other half. The majority of fossil fuel manufacturers and associations also state that the changes in PAH level have led to increased production and distribution costs.

Fuel additive producers point at the trade-off that higher quality fuels can lead to savings in the cost for vehicle production and maintenance, as well as environmental benefits, although associated with costs associated with producing the fuel itself.

While data on costs arising from derogations is limited and patchy, stakeholder evidence indicates that there are additional costs associated with the application of derogations in some cases. However, these costs are outweighed by the economic savings obtained, according to most of the respondents. Some respondents have indicated that these savings may not have an impact on consumers and will therefore only benefit the fuel manufacturing industry.

Member States justified their submission of derogations stating that the required investment would be of at least €37 million and increased operational costs of at least €24 million per year. This gives an indication of the possible benefits obtained by petrol manufacturers with these derogations.

Nevertheless, responses from industry stakeholders indicate that approximately one sixth (5 out of 40) of respondents state they incurred higher costs due to low ambient summer temperature derogations, or derogations in relation to bioethanol during the summer period. These five are all fossil fuel manufacturers. Five respondents do not believe that the benefits brought by the low summer ambient temperature derogations outweigh the costs. Contrary to that, 6 stakeholders responded that the vapour pressure waiver (due to low summer ambient temperature or to increase the bioethanol content of petrol) does not incur higher costs, given that manufacturing petrol with a higher vapour pressure is actually cheaper due to the higher use of butane, which reduces costs.

Cost-effectiveness of the monitoring and reporting obligations is perceived differently by the Member States. Six Member States positively evaluated the relationship between the administrative time burden and the benefits arising from it (Malta, the Czech Republic, France, the United Kingdom, the Netherlands and Slovakia). Four Member States negatively evaluate the cost-efficiency of the monitoring and reporting obligations (Croatia, Estonia, Luxemburg and Sweden), considering that the reporting administrative time burden is disproportionate in relation to the benefits delivered. Cost estimates provided by the Member States indicate a broad range and variability in costs, which are influenced by a number of factors, including the choice of Fuel Quality Monitoring System (FQMS) applied by each

Member State, the number of fuel samples taken and analysed, and other factors such as labour costs within each country.

### *Coherence*

Comparing responses from industry and Member States authorities indicates that Member States have a more positive view regarding the coherence of the FQD. Industry stakeholders have highlighted concerns around the practical issues regarding day-to-day compliance. These issues include a perceived lack of coherence between the FQD and the Renewable Energy Directive (RED) and interactions between engine functioning and the requirements of fuel specifications.

Most Member States indicate that the scope of the FQD is clear and understandable. Industry stakeholders often claim a lack of clarity regarding the coverage of NRMM, the exclusion of certain fuels not meeting the definition based on CN codes, non-coverage of alternative fuels (such as CNG), as well as specifications for gas oil for inland waterways vessels.

Among Member States, most (14 out of 18 responding) consider that the petrol specification has not impeded the introduction of biofuels. The biofuel blending limit is not seen as contradicting the 6% GHG target under Article 7a of the FQD and the 10% RES target under the RED. These targets are, however, generally seen as challenging and require a change as compared to the current fuel mix in certain Member States (France, Spain, UK). Only the Netherlands state that the 10% limit for ethanol has impeded the introduction of biofuels, since HE15 (a blend of 16% hydrous ethanol and 85% petrol) had to be removed from the market as a consequence.

However, respondents from the biofuel sector and some other industry representatives believe that the blending limits for certain biofuels hinder the introduction of biofuel in the market.

Some industry and NGOs also consider that the exclusion of higher blends from the scope of the FQD does not support them in becoming commercially viable and treated as general market fuels. Nevertheless, some Member States opted for introducing fuels with higher biofuel content in order to comply with the targets of the RED. Some Member States (the Czech Republic, France, and Latvia) decided to allow the placing on the market of higher blends such as B31 or E85 in their legislation, which are out of the scope of the FQD<sup>60</sup>.

The EU refining industry has also expressed concerns on the increased use of biofuels in petrol and diesel blends and how this can impact production costs and their revenue.

Member State authorities were also asked whether the fuel specifications in Annex I are in line with relevant CEN standard. 12 Member States stated that they are not aware of any discrepancies (Germany, Italy, Spain, Poland, Malta, Latvia, the UK, Croatia, France, Denmark, Sweden and Finland). Conversely, the Czech Republic and Slovenia state that they are aware of discrepancies, but no details were provided.

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<sup>60</sup> Lithuania and the Netherlands temporarily permitted the placing on to the market of petrol with an ethanol content higher than 10% (RON98E15 in Lithuania, HE15 in the Netherlands), potentially driven by the targets in the RED, however in both cases these fuels were not compliant with the FQD and have been withdrawn from the market following intervention by the Commission

Industry stakeholders addressed the question whether the latest amendment to the FQD, which confirmed the mandatory introduction of sulphur free fuel, influenced engine functioning. 19 (48%) state they do believe this influences engine function (these include automobile manufacturers, fossil fuel and biofuel producers, and NGOs). Four fossil fuel manufacturers, state they believed it did not affect engine functioning.

Industry stakeholders also commented on the FQD amendment reducing aromatics content to 35% impacted on engine functioning. There are conflicting views among stakeholders regarding the impact of aromatics content on engines. Many stakeholders (14) think it does, including fossil and biofuel fuel manufacturers, fuel additive producers, and the automobile industry. The seven who think the change in aromatics does not influence engine functioning were 6 fossil fuel manufacturers and one biofuel producer. As evident from position papers published independent of this stakeholder consultation, the automotive industry would be in favour of reducing aromatics concentration levels further and to align engine and fuel quality standards, to avoid hindering compliance with other legislation, and potentially damaging engines.

Industry stakeholders provided their views on whether engines will be affected by the latest amendments of the FQD to limit to below 10 ppm sulphur in diesel and 10 ppm sulphur in gas oil. There was not a consensus agreement from industry stakeholders in this regard, with 17 believing there is an effect, and 14 believing there is not.

Regarding the 8% limit for PAHs, the opinions of industrial stakeholders are similarly divided. Approximately a third of the respondents state that this amendment has an effect on engine performance, whereas 31% stated that this is not the case. Those who state that there are no effects mention that whereas engine functioning may not be affected, the 8% PAH limit can lead to higher NO<sub>x</sub> emissions.

#### *EU added value*

As also point out above, in relation to the impact on the internal market, by far most Member States and other stakeholders (27 out of 37 respondents from both fossil fuel and biofuel industries and NGO) believe that a single market could not be delivered in the absence of the FQD, therefore they value it in that regard. The FQD also guarantees minimal standards with respect to environmental performance of transport fuels.

Some industrial stakeholders consider a homogenous internal market to bring limited competitive advantages for EU operators as compared to extra-EU operators because the introduction of harmonised fuel specifications the FQD has also reduced the barriers to entry for non-EU fuel suppliers. Also, as EU refineries have converted their full production capacity to comply with the FQD, this is considered to make it more difficult for them to compete with non-EU producers in regions with less stringent fuel specifications.

In response to the questions whether the scope of the FQD as defined now justifies EU intervention or whether a voluntary application of CEN standards would not deliver the same result, 8 Member States responded affirmatively, while two responded negatively.

Industry representatives prefer the legally binding framework of the FQD, and certain stakeholder sub-groups (e.g. fossil fuel manufacturers and suppliers) in their majority would prefer even greater steps towards harmonisation of the single market under the FQD. One

anonymous respondent suggested transforming the FQD into a Regulation in order to improve the harmonised implementation.

There are different opinions regarding the question whether flexibilities provided to the Member States limit the added value of the FQD. Three-quarters of the Member States do not believe that this is the case. Among industry stakeholders, opinion is divided clearly: fossil fuel manufacturers and suppliers state that the added value of the FQD has been reduced by the introduction of different biofuel limits by certain Member States, while the majority of biofuel stakeholders believe it has not.

A conclusion cannot be reached on this subject. Although Member States agree that the EU-added value of the Directive has not decreased, stakeholders understandably have conflicting views on this issue, given that harmonisation of limits is beneficial for fossil fuel suppliers, while introduction of different limits is likely to enable higher use of biofuels, being beneficial to biofuels producers.

### **Use of the stakeholder input for the evaluation**

Stakeholder input received during the stakeholder consultation was an important tool to address certain limitations in access to quantitative data for the evaluation. The results from the analysis of the stakeholder input have been used when answering the individual evaluation questions as a complementary source that may or may not corroborate the findings from other sources. Statements or positions brought forward by certain stakeholders have been clearly highlighted as such.

## Annex 4 - Graphical representation of the intervention logic of the FQD

The graph shows the intervention logic of the FQD in its present form (as amended)

